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Due to a printing error, the Table of Contents on the front page of this issue is incorrect. The corrected version follows.

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Introduction from the Editorial Group

The four articles in this issue of the Newsletter address very different topics but each is concerned with socially *mediated* performance; how it can be represented, analyzed, interpreted, or planned. The first article, by Ed Hutchins, explores connections between behaving and thinking. He analyzes these connections by relating two models, one of a person using a common mediating device, a check list, in accomplishing a task, and the other a cognitive model consisting of interconnected "neural networks." His analysis posits a complex interplay between what he calls internal and external mediating structures and how this dynamic interaction changes with social practice. Hutchins' work represents a cognitive science approach in which thinking is not located solely inside someone's head. On the contrary, an ethnographic understanding of social actions becomes indispensable to the development of sophisticated models of thinking. As such, thinking is perceived as socially created and distributed phenomena whether one concentrates on individuals or their social behavior.

Mariane Hedegaard follows with a detailed contrast of the underlying constructs of two approaches to the study of thinking, the "cultural-historical" theory associated with Soviet psychologists and "cognitive-behaviorist" theory associated with Western psychologists, most prominently in this country. She emphasizes how the constructs of the cultural-historical approach bring the analyst closer, unavoidably closer, to the study of individuals-in-social-activity as the primary unit of analysis, thus including in a psychology of thinking those properties that most distinguish human beings, our social actions, but which are most problematic for individually oriented, Western approaches to thinking. She points out that a key component of the cultural-historical approach is the inclusion of the *content* of thinking as an essential, mediating element influencing how we go about interacting with our environments. Thus, content serves as a vehicle that constantly brings the social world into the process of thinking, becoming a major, although neglected, element in its development.

Alessandro Duranti reports on his analysis of a computer communication network he implemented as part of an undergraduate course. He

applies ideas of framing borrowed from discourse analysis to analyze the openings used by the students in their electronic messages. He shows how the students used previous forms of mediation in making sense and in helping others make sense of the new communication medium. His results demonstrate that even a new communication technology without a history of use is "socialized" by its users to achieve some continuity with other media of communication. The machine may appear ahistorical but the user never is.

Tom Humphries argues for a different representation of deaf people with important consequences for their schooling. In particular, he emphasizes a "dualist" identity of the deaf population; people with impaired hearing, thus disabled to one extent or another, are also people who, as a result of this characteristic, have evolved a complex, viable and valid cultural system for living. From this perspective, deaf education must go beyond "basic support services" that facilitate schooling and address ways to develop an appropriately complex, culturally-mediated education system that promotes the social and intellectual development of these students.

Note

The editors have been asked for a word of explanation about the added logo at the head of this newsletter. For those of you who do not read Japanese, it says, "Kyo ju Gakashu." A rough translation is, "Teaching-Learning Juku." It brings together several concepts important to the work of LCHC. First, a good deal of our experimental work in recent years has been carried out in afterschool settings which we think of as culture-specific transformations of the Japanese afterschool settings called "Juku." Second, it embodies the idea of educational activity as requiring an integrated process of teaching and learning which is stressed by our Soviet colleagues. Third, it reflects our gratitude to our Japanese colleagues for their many stimulating contributions to our thinking.

The logo was created by Dr. Kiyoshi Amano of the National Institute for Educational Research in Tokyo. Dr. Amano is an expert in the field of education for the retarded who has also studied and conducted research in the U.S.S.R. Our special thanks to him for this beautiful contribution.

Mediation and Automatization

Edwin Hutchins

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I take *mediation* to refer to a particular mode of organizing behavior with respect to some task by achieving coordination with a mediating structure that is not itself inherent in the domain of the task. That is, in a mediated performance, the actor does not simply coordinate with the task environment, instead, the actor coordinates with something else as well, something that provides structure that can be used to shape the actor's behavior. What this something else is, where it may be located, and how simultaneous coordination with it and some task relevant environment is achieved are central questions in understanding what sorts of creatures we humans are. Skill *automatization* refers to the process presumed to underly the observation that skilled performance may become effortless or phenomenologically "automatic" after extensive practice. This article discusses some relationships between these two concepts based on the behavioral properties of so called "neurally inspired" models of cognitive processing. The first section attempts to explore the sorts of activities that are involved in the use of a simple mediating artifact. Here I make two assumptions: 1) That all "skilled" performances are initially mediated by some structure, either internal or external, that provides some sort of description of the performance of the skill, and 2) that the descriptions in this mediating structure provide constraints on behavior; constraints that can be used to control behavior. The control may not be direct in the sense of producing behavior; the constraints need only permit the actor to evaluate behavior that has been produced and judge whether or not it is appropriate. In the worst case, the actor might behave randomly until an appropriate behavior is produced. In such a case, learning would be undirected and would surely be very slow, but it could still occur. The second section describes what a Parallel Distributed Processing (PDP) or "connectionist" approach to cognition would lead us to expect as consequences of repeated mediated task performance. In brief, this approach leads us to expect that a neural apparatus will learn the sequence of states that

constitute the task, and with sufficient practice may be able to move through them without the application of the constraints provided by the mediating structure. I will argue that this condition of no-longer-mediated performance is precisely what has been seen as automatized performance and that the changes that obviate the need for mediation are the process underlying the development of skill automatization.

The phenomena of mediated performance are absolutely ubiquitous. For the purposes of exposition I have chosen as an example a simple, explicit, external mediation device, a checklist. Many tasks in our culture are mediated by checklists or checklist-like artifacts, but even considering all of them would not scratch the surface of the full range of mediated performance. Language, cultural knowledge, mental models, arithmetic procedures and rules of logic are all mediating structures too. So are traffic lights, supermarket layouts, and the contexts we arrange for each other's behavior. Mediating structure can be embodied in artifacts, in ideas, in systems of social interaction, or in all of these at once. I have chosen the checklist because it is an artifact that provides a relatively explicit example of mediation for which a relatively simple exposition can be given.

Checklist as Mediating Structure

Consider an actor using a checklist to organize the performance of a task where it is essential that the actions of the performance be taken in a particular order and that all of the actions be taken before the performance is judged complete. In order to use a checklist as a guide to action, the task performer must coordinate with both the checklist and the environment in which the actions are to be taken. Achieving coordination with the checklist requires the actor to invoke procedures for the use of the checklist. These include reading skills and a strategy of sequential execution which permits the task performer to ensure that the steps will be done in the correct order and that each step will be done once and only once. The fixed linear structure of the checklist permits the user to accomplish this by simply keeping track of an index that indicates the first unexecuted (or last executed) item. Real checklists often provide additional features to aid in the maintenance of this index: boxes to tick when steps are completed, a window that moves across the checklist, etc. The mediating artifact has been

designed with particular structural features that can be exploited by some procedure to produce a useful coordination. Such a procedure can be seen as meta-mediation, a mediating artifact that permits the use of some other mediating artifact. An actor always incurs some cognitive costs in coordinating with a mediating structure. But the savings of the mediated performance over the unmediated performance hopefully outweigh the costs of using it. The reduction of error or increase in efficiency obtained via the use of the checklist may compensate for the effort required to use it. For the unskilled performer, of course, the task may be impossible without the use of the checklist so the economy of mediated performance in that case is clear.

The first stage in the use of the checklist is depicted in Figure 1. The left-hand column of the figure contains relevant things inside the actor and the right-hand column contains relevant things in the environment of the actor. All of the things listed are brought into coordination with each other by the actor to achieve the described action. The items in UPPERCASE letters are the things that are meant to be shaped or brought into existence by the action. Figures 1 through 4 present a pseudo-sequential picture of the actual activities of the user of a checklist. Because the action described by each figure depends in some way on the actions in the previous figures, it is tempting to think of these as sequential stages. However, because of interactions among them in the doing of the task, they are better thought of as concurrent levels of activity than as stages.

In finding the next step to do in the checklist, the actor invokes the sequential execution strategy on the checklist to determine which step is the next one, and possibly to determine an index of the next step that can be remembered. There are two related issues concerning this index: where it is stored and what it contains. The index could be encoded in the memory of the actor, or the actor could take some action on the world, making a mark on the checklist itself, for example, that acts as the index. The content of the index might be simply a mark on paper, a number if the steps are numbered, the lexical or semantic content of the step description itself, or something else. Each of these alternatives requires a different procedure to implement the sequential execution strategy. For example, if the content of the step index is the lexical or semantic content of

the step itself, then finding the next step and establishing the step index are the same action. If the content of the step index is a mark on a paper or a number to be recorded or remembered, then some action in addition to finding the next step must be undertaken to establish the step index. Although the primary product of the application of this strategy is the determination of the next step to do, it is important to notice that either the checklist as an object in the environment or the procedure that implements the sequential execution strategy may also be changed as a consequence of the activities involved in finding the next step.

Having generated a step index (in whatever form) the actor can bring that index into coordination with the checklist to focus attention on the current step. Although the goal of the use of the checklist as a mediating artifact is to ensure sequential control for the actions taken in the task domain, it is clear that the task of bringing the checklist into coordination with the domain of action may not itself be linearly sequential. For example, if a user loses track of the step index, in order to determine the next step to be taken, the user may go back to the beginning of the checklist and proceed through each step in the checklist, not executing it, but asking of the task world whether or not the expected consequences of the step's execution are present. When a step is reached whose consequences are not present in the task world, it may be assumed that it has not yet been executed. This is a simple illustration of the potential complexity of the meta-mediation that may be undertaken in the coordination of a mediating structure with a task world.

Once the current step has been identified, the user may coordinate its printed representation with shallow reading skills in order to produce an internal representation of what the step says in words. This is depicted in Figure 2. The shallow reading skills here refer to organized (possibly already automated) internal structures that can create internal representations of words from their external printed counterparts.¹ It is obvious that this may proceed concurrently with the stage of reading what the step means. However, I have separated shallow and deep readings primarily because shallow and deep readings produce different sorts of products that can be shown to exist independently. Thus, a user who does not under-

INSIDE	OUTSIDE
<p data-bbox="303 196 518 227">Sequential Strategy</p> <p data-bbox="303 404 544 435">NEXT STEP INDEX</p>	<p data-bbox="681 196 790 227">Checklist</p> <p data-bbox="681 265 879 296">(as a list of steps)</p> <p data-bbox="777 404 926 435">NEXT STEP</p>

Figure 1. Finding the Next Step.

INSIDE	OUTSIDE
<p data-bbox="352 994 527 1025">Next step index</p> <p data-bbox="352 1098 544 1130">Shallow Reading</p> <p data-bbox="352 1168 663 1230">"WHAT THE STEP SAYS" WORDS</p>	<p data-bbox="729 994 931 1057">Checklist (as a list of steps)</p> <p data-bbox="729 1098 931 1130">CURRENT STEP</p>

Figure 2. Finding What the Step Says.

stand the domain of action may know and be able to recall what a step "says" without having any idea at all of what it "means."

Figuring out what a step means requires the coordination of what the step says with the task world via the mediation of a deeper sort of reading (see Figure 3). This deep reading relies on two internal structures, one that can provide semantic mappings from linguistic descriptions provided by the checklist to states in the world and another to provide readings of the task world to see what is there. What the words in the step description are thought to mean may depend upon the state of the task world that has been produced by prior steps. In this process it also becomes clear that the right way to think of this situation is not that the words and the world are coordinated by language in order to produce the meanings, but that the meanings, the world and the words are all put in coordination with each other via the mediating structure of language. As we saw in the very first figure, the item in uppercase letters is in some sense the product of the activity, but the other items with which it is brought into coordination may be changed in the process of producing the product. Thus, the structure of language may be changed by its use, and what is thought to be in the world may be changed by describing it in a novel way. All of the structures provide constraints on the others, and all are to some extent malleable. The system composed of task performer, mediating structures and task world settles into a solution that satisfies as many constraints as is possible.

Finally, having determined what the step means, the user of the checklist may take actions on (and in) the world to carry out the step. This is described in Figure 4. Whether the action should be placed inside or outside the actor is difficult to say. This is because actions taken on the environment involve phenomena inside and outside the actor and because for some mental acts the task world itself is inside. In any case, the meaning of the step, the action and the task world are brought into coordination. Having completed this step, the checklist user may find the next step and continue.

While following the checklist, high level control of task related behavior is given over in part to the structure of the mediating artifact. The interaction with the checklist produces for the

actor a sequence of experiences of step descriptions. Each of these experiences may have several components: what the step says, what the step means, and the actions in the task world that carry out the step. Although it might have seemed at first blush that the actor alternates coordinating with the checklist and coordinating with the world, the coordination with the two media is in fact simultaneous to the extent that understanding a step in the description may depend upon understanding the state of the world in which it is to be carried out. The experience of the meanings of the descriptions of the steps embeds experience of the task world, and the doing of the actions embeds the experience of the meaning of the task steps. The importance of this is that in this mediated performance the actor becomes a special sort of medium that can provide continuous coordination among several structured media. Looking across Figures 1 through 4, we see that many layers of transformed mediating structure may lie between a simple mediating artifact like a checklist and a task performance.

Consequences of Mediated Task Performance

Parallel Distributed Processing (PDP) models of cognition assume an architecture of computation that is inspired by the general organization of neural networks in biological organisms.² A PDP system consists of a set of processing units and a set of unidirectional connections between the units. At each point in time, each unit has an activation value. This activation is passed through the connections to other units in the system. Each connection has a *strength* which determines the amount of effect that the unit sending activation has on the recipient. The combined inputs to a unit from other units along with its own activation value determine its new activation value. If we were to force some subset of the units of the system to assume particular activation values, the effects of that input would propagate across the connections and the set of units as a whole would assume a pattern of activation that is determined by the combined effects of the structure of the input we forced upon it and the pattern of the strengths of the connections among the units. Such a pattern of activation across the set of units as a whole can be interpreted as a state of the system. When we are thinking of PDP networks as cognitive systems, a state as a pattern of

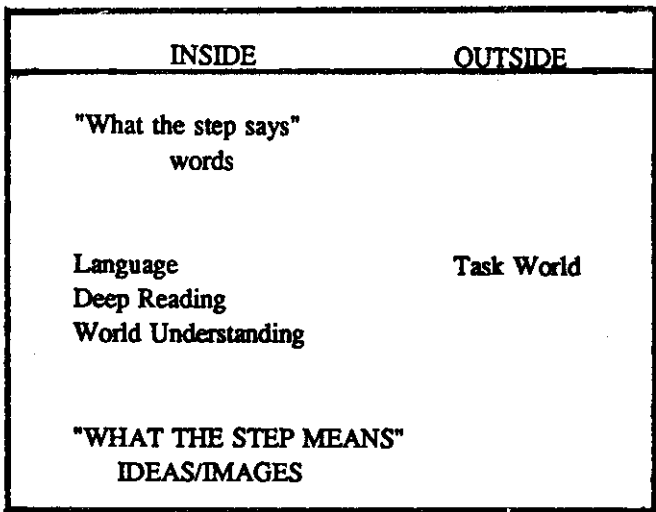


Figure 3. Discovering What the Step Means.

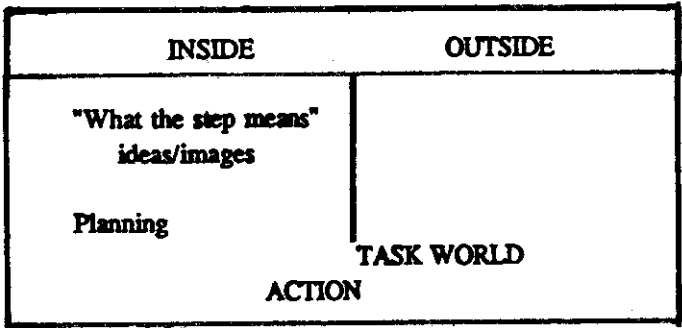


Figure 4. Performing the Step.

activation across the units corresponds to a representation. Such a simple system can do pattern matching and can complete patterns from incomplete inputs. Which states the system assumes in response to which inputs is governed by the pattern of connectivity among the units. What the system *knows* is encoded in the connections among the units, rather than in the activation states the units assume. The strengths of the connections among the units are not fixed. Instead, they can be modified on the basis of experience. This means that the state the system assumes in response to an input can change, or, put in other words, the system can learn to respond to an input in a particular way. If the units that are the output of the network are connected back into the network's own input, the network can be trained on a sequence of states and will learn to transition through the sequence automatically. With appropriate training, the occurrence of each state in the network becomes the condition that causes the network to assume the following state. Notice that although the states of the network may be taken as explicit representations, the way the network gets from state to state is not explicitly represented anywhere in the network. It is implicit in the pattern of connectivity among units.

Imagine three such neural networks, a lexical network dedicated to representing what the steps of the checklist say, a semantic network dedicated to representing what the steps mean, and an action network dedicated to effecting the actions taken in the task world. All three of these may be working concurrently. When the checklist user performs a step, all three networks are activated. The shallow reading of the step itself produces a state in the lexical network. The working-out of the meaning of the step produces a state in the semantic network, and the performance of the actions that constitute the doing of the step produce states in the action network. The states in these networks are related to each other by the mediating structures (listed in Figures 1 through 4) that propagate states from one network to the next (see Figure 5). Let us now consider what might happen to this system with repeated performance of the task. As the user of the checklist reads each step in turn, the network that is dedicated to representing what the steps say is driven through a sequence of states that is repeated each time the checklist is followed. As a consequence,

with repetition, the network learns the sequence of states produced by the shallow reading of the checklist, thereby internalizing the checklist. Here, by "internalizing the checklist" I mean specifically the development of a network which when placed in a state corresponding to the experience of "what step N says" will transition automatically to a state corresponding to the experience of "what step N+1 says."

Once such an internalized version of the checklist is developed, it may become the controlling structure for subsequent performances. This is shown in Figure 6. This amounts to the task performer having learned what the checklist says so that instead of reading the next step, he can "remember" what the next step says, use that to construct the meaning of the next step and use that meaning to organize an action. A performance guided by the memory of the checklist is still a mediated task performance, but the mediating structure is now internal rather than external. The lexical network that encodes what the steps of the checklist say provides explicit representations of the steps of the procedure. It can move through a sequence of states, each of which corresponds to the experience of reading what a step on the checklist says. Moving from external to internal mediation also introduces new possibilities for the relations between the actor and the environment because the environment no longer need contain the mediating structure. The actor can deal with a wider range of environments. If the mediating structure was provided by the activities of another person, the actor who has internalized the structure can now act alone.³

Of course, at the same time that the neural network dedicated to the representation of what the steps say is being driven through a series of states, so is the neural network dedicated to representing the meanings of the steps. This is shown in Figure 7. Once this semantic network has been trained, the actor can remember the meanings of the steps, if necessary without reference to the memory of what the steps say. Because that other structure is around, however, and because people are unrelentingly opportunistic it is likely that both the memory of the meaning of the step, and the meaning derived from interpreting the memory of what the step says will be used in concert to determine the meaning of the step. Furthermore, a task performer may learn about the semantics of the domain and use that

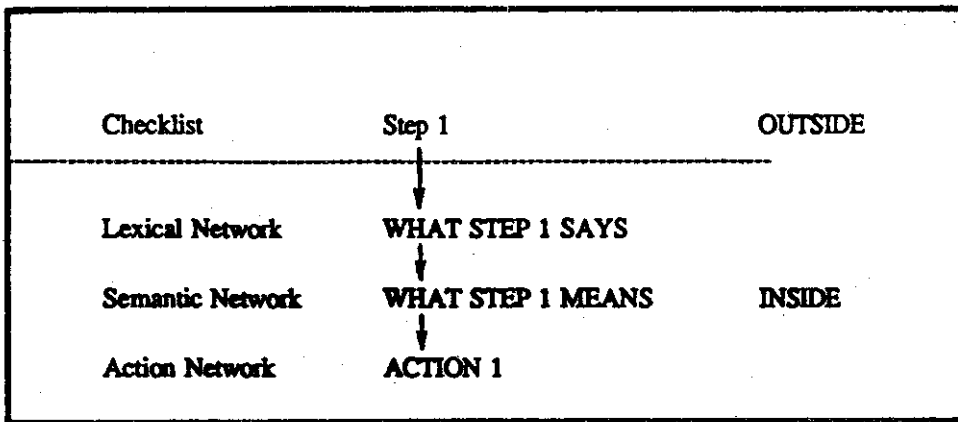


Figure 5. The Networks Activated in the Performance of a Step.

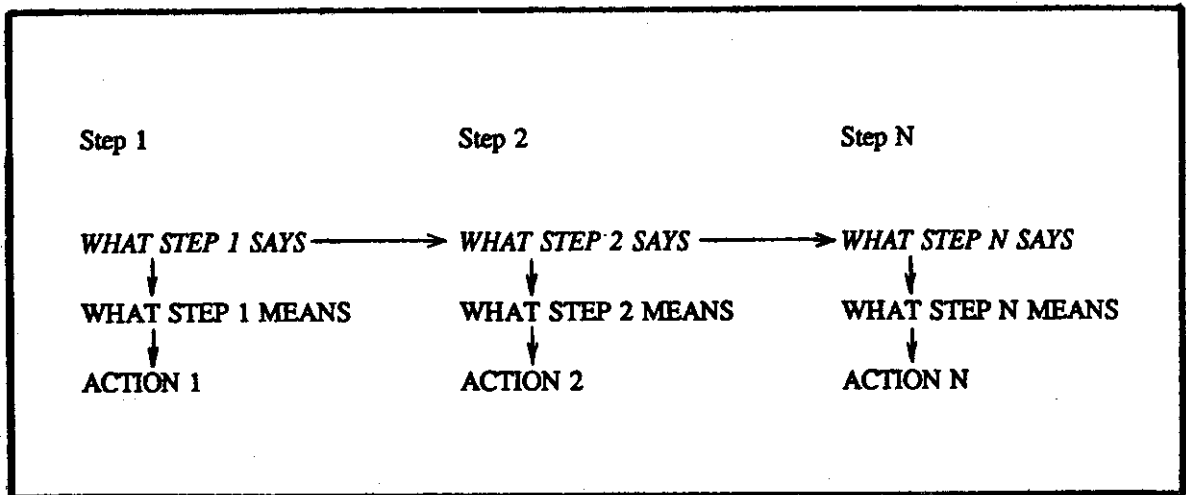


Figure 6. The lexical network has internalized the succession of states corresponding to the experience of reading the steps of the checklist. The horizontal arrows represent the learned state transitions in the lexical network. The vertical arrows represent the mediated propagation of state from the lexical to the semantic network via language skills, and from the semantic to the action network via planning and motor skills.

additional knowledge as yet another internal mediating structure in a sub-task of deriving constraints on the meaning of the next step to help in the reconstruction process that is remembering. This is an argument for the value of conceptual learning beyond rote learning.

But something else is happening too. In both the use of the external checklist and the internalized checklist, the neural apparatus involved in the performance of the task is driven through a sequence of states. Because of the nature of the structured interaction of the task performer with the environment, the sequence of states is repeated more or less consistently each time the checklist is followed. The network begins to encode the sequential relations among the successive states. Something of the organization of the N+1th state is in the potential of the network when the Nth state is present. Thus, the action network begins to internalize the sequence of steps of the task in a different sense than the internalization of the words or meanings of the checklist itself. This latter internalization is implicit where the former two were explicit. With this encoding of the sequence represented implicitly in the connections of the action network, the network, once placed in state 1 can *do* the task automatically without reference to any explicit representation of the sequence. The mediated performances leading up to this state could be thought of as training trials for the network that produces the action. The system has now reached the condition described by Figure 8. In this condition, for a normal task performance, the action network no longer needs the organizing constraints of the mediating structure. Once placed in the initial state, the action network simply transitions through the states that constitute the doing of the task. This is the nature of automatized skill performances; automatized performances are performances that no longer utilize the organizing constraints of the mediating structure. Of course, if exceptional circumstances arise in the task world, the automatized performance may fail, requiring additional recourse to the mediating structure.

It is important to see that internalized memory of the checklist must become an automatized system before it can be used alone to control the states of the action network. Internalized mediation systems, while having explicit representational content in their states, rely for their controlling behavior on automatized implicit encod-

ings of relations among their states. The issue of what is implicit and what is explicit depends upon the question being asked. The internalized memory for the checklist consists of states that represent explicit descriptions of the actions to be taken. But the sequential relations among those step descriptions are implicitly encoded in the pattern of connectivity of the lexical network much as the sequential relations among the step descriptions in the external checklist were implicitly encoded in their spatial relations on the checklist artifact itself. Consider briefly another common mediating structure, alphabetical order. It is used in many storage and retrieval schemes in our culture, so pains are taken to ensure that children learn it. In learning the alphabet song, the child is developing an explicit, internalized, automatized version of the alphabet structure. The content of the states, the words of the song, are explicit, but the sequential relations among them - which were provided by another mediating system, a teacher - are implicit. A child who knows the song can tell you what comes after "P" (perhaps after singing the first 17 letters) but that same child will have a difficult time saying why "Q" follows "P." There is simply no explicit representation of that in what the child knows.

The same thing would be true for the meanings of the steps were it not for the potential mediating role of conceptual knowledge in the task domain. If conceptual knowledge is tied to the meanings of the steps, some other network in the system may assume states that explicitly represent a reason why step N+1 follows step N. However, such a mediating structure need not be learned before the sequence of meanings of the steps is learned. Sometimes we discover *why* we do some task the way we do long after we have learned to do the task itself.

A common observation concerning automatized skill is that skilled performers may have difficulty saying how it is they do what they do. Two reasons for this fall out of this analysis. First, the automatized action network for the checklist is a way of producing in the relation of the person to the environment a sequence of actions that constitute the doing of the steps described by the checklist. Because it encodes a relationship between the person and the environment, the execution of the checklist by the automatized action network requires the coopera-

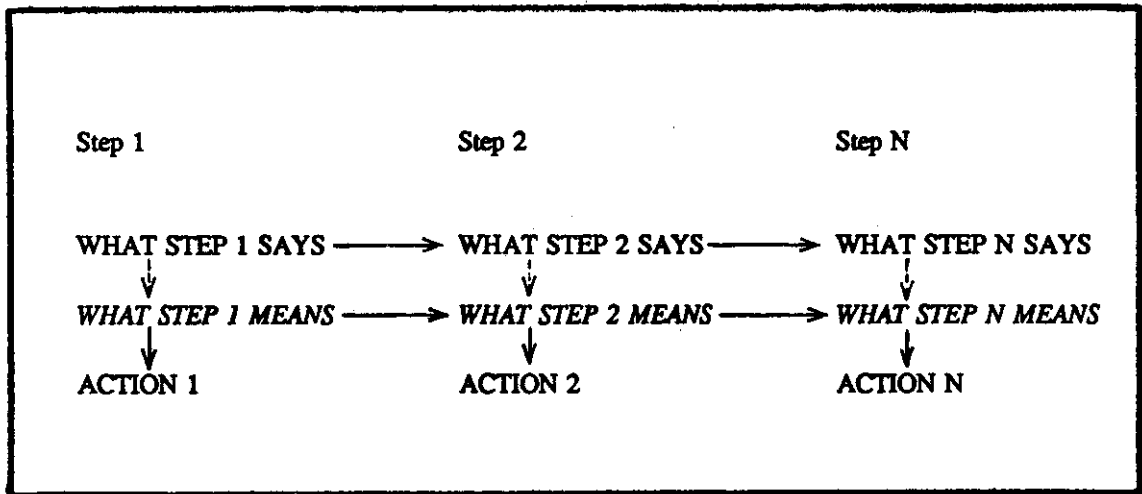


Figure 7. Automatization of the Step Meaning Sequence by the Semantic Network.

The semantic network has internalized the succession of states corresponding to the meanings of the steps of the checklist. The solid vertical arrows represent the mediated propagation of state from the semantic to action network. The dashed vertical arrows represent the available but not normally needed mediated propagation of state from the lexical network to the semantic network.

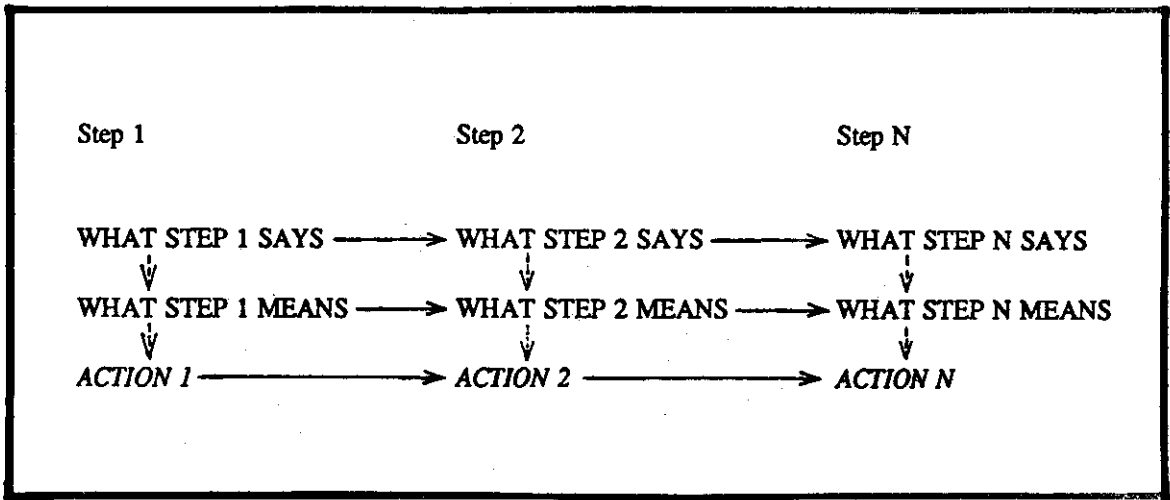


Figure 8. Automatization of the Action Sequence by the Action Network.

The action network has internalized the succession of states corresponding to the actions taken in the task world. There is no longer a need for any mediation in the task performance. The entire structure is present, however, and could be invoked following any of the pathways present. The dashed vertical arrows represent not normally needed mediated propagation of state from the lexical network through the semantic network to the action network.

tion of the environment in a way that remembering the checklist does not. For example, the attempt to do a step can be frustrated by the lack in the environment of something required by the step. Yet one may remember a description of a step even though the conditions required to carry it out are absent. In the example above, the actor may be forced by the lack of the required condition to do some other actions in preparation for the previously frustrated step. In giving an account of how to do a task, the task performer must assume a world, or perhaps more correctly, the report itself implies a world in which the described actions make sense. Except where the task in question occurs in a very stable set of environments, the assumed world is certain to differ from many of the actual worlds in which the task is attempted and the description will therefore fail in many of the worlds in which the task is performed. Second, the reports skilled performers can give are generally based on the mediating structures that were used to control their behavior while they were acquiring automatized skill. The accounts that are given, being descriptions of mediating structures, may be just what is needed to communicate the skill from one person to another because the only way to produce the automatized skill is to have the network learn it from experience and the only way for a novice to experience it is by use of mediating structure. However, if the memory for the mediating structure has atrophied as a result of long disuse during automatized performance, when we ask an expert how she does something, there may simply be no meaningful answer to be given. The automated system does what it has been trained to do, but it has no explicit representation of what it is doing. The *representation* of what it is doing exists only in the apparatus that provided the training, that is, the mediating structure which is now degraded.

Another situation that results in the expert task performer being unable to account for her own task performance arises when the mediating structure is present as constraints in the environment that shape the development of the action network directly without the development of internalizations of explicit mediating representations. This seems to be the case for many motor skills. When asked to describe how the skill is performed, such an expert may describe events in which the skill was manifested. One view of such a response might be that the expert is being uncooperative,

but when we understand that the mediating structure was in the environment of the skill acquisition, we see that describing events in which the skill was manifested is the best the expert can do to describe the mediating structure under which the skill developed.

With this example I have attempted to highlight the complexity and richness of interaction of mediation structures of different sorts in the performance of what seemed at the outset to be a relatively simple mediated task performance. I don't think this analysis should lead us to change our minds about the relative simplicity of using checklists. On the contrary, I hope it heightens our awareness of the diversity of kinds of mediating structures that come into play in everyday cognitive activities. In order to get useful mental work done, of course, the actor must be capable of bringing these structures into coordination with each other. As we saw with the coordination of the checklist with the task world, bringing mediating structures into coordination may require still more (meta-)mediating structures. The consequences of the lack of this ability are encoded in our folk wisdom about the differences between "book learning" and experience. One may have complete mastery over a major mediating structure for some task, but no development whatever of the meta-mediation required to put it to work in a real task environment.

In this view, what we learn and what we know, and what our culture knows for us in the form of the structure of artifacts and social organizations are these hunks of mediating structure. Thinking consists of bringing these structures into coordination with each other such that they can shape (and be shaped by) each other. The thinker in this world is a very special medium that can provide coordination among many structured media, some internal, some external, some embodied in artifacts, some in ideas, and some in social relationships.

Notes

¹Whether this internal representation is primarily auditory or visual or something else, I do not know. The important thing is that it be capable of permitting the actor to "remember" the lexical content of the step at a later time.

²There is not sufficient space here to adequately explain how PDP systems actually work. In the following paragraphs, I outline some of their more interesting functional properties. I refer the interested reader to Rumelhart and McClelland, 1986.

³This echoes Vygotsky's general genetic law of development with the two appearances of the mediating structure, one inter-psychological and the other intra-psychological.

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Two Approaches to Thinking and Knowledge Acquisition

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In the tradition dominating the Western psychology of concept learning and thinking, three problems can be identified. The problems can be avoided by relying on a different sort of psychological presumption than that upon which the behavioristic and cognitive traditions are based. This article compares some basic traits of the theories of thinking in the cognitive traditions of Western psychology (represented by Ausubel, 1965; Bourne, 1966; Bruner, Goodnow, & Austin, 1956; Bruner, Olver & Greenfield, 1966; Heidebreder, 1945; Hunt, 1962; Johnson, 1972; Kendler, 1965; Nelson, 1974; Piaget, 1955) with the assumptions of the cultural-historical traditions (represented by Davydov, 1977, 1982; Iljenkov, 1977a, 1977b, 1979; Leont'ev, 1977, 1979; and Vygotsky, 1971, 1974).

Three Problems

The first problem of cognitive and behavioristic theories is their narrow definition of a concept. They relate a concept solely to the individual by its formal characteristics, mostly its physical attributes related to each other by

mathematical rules or the rules of Aristotelian logic. Within this narrow scope, concepts are defined either as a form of cognitive structure (Bruner, et al., 1956; Piaget, 1955, 1971), as a form of cognitive functioning (Olver & Hornsby, 1966), or as a form of behavior (Hull, 1920; Kendler, 1965).

Integrating these three different approaches has been difficult, e.g. attempts to integrate theories which describe concepts as structures and those which describe them as functions (Elkind, 1969; Nelson, 1974). But even if these three different definitions of concept could be integrated so that *behavior*, *function*, and *structure* are taken into consideration, important aspects remain to be addressed, namely, those deriving from the *content* of the subject areas conceptualized.

Another problem in the cognitive tradition of theories and research about thinking and concept learning has been the dualism between action and cognition. Representation is a central key in these traditions. Modes (Bruner, et al., 1966), structure (Piaget, 1971), and function (Olver & Hornsby, 1966) of the individual's representation of the world around him are seen as directly connected to differences in the individual's capacities for the handling of information and acting. Representation is seen as being derived from action and guiding action, but it is conceptualized as a psychic, internalized phenomenon which has its own rules that are qualitatively different from the rules for action. There is a sharp distinction in these theories between mental activity and manual activity. They are regarded as qualitatively different phenomena.

A third problem in the cognitive behavioristic tradition has been the origin of concepts. How does "first knowledge" get into the head of the child? Is it impression (Kagan, 1971) or is it modification of reflexes (Piaget, 1955)? How can the child's intention have any meaning in relation to concept learning? Is it necessary to exclude the child's intention in order to understand how the child learns concepts? Is the child's intention something that can be introduced in the theory of concept learning at some stage in the process, for instance, when the reflexes have been overcome (Bruner 1975)? Does intention come into play when the concept can be reflected upon (Rommetveit 1960)?

Different Psychological Presumptions

The works of Davydov (1977), Galperin (1961), Leont'ev (1979) and Vygotsky (1971, 1974) can be used to represent the cultural-historical tradition in psychology. Referring to their studies of learning and instruction, we can examine the three problems characterizing the cognitive behavioristic theories of knowledge development and acquisition presented above. Since the core concepts of the cultural-historical tradition of thinking and concept learning are in opposition to the cognitive behavioristic tradition of thinking, the cultural-historical tradition may offer a way to overcome the problems which the cognitive behavioristic orientation experiences.

The essential differences between the two approaches to a theory of thinking are listed in Table 1. This set of contrasts¹ provides the background for a restatement of the three essential problems in the cognitive behavioristic theories of thinking mentioned above.

- (1) The problems of differences in definitions of concepts (structure/behavior/function) and neglect of the content of concepts.
- (2) The problems of dualism between thinking and activity, or the separation of man's psyche from his real life activities.
- (3) The problem of how the child becomes conceptually related to the world.

1. Concepts. In the cognitive behavioristic tradition, concepts are defined and related solely to the individual by defining *how* man conceptualizes. *What* man conceptualizes is completely neglected; therefore, in this tradition, it has to be the formal aspect of the concepts in the form of structure, behavior, or function that are investigated in the study of concept learning and the role of concepts in the thinking process.

Instead, the problem must be seen as having two interdependent aspects: The content of the concepts and the capacity the individual has for mastering the concepts. So the problem has to be restated as a problem of the relation between the content (the collective aspect) of a concept area and the capacity of the individual for acquiring and mastering a conceptual area (the individual aspects).

This is not a call for simply adding the collective aspect; rather, there is an intricate relation between the individual and the collective cultural knowledge of a subject, i.e., the social and historical development of a subject. According to the cultural-historical tradition, the analysis of the individual's capacity takes its point of departure in the content of the concept, i.e., in the cultural knowledge of the subject area analyzed. The problem of the individual's capacity can, therefore, never be a problem of behavior, of structure, or of the functioning of his concepts in general, but has to be a problem of a person's capacity to master concepts of a *specific* domain where his behavior with these concepts, the structure of these concepts, and how they function in his problem solving, are dependent on the subject area conceptualized. Conversely, teaching cannot be seen as teaching the child only one correct way of forming concepts or of thinking which can be used for every subject. Nor can teaching be seen as giving children facts about the world, either directly or through his own active searching.

Instead, the theory of the cultural-historical tradition described by Davydov, prescribes teaching as giving the child a model of the objects of the scientific domain taught and a method so that the child has the possibility of moving inside this model. This approach to teaching combines both the content of a subject area and a theory of how the child acquires specific concepts.

2. Dualism. The second problem is the dualism between action and cognition, between external practical activities and the psyche as an internal ideal phenomenon. This problem of the separation of man from his life activities is explicitly solved in Leont'ev's theory.

Talyzina (1981) summarizes the cultural-historical solution. She writes that Leont'ev overcomes the dualism by showing that the process of arriving at conscious awareness and external activities are two forms of the same thing, namely activity. They are not two distinct things. The two forms are related to each other through mutual transitions and mutual transformations; this represents the most important and effective expression of the integral unity of the psyche with activities. Since external practical activities and internal psychic activities possess similar structures (activity, action, and operation), it is possi-

TABLE 1

The cultural-historical tradition	The cognitive-behaviorist tradition
1) The point of departure for study is the content of thinking.	The point of departure for study is the function/structure of thinking.
2) Thinking is seen as an activity which includes motivation, action and emotion, all of which have to be studied as a whole.	Thinking is studied as a separate function of the subject divided from other functions, where motivation is seen as a source outside the content of thinking.
3) There is no conceptualized border between the world to be thought of and the thinking subject because the content is in the objective world but only receives status through the thinking process of the individual.	The subject is conceptually separated from the world so that thinking has to be related to the impressions that the individual receives of the world.
4) There is a distinction between two types of thinking: Empirical and theoretical thinking. Theoretical thinking is based upon the inner determining relations of objects. Empirical thinking is based on common attributes. The relation between these two modes of thinking is that empirical thinking precedes theoretical thinking in development. Through the process of teaching, the child acquires theoretical thinking and this type of thinking then dominates empirical thinking.	There is a distinction between convergent and divergent thinking. Divergent thinking is a form of fantasizing. The main characteristic of convergent thinking is its goal orientation and its logical character operating with the common traits of objects. The relation between these two modes of thinking is that convergent thinking in the child's development gradually becomes the dominant mode of thinking, perhaps with divergent thinking as a phase in the thinking process.
5) The concepts of thinking have the social and historical genesis of the objects as their preliminaries.	The concepts of thinking have sensoric aspects of the world as preliminaries.
6) Schooling is seen as the necessary condition for the development of theoretical thinking. Teaching is seen as a necessity for guidance into the essentials of a scientific area.	Schooling develops convergent thinking (empirical thinking). Teaching is seen as a means which can give the pupil the knowledge for his own discovering activities in relation to the subject area.
7) The goals of teaching are to give the pupil models of the objects of the scientific area taught and a method so that the child can move inside this model.	The goals of teaching are to give the pupil the facts of the scientific area and to develop his thinking so that it can be characterized by the rules of logic.
8) The development of thinking in the child is one side of the coin; the child's acquisition of the concepts of society is the other. So, concept acquisition and development of thinking is the same process where inner contradictions in the content of the concepts determine development.	Development of thinking is seen as stage-specific, either characterized by differences in structure or by differences in representational modes, where structural or functional conflicts determine development.
9) The essence of the concept is explored in a uniting object-system by analysing the content of the system. The function of the concepts is to find new aspects of the objects so that the relation between the objects in the system can be explained.	The concepts are related to each other in a hierarchical way, where sensual aspects are always the primaries for concepts on an abstract level. The sole function of the concept is classification, so that the individual can have an unambiguous system regarding the world around him.
10) The concepts of an object-system have to be related to the history and the development of the scientific area. A scientific area is a system in change because science is renewed as a system in relation to the development of society. This characterization of science is at the same time the main characteristic of thinking as an activity of the individual.	The hierarchical organization of a concept is related to the Aristotelian rules of logic. And science is seen as one-dimensional in its development, without any relation in content to the development of society.

ble for mutual transformations to take place. Internal activities continuously incorporate individual external actions and operations while external practical activities incorporate internal actions and operations of reasoning.

The activity approach to psychology has, as its object of analysis, the interaction of man with his environment; this requires psychological processes to be examined and understood in the context of solutions to specific tasks. By beginning with the content of specific tasks, the content of what a person *is going to learn* is stressed as central. Thus, the analysis of a person's activity reflects the object world as well as the subject's life.

3. Genesis. The third problem is related to the origin of the child's concepts. How does "first knowledge" get into the head of the child? This problem is connected to assumptions which imply a sharp distinction between 1) the child and the surrounding world and 2) the world as pure nature on the one hand and as social on the other.

The dominating cognitive and behavioristic theories of concept acquisition treat concept acquisition as a hypothesis testing procedure (Bourne, 1966; Bourne, Ekstrand, & Dominowsky, 1971; Bower and Trabasso, 1969; Bruner, et al., 1956; Hunt, 1962; Levine, 1966; Miller, Galanter & Pribram, 1960). The obvious question, then, is: Where does the individual get his hypothesis from? Hunt explicitly states that this problem must be solved by the psychology of perception; making the assumption that the individual *has* some hypotheses, Hunt's research is then limited to finding out how the person tests these prior hypotheses.

The theories which are directly concerned with the development of children's knowledge (Kagan, 1971, Nelson, 1974; Piaget, 1955) take as their basic assumption that the child's first knowledge is based on impressions or reflexes. The impressions are seen as determined, either by conditioning or by the child's active manipulation with objects in the world. The child's impressions are seen as structured in experiential knowledge; the structure is later used for hypothesis testing and the building of categorical knowledge of objects.

In short, the individual's knowledge acquisition is seen as directly related to nature in Kagan and Piaget's theories. They differ explicitly, however, in their explanations of how this relation is built up. Kagan's view is that the primary base is impressions from the outside world, while Piaget focuses on the child's own activity.

Both viewpoints imply that one has to study the individual as separated from the surrounding world. So, either the world can make impressions or the child can seek information where the elementary needs are seen as intervening variables to get the individual's orientation to the outer world started.

In these types of theories, the distinction and separation between the physical world and the psychic world, between objects in the world and the child's psychic activity, is stressed as very important. The objects of the world are defined in physical terms and the child's action (perceptual and manual) is described only in relation to the individual's psyche (operations, habits, habituation, intention, need, goal imagination).

In the cultural-historical approach, such separation is very problematic because it neglects the dialectic between action and objects. In the theoretical approach of Leont'ev and Davydov, the child's activity is always seen as object-related and, thereby, historically determined (Leont'ev, 1979, p. 48). Activity must be seen as realized in relation to something definite. If the activity is not embodied in something corporeal, it cannot be real, but only possible, only potential and therefore, according to Iljenkov, (1977)b, it is not activity but the opposite -- inactivity.

Objects, on the other hand, cannot be defined independently of actions. Iljenkov describes this philosophical necessity by pointing out that the ideal form of a thing is a form of social human life activity. "Things which, while being wholly 'material,' palpable formations, acquire all their 'meaning' (function and role) from spirit and even owe to it their specific bodily existence . . ." (1977b, p. 89)

In Piaget's and Kagan's theories, the child's development is seen in relation to the world as a world of natural things. Both Iljenkov and Davydov stress the problems that arise for this approach given that, independent of consciousness and intention of the individual, there is not only a material world but also a very complicated histori-

cal sphere of material and psychic culture of humanity. The newborn child is born into a society with a psychic culture and a material culture. The newborn child develops by transforming this collectively psychic manifestation of humanity into his own consciousness.

In the cognitive tradition we find theories which stress the necessity of taking into consideration that the child is born into a specific culture. Bruner (1975) and Nelson (1973, 1977) especially stress this point. The newer literature about child language acquisition focuses on parent-child interaction as a basis for development of word meaning and references (Olson, 1980). But what is stressed in this new approach is the *dyad* between infant and grownup in the child's knowledge acquisition. Instead of only focusing on the child in relation to nature, the focus is now on the dyad in relation to nature. But even in this new approach in cognitive psychology, the historical genetic aspect of the development of object meaning is not taken into consideration. The difference between the world of collectively acknowledged notions (i.e., the whole socialized, organized world of intellectually established universal patterns) and the real world as it exists outside and apart from its expression in these socially legitimized forms of experience is not taken into consideration, even in these newer, socially oriented cognitive theories.

In the cognitive approach, intentional concept formation is stressed. (See especially Bruner's film, *The intention to take*, 1974.) But intention is seen as an *outside* phenomenon in relation to concept acquisition-- as the motor which sets the child going. Where the child gets his intention from is still a problem and cannot be solved until we stop separating activity from things and, instead, regard them in their dialectically contradictory natural transformation.

Ilijenkov writes of intention:

Consciousness and will appear in man only because he already possesses a special plan of life activity that is absent in the animal world - activity directed towards the mastering of forms of life activity that are specifically social, purely social in origin and essence, and, therefore not biologically encoded in him . . . The existence of this specifically human object - the world of things created by man for man, and, therefore, things whose forms are *reified forms of human activity* (labour), and certainly

not the forms naturally inherent in them - is the condition for the existence of consciousness and will and certainly not the reverse. It is not consciousness and will that are the conditions and prerequisite for the existence of this unique object, let alone its 'cause'. (1977b, pp. 93-94)

Concluding Comments

The aim of this paper has been to point out that essential problems, which are troublesome for the cognitive behavioristic tradition, can be approached as solvable by the cultural-historical traditions. A successful approach to these problems can be based on dialectics among 1) the content and the capacity aspect of concepts, 2) thinking and life activities, and 3) action and objects.

Note

¹The contrast in point 6 requires a few remarks, especially in relation to Bruner's theory of development and learning. In the Bruner tradition, schooling is stressed as one of the most important aspects of the child's achieving symbolic competence. At school, the child learns how to use the symbolic mode of mental activity in its real meaning as a form of abstract thinking. But what characterizes the symbolic activity is still, according to Bruner, the formal aspects of a system of hierarchically organized categories. It is not the importance of the content of the psychic activities, seen as the child's competence at getting into the content of a subject area. The effect of schooling is, according to Bruner, that the child attains a system of hierarchically organized categories which are based upon the abstract and formal aspects of the objects in the world. By attaining organized categories the child can systematize its thinking so that it can move faster in its process of learning by discovery.

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What is demanded is thus the following: we should know the cognitive faculty before we know. It is like wanting to swim before going in the water. The investigation of the faculty of knowledge is itself knowledge, and cannot arrive at its goal because it is this goal already.

Georg Hegel

Framing Discourse in a New Medium: Openings in Electronic Mail

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Much of the work within discourse analysis has concentrated, in the last decade or so, on the different strategies used by speakers to achieve continuity between otherwise temporally or spatially disjunct sequences of talk. In this tradition, the function of certain linguistic expressions is seen mostly, if not exclusively, as the retrieval of background information or the introduction of some new information, that might need to be recalled at some later point (cf. the papers in Givón, 1979; Givón, 1983). The presence of anaphoric or "dislocated" constituents is interpreted by the analyst as dependent upon the speaker's understanding of the hearer's cognitive accessibility to a given topic.

When we look at discourse not exclusively as the locus of exchange of information but also, and crucially, as one of the domains for establishing social relationships and more generally defining the social order in which we live, we realize that "discourse continuity" is only one small aspect of a more general phenomenon, namely, the creation and maintenance of a universe in which individuals and the events that are relevant to their lives are connected to one another in meaningful ways.

The creation of such meaningfulness is one of the greatest challenges that speakers-hearers, *qua* social actors, must face in constructing discourse units. The deconstruction of such work is an equally complex and difficult task for the analysts. One way of reducing some of the complexities is that of choosing a corpus in which the analyst's disadvantage corresponds to the participants'. The study of telephone conversation by Schegloff and Sacks (1973; Schegloff, in press) is one such example. The usual problem of accounting for the non-linguistic context is partly avoided by studying an interaction in which the participants themselves have no access to the on-going non-verbal behavior. In this paper, I have also chosen to document a system of communication in which some of the analyst's puzzlement in figuring out how to look at the data may be echoed by the

participants' preoccupation about how to use a new medium. The new medium I will be discussing is electronic mail (hereafter "E mail").

E mail is an asynchronous (i.e., non-real time) system of communication in which people who have an account on a computer system can send messages to other users of the same computer as well as to users of any other computer that is part of the same network. Such messages are stored in a "mailbox" and can be read by the recipients at any later point. (Users are told of the presence of new mail by a message that appears on the screen when they log in.) [cf. Bannon, 1986; Crook, 1985; Quinn, Mehan, Levin, & Black, 1983; Scollon, 1982].

Being in a new medium, E mail users must learn and test the properties of the system while at the same time coping with the more general needs of communicating and interacting successfully. As we shall see, one of the problems that users address is that of achieving discourse continuity. Users display a concern for constructing a universe of discourse that would be linked to other domains of interaction, through other media (e.g., face-to-face interaction), and to other aspects of the social identity of the parties involved (e.g., relationships other than those established or presupposed by the use of E mail). This kind of *inter-domain continuity* is common in other media as well. The issue is whether the manner in which such continuity is achieved differs from one medium to another. In particular, it is theoretically interesting to find out whether some of the properties of E mail shape or constrain the particular ways in which users try to establish continuity.

This paper is a first attempt at isolating some specific framing devices that novices and experts use to achieve continuity in E mail.

Data

This study is based on a corpus of several hundred electronic messages collected over a period of nine months (September, 1984 - May, 1985).¹ Most messages were exchanged between my students and myself in two courses I taught at Pitzer College of the Claremont Colleges. The first class was "Introduction to Linguistics," where E mail played a minor, albeit interesting, role. The second class, "Computers as Tools," focussed instead on the uses of computers in a range of con-

texts and electronic messaging was presented as both a topic and a tool. In addition to these messages, I also collected messages that my students and I exchanged during the same period with others connected to the "system" (i.e., a VAX 11/780 with VMS located at Harvey Mudd College). My data include as well audio recordings of most of the meetings with the computer class and some field notes on my non-electronic communication with my students.

All the messages are here reproduced in their original form, including spelling mistakes.

Openings

Inspired by the work by Quinn, Mehan, Levin and Black (1983) on the use of E mail for instruction, I was originally interested in comparing topic continuity across contexts and media. This project turned out to be much more complex than I had expected. I decided then to start by pursuing a more limited goal: I examined how novices and experts begin and close their electronic messages. This paper is a first report of my findings on the content and structure of openings in E mail. As we shall see, in openings, users display a common concern for achieving continuity with other contexts.

From conversation analysis (cf. Schegloff & Sacks, 1973; Schegloff, in press), frame analysis (cf. Goffman, 1974), and ethnographically oriented studies of verbal interaction (cf. Duranti, 1985), we have learned to pay attention to the structuring of beginnings and endings of social encounters and verbal exchanges. It has been said, for instance, that openings perform some important jobs in organizing human interaction.

One aspect of the compactness and density of openings is the multiplicity of jobs which regularly get done in them. One of these jobs is the 'gatekeeping' one, of working through in some coordinated spate of behavior whether or not some co-present persons are going to engage in a sustained episode of interaction on some incipient occasion or not; ... Another job that gets done in openings is the constitution or reconstitution of the relationship of the parties for the present occasion, whether the occasion is a first for these parties or involves a next encounter with a history to it. (Schegloff, in press)

We have thus learned that part of the multi-functionality of openings includes linking to the past and preparing for the future. We know very little, however, about the effects of different media on the organization of openings.

Openings in electronic messages seem, then, interesting places of departure for investigating the relationship between some communicative work that needs to be done and the constraints and requirements that a medium may impose on its users. The fact that E mail is a new medium gives us the unique opportunity to study how users might bring in information and expertise from other communicative domains while at the same time learning to exploit the specific properties of the medium.

Greetings

It has been said that E mail encourages a conversational style of writing (cf. Crook, 1985) and that, "Within the working environment, electronic mail lies between the phone call and the office memo with respect to its degree of formality." (Bannon, 1986, p. 448) When I looked at the first messages from my "Introduction to Linguistics" class, in which most people who sent messages were novices, the data seemed to confirm the "conversational nature" of electronic messages.² Despite the memo format of E mail (with the "From;" "To;" and "Subject:" lines), which does not particularly encourage greetings, these first messages displayed several instances of opening greetings, as shown in (1) - (3).

(1)

From: LANGUAGE 19-SEP-1984 13:21
To: ADURANTI
Subj: HI

PROFESSOR DURANTI, HI! I JUST WANTED YOU TO KNOW THAT I AM ONE VERY CONFUSED PERSON!!! I UNDERSTAND THE THINGS THAT YOU ARE SAYING IN CLASS, BUT LYON'S IS VERY CONFUSING TO READ. I AM GOING TO READ IT ONE MORE TIME, THEN I WILL PROBABLY BE IN YOUR OFFICE ON MONDAY MORNING. YOUR CLASS IS VERY INTERESTING. SEE YOU ON MONDAY.

[SIGNED]

(2)

From: LANGUAGE 19-SEP-1984 13:33
To: LANGUAGE

Subj: HELLO MR. DURANTI, I JUST WANTED TO THANK YOU FOR BRINGING ME TO THE COMP

[The text is truncated because the user tried to type the entire message at the Subject line, which allows only a limited number of characters.]

(3)
From: LANGUAGE 24-SEP-1984 13:43
To: ADURANTI
Subj: LINGUISTICS/LYONS

HI, PROFESSOR DURANTI! SORRY I DIDN'T
COME UP SOONER. I GUESS I'M JUST TOO
LAZY TO TAKE THE LONG TREK UP HERE FROM
POMONA. READ MOST OF CHAPTER 3 IN LYONS
[...]

[SIGNED]

I first thought that opening greetings were typical of novices, that is, of people who are new to the medium and have not yet mastered its properties. New users seemed to apply conventions learned in some other domain of interaction.

I soon discovered, however, that the use of greetings in the first message is not confined to novices. Expert E mail users also employ them. Example (4) is a message from an expert programmer and frequent E mail user trying to reach Michael Cole's students at UCSD:

(4)
4CCVAX::LANGUAGE 13-MAR-1985 11:04
To: [Long Address]
Subj: Hello from Pitzer College

Hi there! My name is James [LAST NAME], and I'm a student of Allesandro Duranti's. I'm testing out some mail routings for Mr. Duranti. I'll keep this short, since I don't know if it will get to you.

Thanks!
James

The same opening greeting is found in a second attempt (14 minutes later). Michael Cole's reply from UCSD to our first successful link up (on the 17th of March) also contains an opening greeting. I used greetings in my first message to another computer class at Pitzer (March 14) and one of the three students who replied to my message also started with greetings, shown in (5):

(5)
From: 4CCVAX::CG 8-APR-1985 15:02
To: ADURANTI
Subj: RETURN MESSAGE

HI PROFESSOR DURANTI! MY NAME IS
CLAUDIA [LAST NAME] AND I AM VERY MUCH
INTEREST & ED IN WHAT YOU AND YOUR CLASS
ARE DOING. [...]

Opening greetings in E mail remind us of openings in other contexts and through other media such as face-to-face encounters and telephone conversations. The use of greetings in E mail, however, shows a pattern of its own. In a telephone conversation, greetings tend to be used in the opening sequence of almost every call (cf. Schegloff, in press); in face-to-face interaction in American society, opening greetings are typically used at the first encounter in the day; they seem to mark "day units" (or even shorter units during the same day, especially when people meet again but in the context of a different setting or activity).

In face-to-face encounters, initial greetings, such as "Hi" are used to signal that the parties are willing or ready to interact with one another. This is typical, for instance, of service encounters: The cashier saying "Hi" implies that he or she will be dealing with your merchandise next and will be considering you as the main or preferred interlocutor. On some occasions, greetings may be exchanged even more than once within the same day. In E mail, instead, greetings mark the beginning of much longer units. In fact, in E mail, *after contact has been made* (which involves two turns: first message and reply to first message) *greetings tend not to be used again*, even when several days or weeks might have passed from the last message. They seem to signal the beginning of an interaction in a *new discourse domain* which, once established, does not need to be renegotiated every time. It would seem that senders assume a continuous availability on the part of the recipients that might be related to the asynchronous nature of the interaction (cf. Scollon, 1982). At the same time, as I will show in the next section, users do exhibit some concern about how to start subsequent messages when they perform certain kinds of speech acts.

Opening Address Forms

The format of E mail is such that (at least in the software used in this case) the receiver knows the intended addressee of the message (e.g., To: ADURANTI). Despite this feature of the

medium, users sometimes employ address terms in the opening line. There are three contexts in which opening address terms are found:

(i) They are used with opening greetings, as shown before, e.g., *Professor Duranti, Hi!*, in example (1);

(ii) They are used to select a particular recipient within a group. This is the case when, as shown in example (6), the "To:" line indicates more than one addressee (or, in some cases, a distribution list).

(6)
From: 4CCVAX::ADURANTI 28-FEB-1985 11:43
To: JL,ADURANTI,IC
Subj: are you guyst co connected?

Jim, do you have "[Ian's username]" as part of your distribution list? I remember you had "[wrong username]" instead. Is it fixed now?

Ian, have you been receiving messages from JL [=Jim]?

ADuranti

(iii) Finally, opening address terms are found in messages that tend to contain apologies or complaints, as shown in examples (7) and (8):

(7)
From: 4CCVAX::PV 27-MAR-1985 20:02
To: ADURANTI
Subj: life

Prof. Duranti,
This message is just to update you on what I have ben up to recently explain why I haven't been putting in a lot to the class recently. [...]

Cheers,
Peter

(8)
From: CW 28-MAR-1985
To: ADURANTI
Subj: IMPORTANT MESSAGE

PROF. DURANTI,

I HAVE TO LEAVE FOR A FAMILY EMERGENCY
AND I WON'T BE RETURNING FOR A WEEK.

[...]

THANK YOU FOR YOUR UNDERSTANDING,
[FIRST AND LAST NAME]

Messages that start with an address term tend to contain speech acts that imply some past or future break of expectations. In terms of Brown & Levinson's (1978) analysis of the politeness phenomena, they would seem to co-occur with face threatening acts. They are not all, however, examples of giving deference through honorifics (or titles + address term). There are also cases in which first name with no title is used. An interesting example is given by a student who sent three messages one after another. Only the second one, example (9) below, starts with the address term *Alessandro*. In that message, he is complaining about the amount of money he might have to pay to take a field trip to UCSD and is proposing to reconsider a plan proposed by me and already approved by the rest of the class.

(9)
From: 4CCVAX::MR 24-MAR-1985 15:04
To: ADURANTI
Subj: the trip to UCSD

Alessandro,

As you know I am an independent student here at Pitzer and although 8 to 10 dollars may not seem like alot of money it is a very damaging sum to me I think we need to take about it further.

This use of opening address terms is something that electronic messages share with face-to-face interaction and certain kinds of handwritten messages. Although it is often found in cases where there has been or there is about to be a breach of expectations, I have also used it in congratulating students for something they had achieved (e.g., Jim, good job ...). In Brown & Levinson's terms, opening address terms seem, in some cases, to signal positive or negative politeness. From a different angle, one could say that the opening address term is a rhetorical device that frames the subsequent discourse as something special. Opening address forms might then be devices to signal a "stepping out" of the normal flow of discourse either to reframe something that has been done or give warning for something that is coming up, whether it be negative or positive.

Inter-Domain Continuity as a Strategy for Achieving Co-Membership

Another feature of E mail openings is the attempt to create or restate co-membership with the recipient. In these cases, *inter-domain con-*

tinuity is created by selecting features of activities, aspects of the social identity of the sender and/or addressee that point to a universe of discourse that transcends E mail.

In the messages I received from students in my "Introduction to Linguistics" class, for instance, it was common to have words, comments or greetings in a foreign language. This feature related to the subject matter of the class, in which, as common in linguistics classes, lectures and discussions made frequent use of examples from a variety of languages. Bringing up this feature was thus a way of tying the current communicative event to another type of event where we normally interacted. It was a way of *reminding* me of our shared history, a way of recognizing a common interest and in so doing achieving solidarity, co-membership.

(10)

From: LANGUAGE 20-SEP-1984 10:57
To: LANGUAGE
Subj: BUENOS DIAS SR. DURANTI.

I WENT TO THE BOOKSTORE YESTERDAY (19-SEP-84) TO PURCHASE THE OTHER TWO LINGUISTIC BOOKS AND THEY ARE STILL NOT IN, [...]

(11)

From: MO 26-SEP-1984 10:36
To: LANGUAGE
Subj: bon jour

My first language spoken at home was Spanish. My parents have been successful in teaching in teaching me their native language rather well. [...] I'm in the process of attempting to learn the French language, what are the chances of my learning and comprehending this third language as well as I have learned Spanish and English? What else besides learning the grammar rules of that language will help me to start thinking "FRENCH?" [...]

(12) (After I replied to her message)

From: MO
To: LANGUAGE
Subj: MERCI

Novices are here bringing in, within the E mail domain of discourse, pieces of some past history. They both rely on such past history and draw attention to it. The form and content of the message often evoke or explicitly bring up some features of interactional work or shared assumptions that had been established on some other prior occasion.

Code-switching is a well known strategy for establishing solidarity despite or beyond the social roles expected in the particular event (Blom & Gumperz, 1972). It is not surprising then that students would use it in sending a message to their teacher. What is interesting, in these cases, is not so much that code-switching took place, but which language is used, when, and why. Whereas the students in the introductory linguistics class used whatever language they knew, the students in my "Computers as Tools" class restricted their choice to Italian. This time the foreign language was used as a link to me as an Italian and not necessarily as a linguist professionally interested in *any* foreign language. Here are a couple of examples:

(13) (First message by a student who speaks Italian and has been in Italy. The assignment was to recount their previous experience with computers.)

From: 4CCVAX::RL 23-JAN-1985 14:37
To: ADURANTI
Subj: HOMEWORK1

BON GIORNO! COME STAI? I HAVE STUDIED BASIC AND LISP. HAVE ALSO TAKEN ARTIFICIAL INTELLIGENCE. I'VE OPERATED SEVERAL MICROCOMPUTERS. I USED BOTH THE BAX AND THE COMPUTERS AT POMONA FOR THEIR SPSS PROGRAMS. CIAO. [FIRST NAME]

(14)

From: 4CCVAX::RL 21-APR-1985 15:08
To: ADURANTI
Subj: c'e un problema

I received a message from [First and last name] that I felt was very negative. I'll forward it to you after this. It was my impression that the computer mail was intended for [sic] communicating and sharing ideas. Io non capisco questi Americani!

A Martedì, Bon Giorno, [FIRST NAME]

Example (14) is from a student (RL) who used at least one Italian word in 10 out of 14 messages he sent me. With one exception, *the placement of the foreign words was either at the beginning (in the subject line³ or in the opening greeting) or at the end of the message*, in some cases, in both places. Italian words functioned as *boundary markers*, linking the past and preparing the way to the future. They were also *metastatements*,

frames: a testimony of a continuous search for a solidarity that would go beyond computers and school. Such a goal is made particularly clear in example (14), in which RL forwarded to me a message in which another student cursed at him for producing too much garbage mail. Notice the typical bracketing with an Italian sentence in the subject line (*c'e un problema* 'there is a problem') and the final comment (*io non capisco questi Americani!* 'I don't understand these Americans!') Given that RL is himself an American, these last words must be explained as an attempt at creating a solidarity with me viz-a-viz his classmates. This is done by evoking a fictitious identity, by reminding me that he is more "like me" than "like them."

The Subject Line

The Subject line forces people to think meta-semantically. Addressers are expected to know what the message is about before typing the text. The communication model implied by the E mail format (with "Subject" before "Text") is one in which the message, or at least its "core" meaning, is assumed as already formed in the sender's mind before he encodes it into some linguistic form and through some particular medium. The question is whether in fact this model corresponds to the users'. The Subject line is thus an interesting place to look for how E mail users understand and exploit the framing slot offered by the system.

First, I found that novices use the Subject line in a somewhat different way from experts. It is not uncommon for beginners to assume that the Subject line is where one should type the message. Only later do they find out that the software is designed to accept in that slot only a limited number of letters. See example (2) above.

Second, the Subject line very rarely constitutes a good "summary" of what the messages contain. Some novices wrote "message" and others "Hi." Furthermore, only *one topic* is usually mentioned, despite the fact that most messages are about *more than one topic*.

Third, experts do not necessarily comply with the seemingly expected function of the Subject line. People who have communicated through E mail for quite some time use the Subject line more playfully and metaphorically than novices do. In general, experts seem more creative and

exhibit alternative notions about the functions the Subject line can serve. Examples of such alternatives are given in (15) - (20).

(15)
From: JL 4-FEB-1985 23:24
Subj: jeez!

(16)
From: LANGUAGE 7-FEB-1985 10:52
To: ADURANTI
Subj: This is beginning to piss me off...

Now my account doesn't work! Yow!!! I don't know what this problem is, because I just changed my password and [...]

(17)
From: 4CCVAX:JL 11-FEB-1985 22:14
To: ADURANTI
Subj: finally

Finally my account works. It looks as though they got VAX 4.0 working better... This is a test message.
[...]

(18)
From: DK "and part time galactic president..." 3-APR-1985 17:17
To: ADURANTI
Subj: :-==*==: ????

The thing next to my name is what is known as a PROCESS NAME. It is a name, other than your boring DK[...] type user name that you can change at will.
[...]

(19)
From: DK "and part time galactic president..." 3-APR-1985 22:20
To: ADURANTI
Subj: Strange lands... strange tongues...

[Follows message on how to connect with users on other nodes in the network]

(20)
From: DK "and part time galactic president..." 4-APR-1985 09:04
To: ADURANTI,CLASS.DIS
Subj: Toys, gadgers and other playthings...

If you wish [=wish], you may create a LOGIN.COM that will automatically do VAX type things [...]

The way in which the Subject line is used here indexes a more complex notion of communication than assumed by the software designers of

E mail. Rather than using it for describing what the message is about, experts often use it as a slot for displaying their attitude or for evoking the addressee's sympathy or interest. In such cases, the social meaning of language is often given precedence over its descriptive or referential power.

Conclusions

In conclusion, a number of interesting facts emerge from a first analysis of the use of framing devices in opening E mail messages:

- (1) Those who exchange electronic messages display an understanding of this form of communication as a *separate domain* from other everyday interactions. Specific framing devices are thus used (i) to establish the new medium as a viable channel for opening up communication in a new discourse domain (see the use of opening greetings in the first message), and (ii) to achieve continuity with other domains of interaction/universes of discourse (see the use of foreign words to evoke past or present co-membership).
- (2) Certain features of the system are sometimes ignored by users who, instead of relying on the information displayed by the E mail format (e.g., identity of the addressee as revealed in the "To" line), introduce framing conventions (e.g., opening address terms) found in other domains of interaction (e.g., face-to-face). Other times, an option offered by the system for efficient communication (*viz-a-viz* the Subject line) is reinterpreted as a slot for rhetorical discourse (*viz-a-viz* the use of metaphors).
- (3) Novices and experts display a different understanding of the use of certain features of the medium (*viz-a-viz* the use of the Subject line). Such differences imply a differential ability across users to manipulate or creatively violate the system. They also point to the limits of the software designers' predictions, given that the more familiar people become with the system, the more often they tend to violate the constraints set or suggested by the designers. According to Dreyfus, Dreyfus, & Athanasiou (1986), this is an ability typical of experts in general. What is interesting in the case of E mail is

the *ways* in which experts play around with the supposed norms. Such ways seem to suggest alternative theories of what particular features of the system should be used for.

One of the properties of any system of communication is its *complementarity*. It is tied to other systems which often use different media. Any medium must thus allow its users to link up with a world of experience and social life that exists outside of the particular interaction in which the particular medium is used. The way in which people will create such a link is the product of many factors. Some of these factors are the physical properties of the medium, whereas others have to do with the conceptual design of the message format. Some of the conventions used are imported or adapted from other domains. Some other ones are creative interpretations of the designer's suggestions. Like other, older media have already done, E mail may soon establish some sound forms of conventionality, which may be harder to violate. In the meantime, we are offered the unique opportunity to watch and discuss the constitution of a new form of communication. This paper has discussed some of the strategies that novices and experts use in framing their messages for their audience.

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Notes

¹For the purpose of this paper, I have closely examined 300 messages.

²The typical format for the username is first initial plus last name, e.g., ADURANTI, JSMITH. To protect the identity of the users, I have left only their initials. "LANGUAGE" is an account used by those students who, for some reason, were unable to get or use their own account. Brackets (()) mark information that I have added, omitted, or slightly altered to protect the identity of the E mail users.

³The fact that foreign words are found in the subject line should not be surprising. Given the format of E mail, the subject line was the first occasion/slot where the user/sender could start establishing common grounds/co-membership. (The subject line does in fact

constitute a potential problem for those who see E mail as an informal, interactive medium, given that it forces them to plan early on what they are going to talk about. Greetings are a solution to that problem.)

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Planning and Evaluating Culturally Sensitive Post-Secondary Programs for Deaf People

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In planning and evaluating an educational program, a starting point is the basic assumption that forms the operating basis for the program. An educational program for a specific population of people is based on certain perceptions of these people and their needs as well as the kind of program that is best suited to meet these needs. This paper will concern itself with the underlying assumptions that are used to build post-secondary programs for Deaf people. From all indications, it seems that the basic assumptions upon which programs for Deaf college students function at the present are valid but incomplete and limiting to program planners who try to use existing programs as models for establishing new programs.

An examination of these assumptions reveals the following: (1) Deaf people can be categorized with other disabled people; (2) Deaf people can be mainstreamed into post-secondary programs; and (3) Deaf people have certain basic support service needs that must be met in order for them to succeed in post-secondary institutions, which include sign language interpreters, note-takers, special counselors and special classes.

These assumptions are not only incomplete, but the way they have been interpreted may be inaccurate. They do not, for example, say anything about the duality of Deaf people. In recent years, it has become clear that Deaf people have a dual identity as a disabled group and as a cultural group using a different language. Therefore, it is necessary to add to the foregoing assumption (number 1) that Deaf people can be categorized with other disabled people, but they should also be recognized as a linguistic and cultural minority.

It may be that some post-secondary programs for Deaf people are operating under this revised assumption without knowing it. For instance, when a program includes a special consideration for the English skills of the Deaf students, it shows it recognizes tacitly that a difference exists between the language of the educa-

tional system and that of the Deaf person. However, this difference is misunderstood when it is believed that the Deaf student's difficulty with English is the same as that of other students who need remedial English classes in order to succeed in college. Remedial instruction is for those individuals who have internalized the rules of the language and may speak it without difficulty, but who are unable to read or write it with proficiency. Because the first language of Deaf students is American Sign Language (ASL), they have internalized the rules of this language and use it without difficulty. Therefore, English is a second language and Deaf students do not require remedial instruction but, rather, developmental instruction. Developmental instruction assumes that an individual has not yet mastered the rules of the target language, which indicates that the need that post-secondary Deaf students have for English instruction is akin to that of English as a Second Language (ESL) students. Akin, but not exactly the same, because certain aspects of the ESL approach do not hold true for use with Deaf students.

How to handle the language situations of Deaf students is the most obvious area of concern for most program administrators and staff. But there is another area of concern that is equally important but much more difficult to understand and act upon. This is the cultural aspect of Deaf people. Padden and Markowicz (1976), Markowicz and Woodward (1982), and Padden (1980) suggest that there is a Deaf cultural group with separate values, behaviors and language from general hearing culture.

Although most people seem to accept this position without reservation, it is hard to know exactly what the differences are. A listing of the difference in values between the two cultures, Deaf and hearing, is beyond the scope of this paper, but it is important to understand that the differences are real and run very deep. A good example of these differences can be found in how the groups use their respective languages. In English, a hearing person uses the term "deaf" or "hard-of-hearing" to refer to someone who is different in a sensory way. The "hard-of-hearing" person is less sensorily different than the "deaf" person. The terms "deaf" and "hard-of-hearing" in English usage refer to degrees of hearing loss.

On the other hand, in ASL, a Deaf person uses the term, "deaf," or "hard-of-hearing," sometimes to refer to degree of hearing loss but more often to refer to cultural orientation or identification. Someone who is a "little hard of hearing" in ASL is almost Deaf but behaves a little like a hearing person. Someone who is "very hard of hearing" is someone who behaves very much like a hearing person. This is in direct contrast to the English usage of the terms by hearing people.

Although all this may seem very abstract, the consequence of ignoring it in everyday life is very real since a genuine cultural difference and, unfortunately, sometimes a serious cultural conflict exists. It is not just a difference in the two languages that can be cleared up with a simple explanation. It is rooted in value systems that get more and more complicated as one examines them.

How do these cultural differences have a bearing on program planning and evaluation? They have a direct bearing on the assumption mentioned earlier, "Deaf people can be mainstreamed into post-secondary programs." The question becomes, "What considerations must be made for a culturally sensitive educational program for Deaf students?" There are many considerations, three of which I examine below.

Language. The first cultural conflict that is likely to occur is between the Deaf person and the system. Deaf students are confronted with a system (the college or university) which is an English speaking system. In assumptions 3 and 4 mentioned earlier, the answer to this problem is a number of support services, including interpreters. It only requires a very basic sampling of the language used by the most "sign language" interpreters to show that, for the most part, interpreters provide a service of "making English visible," rather than actual translation from language to language. It is neither appropriate for programs to assume that their interpreters are doing language-to-language translating nor to charge interpreters with the responsibility of solving the language difference between the system and the Deaf student. The task of "simultaneous interpreting" that is assigned to interpreters almost without exception requires the interpreter to follow the English word order of the speaker, and

because ASL has a separate and different grammar from English, the result is a kind of "signed English," not ASL.

Although it is not fair to the interpreter or the Deaf person to exaggerate what the interpreter does, it is appropriate to recognize the essential function interpreters provide in the program. What actually happens in most interpreting situations is that sign language interpreters serve as a way to make English partly visible so that Deaf people can use their knowledge of English to understand what is being communicated.

This means that with or without an interpreter Deaf people are faced with the language difference and the accompanying possibility of cultural conflict due to incomplete and ambiguous understanding of each other's language. Using an interpreter is a skill that a Deaf person may or may not have.

Language use plays a part in another kind of cultural conflict. Often, the English-speaking system blames the Deaf person for a lack of proficiency in English and places him/her in the category of "educationally deprived," "culturally deprived," or "language deficient." The situation for Deaf people is more like that of a person from another country who may not know English well but is in no way deprived in the language, education, or culture of another country. A Deaf person's problems with idiomatic usage in English is often used to point out their "language deficiency." But it would be more appropriate to say that the lack of proficiency in English idiomatic usage is due to the fact that Deaf people are from a different culture. Idioms are culturally dependent. It is little wonder that someone not in the mainstream of the culture would have problems with them.

The difference between thinking that someone is deficient and thinking that someone is culturally different is the basic kind of sensitivity which needs to go into planning and evaluating programs for deaf individuals because it facilitates functioning across cultures.

Training. Functioning across cultures is a skill that requires experience and training. Whenever industrialists, diplomats or Peace Corp workers are assigned to work in another country, they are given training, sometimes intensive training, in the language, the values and the behaviors of the people with whom they will work. This is for

good reason. The effects of American insensitivity to foreign cultures is well-documented and almost legend in some parts of the world. There are compelling reasons for providing the same kind of training for program staff and the Deaf people in an education program that will mainstream Deaf people into a hearing culture. Not only is there the need not to offend people from another cultural group, but there is the need to avoid making program decisions based on inadequate understanding of the people for whom the program is intended. The model that is selected on which to base parts of the program will determine whether or not the program is ultimately culturally sensitive.

This can be illustrated by example. In most educational programs for Deaf people, there is a provision for academic, career, and personal counseling services. Sometimes, there is special counseling service with a counselor trained in sign language who is supposedly trained to work with Deaf individuals. Other times, the Deaf student must take a chance with an untrained counselor through an interpreter. Whichever the case, rarely is this counseling based on a cultural model. To be sure, most counselors who work with Deaf students are probably aware that a difference in language and culture exists. Few seem prepared to act upon this knowledge. To be fair, counselors are rarely trained to counsel a cultural situation when confronted with one. If asked to work with a non-American, the counselor will realize that part of the problem may be a cultural conflict and will react accordingly by informing concerned parties and by exploring ways to resolve the conflict.

Rarely will a counselor think culture when confronted with cases involving Deaf persons. Given this lack of association of Deaf people with cultural differences, the inclination is to think in terms of other types of conflicts, such as personality conflicts, or to assign to Deaf people as a group certain characteristics that contribute to a conflict, such as "not goal oriented." Characterizing people in this way is not new. It happens to most cultural minorities in America, including Native Americans, Chicanos and Blacks, as well as historically to Deaf people.

If a decision is reached that "personality conflict" or "not being goal oriented" is the problem in a case involving a Deaf person, then efforts to

work out a solution will proceed on this decision. If that is really the problem, then there is no reason why a solution will not be found. But if the problem is an unrecognized cultural conflict, and efforts are focused on something else, the problem will never be solved to anyone's satisfaction. In fact, misguided efforts at a solution may compound the problem.

It has been noted that Deaf persons prefer Deaf counselors. The reason for this is not based solely on language. Being "more comfortable with one's peers" translates into a shared culture. But even Deaf counselors will need training in coping with cultural differences if they are to be effective in their roles. For the counselor and all program staff, it is not enough to know there are two cultures involved--skill is needed when two cultures meet.

Cultural Access. On most campuses, there are few staff and personnel, especially teachers and counselors, who are of the Deaf culture and language. In other words, there are few who are Deaf themselves and use ASL as their first language. In most places, there are probably one or two who sometimes make all the difference in the world for the Deaf student.

Imagine traveling in a far country without benefit of a common language where the culture is very different and not understood. The traveler might feel a discomfort born of the inability to interact fully with other people and eventually acutely miss the native language and culture. This is a very frequent occurrence for people who take long trips and encounter other cultures. It is not hard to imagine the relief of meeting another traveler from the same culture. The pleasure of hearing the native language and the ease of interaction based on shared life experience would be tremendous.

For Deaf students, the presence of Deaf professionals on campuses resembles the traveler met on the road mentioned above. In trying to travel through the hearing and English speaking system, a Deaf student may look to other Deaf students, but he/she will get great relief from Deaf professionals. The reason for this is that the Deaf professional brings de facto bicultural education to the campus. By de facto, it is meant that bicultural (and bilingual) education is happening in reality to some extent, even if it is not realized or recognized.

By having Deaf teachers teach special classes (such as English) using ASL, a program is made accessible to the Deaf student using the student's own culture and language within the system--not an adjunct to the system. It is a favorite theme of Deaf folklore that a successful Deaf person can often point to a Deaf person in the past who helped provide the turning point for success.

There exists a need to have Deaf culture present and accessible in the educational program. Black and Chicano programs are a foregone conclusion at most colleges and universities. Classes in which Deaf people can study ASL and Deaf culture are rare indeed. Yet, just as hearing people need English classes, Deaf people need American Sign Language classes. Just as hearing Americans are required to study their culture in History, Government and many other classes, Deaf students need to have access to study their own culture. It is extremely ironic that many colleges and universities regularly offer ASL and Deaf culture classes to hearing students, but rarely design classes on the same topics for the people to whom they belong--Deaf people.

Finally, the aspects of program planning in language and culture also extend to program evaluation. The questions that need to be asked when the time comes to evaluate the effectiveness of a program include the following:

Does the program provide language instruction that is appropriate for a population that has a first language different from English (an adult, developmental program)?

Is the staff trained not just to know but to understand and cope with a culturally different group?

Does the program provide bicultural, bilingual access (a Deaf presence on the staff)?

And finally, does the program have the ability to keep up with the speed at which we are discovering new things about Deaf people (is information made available to Deaf students in courses that relate to them as Deaf people)?

These questions may seem radically different from those usually asked of programs for disabled students, but they represent the difference between other disabled groups and Deaf people. The difference is a very positive one. The percep-

tion of Deaf people as a linguistic and cultural group is not only accurate but infinitely more productive.

Notes

Another version of this paper appeared in the Winter 1983 issue of *CAPED*. (Planning and Evaluating Culturally Sensitive Post-Secondary Educational Programs for Deaf People, *CAPED*, 1(1), 17-24.)

¹The capitalized "Deaf" is used when referring to cultural aspects, as in Deaf culture. The lower case "deaf," on the other hand, refers to non-cultural aspects, such as the audiological condition of being without hearing. The capitalized "Deaf" does not include hard-of-hearing or other deaf people who are not and do not consider themselves as part of a Deaf cultural group.

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