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This report of the proceedings of the 3rd Annual Professional Education Seminar of the Central States Colleges and Universities centers upon the implications of technology for teaching and learning and contains addresses delivered, including "Some Concerns Related to Technology in Education," by Len Froyen; and "Implications of Technology for Teaching and Learning" and "Models for Uses of Technology," both by Asahel Woodruff. A foreword is written by Ned Ratekin. Also included are a summary of seminar reports, "Directions of Change," and an appendix listing seminar participants. (SG)

IMPLICATIONS OF TECHNOLOGY FOR TEACHING AND LEARNING

Third Annual Professional Education Seminar of

Central States Colleges and Universities

Addresses by

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Cedar Falls, Iowa

November, 1967

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FOREWORD

The third annual Professional Education Seminar of the Central States Colleges and Universities was held on the campus of the University of Northern Iowa on November 9 and 10, 1967. This Seminar, as those held in 1965 and 1966, offered an opportunity for representatives of the CSCU group to discuss problems and share solutions in specified areas of their teacher education programs.

The 1967 Seminar focused on the responsibility of educational psychologists to affect the behavior of teachers. To direct the content of discussions and presentations, the concern was narrowed to the topic, Implications of Technology for Teaching and Learning.

This area of concern was selected for several reasons. Ideally, of course, technology in the form of an educational device or system must serve educational objectives. But an anxiety akin to fear grips many in education who see that what happens in education is instead being determined by this technology, and a sense of urgency comes upon us when we see that this technology is not going away, as would a fad, but is more and more with us. Also, the number of students, the increasing student-qualified teacher ratio, and the expansion of available knowledge have forced educators to turn to technology for a possible solution to their problems of quality comprehensive education. In addition, there is sensed by those rummaging among the concepts and gadgets of the new technology an inkling that these may directly contribute to more efficient learning even if the numbers game were not being played. There is abroad the opinion that children today are more at home and receptive when placed in the humming environment of electric machinery.

With these concerns, the committee developed a program centered about the addresses by Asahel Woodruff and Len Froyen, and discussions among the participants in the Seminar. Dr. Woodruff has been chairman of the advisory committee to the teacher education and media project of AACTE, author and teacher in the area of educational psychology, and presently a member of the bureau of educational research at the University of Utah. Len Froyen is Assistant Professor of Education and director of professional sequence, Department of Education at University of Northern Iowa. This report is a record of the addresses and summaries of the meetings, presented with the hope that they may whet interest in facing the basic concern of the Seminars--development of optimum programs in teacher education.

Ned Ratekin, Chairman
1967 Committee

The Committee

George Ball
John Earls
Merritt Melberg
Margaret Nelson
Dan Oppleman
Vernon Peterson
Ned Ratekin

SOME CONCERNS RELATED TO TECHNOLOGY IN EDUCATION

BY: Len Froyen

I understand there is a legend told in Persia about the bug-in-the-rug. This is the tragic story of a bug that spent his entire life in a beautiful Persian rug; but all he could see was his problems. His problems stood up all around him; he couldn't see over the top of them. Each day he had to fight his way through the tufts of wool and strands of fiber to get at the few crumbs scattered throughout the rug.

The tragedy is that the bug lived and died in this beautifully designed rug without ever realizing the beauty of his surroundings. Now if that bug could have gotten above the rug he would have seen two things: first, there was a pattern to his surroundings and secondly, those things he called his problems were really part of the pattern.

I'm sure that at times we have all felt like the bug-in-the-rug. We are so overwhelmed with our problems that we only see a small part of the world in which we live. We become so immersed in our problems that we never get above the rug.

We have organized this conference to see if we can get above the rug. We have endeavored to do this in two previous years. The first year we tried to discover the dimensions of social foundations and the contributions this area could make in the preparation of teachers. Last year we explored the patterns in the introductory courses in teacher education. We are hopeful this year, that even if we can catch but a glimpse from above the rug we might learn, as the bug never did, there are some distinct patterns shaping the relationship between technology and educational psychology. Hopefully, by isolating and discussing these patterns, we can better understand the problems.

Thus, to start this conference, I have been asked to briefly share some of my concerns about the new technology; to express what appear to be some

of the patterns. It is not my intent to discuss these patterns, but merely to suggest them as alternatives for our thinking during this conference. I will expand each concern only to clarify a few dimensions of each pattern. For convenience, I have organized these concerns into two groupings--four concerns in each group.

I. The first set of concerns express some discontent with conditions which seem to favor technology. My dissatisfaction is directed at the outcomes of an unfavorable balance between technology and the operation of the total educational enterprise.

1. Preoccupation with technology will side-track recent progress toward defining what to teach and to whom. Here I am suggesting that without answers to what to teach, and to whom, there is really no basis for selecting, applying and evaluating technology. In addition, I'm expressing a concern that the very trend that is likely to help us make effective use of technology will be shoved aside by it. The emerging interest in the structure of a subject field and the analysis of learning skills is likely to be passed by technology; confined to follow technology rather than preceding it. This condition leads me to hypothesize that our job might well become one of preparing teachers to assess objectives rather than write them; to evaluate outcomes rather than specify them. In summary, I'm concerned that by withdrawing the focus of attention from the area of goals we will usher in my second major concern.

2. Commercial mergers, principally involving electronics companies and publishing houses, will result in instructional systems that supplant rather than supplement the curriculum. The textbook has often been the tail that wagged the dog. How often it is called the poor teacher's crutch. Technology promises to place a new, more elaborate device at

the teacher's disposal. Again the outcome is both the purchasing of educational objectives and instructional techniques. The tool becomes the master. Yet one shouldn't be totally pessimistic for we have begun to ask, "When is the tool basic; when peripheral?" I continue to wonder if we will be able to ask the right questions and answer these questions with a tool, a technology so subtle, often so obscure, to the mechanically inept and skeptical teacher.

As these systems achieve wider acceptance they will substantially change the educational setting. As the curriculum establishes the instructional setting, these companies then can control this setting. I'm afraid we won't have educational models to modify or accommodate these systems; models which suggest the new relationships among teachers, pupils, parents, the school and community. My third concern outlines the reason for this conclusion.

3. Learning theorists will ignore the modes of learning imbedded in the technology. I'm fearful we will come along too late to really help. We may be too slow to provide a conceptual structure against which teachers can process the elements of technology. Have we even examined the more obvious assumptions that underscore some early technological enterprises--concepts of linear learning in small steps, the notion of a straight line from question to answer, the idea that learning is better if errorless?

Can our teacher education graduates select and use technology because they understand; in the area of purpose; what technological works best when . . .? In the area of individual difference, do our graduates know what learners respond best when . . .?

I'm concerned that unless some framework for processing the variables of the teaching--learning process is available teaching will become less

manageable. Today we are attempting to reduce clerical functions to make teaching more manageable. Are we merely substituting confusion at a higher plane? A synthesis of these first three concerns actually contributes a fourth.

4. Technology will both perpetuate and reinforce the over-emphasis on methodology in education. Technology will build objectives in reverse. We will study the capabilities of the machine and then design a rational for the program based on these capabilities. This is the old story of the means determining the ends. Aren't we all aware that the bag-o-tricks approach to teaching needs no support from technology?

II. Now I would like to discuss a second set of concerns. These are stated with an implied sense of support. For example, if each concern was preceded by the word "unfortunately" such support would be more obvious. Thus, this second set of concerns suggests that certain conditions will operate against widespread acceptance of worthwhile technological innovations.

1. External resources will make technological innivation available, but internal management will limit its use. This trend replaces the old problem of building the new school and not having the money to equip it. Now we can equip the building, but lack the human resources to maximize the use of such. We now have arsenals of hardware but no personnel to produce materials and to show staff how to use it. Another dimension of this concern is my feeling that media will continue to be unavailable to the teachable moment. Media will increasingly frame the job, but like the supplementary textbook they will be stored in a central facility.

2. As a consequence of this external push, technology will continue

to develop in a revolutionary fashion within an institution that changes in an evolutionary manner. No doubt some schools will try to be revolutionary. Since they have no such experience, just the money, technology will merely be superimposed. These schools will make no attempt to shift school patterns. These schools will become quickly disenchanted; ready for the next revolution. On the other hand, some schools will continue to be evolutionary--tradition will dominate, change will be a bitter pill. My concern is that both of these groups will end up in the same place. When they meet they will usher in my third concern.

3. Acceptance of technological equipment and materials will be limited to the substitution or replacement level. The overhead will merely replace the chalkboard, the film will be used when we run out of things to say. We won't really make use of the unique qualities of the media or the machine.

I'm also fearful that the tool will not be seen as generating knowledge. Each tool offers different kinds of data. Can we learn like the doctor, to use the tool to collect data, as well as dispense information? Can the machine amplify human teaching skill; rather than being used to replace it? At this place in time we would have to answer these questions in the negative. For the TV machine has not changed teacher behavior, it has only transmitted that behavior to more people. This thought brings me to my last concern.

4. The prevalence of nonsignificant differences will relieve professors of ever learning to use the new technology or to see a reason for making the benefits available to students. Haven't the studies of TV with two-way communication, with varied size groups, etc., all yielded low, if nonsignificant differences? Doesn't this help us defend

our present non-technological practices? It has occurred to me that our research is a self-fulfilling prophecy. We have focused upon the wrong problems. Rather than studying the conditions under which the machine is most effective, maybe we need to devote our time to discovering the message built into each machine and how to offset or capitalize on that message.

CONCLUSIONS

In conclusion, I would like to underscore my over-riding concern. I would suggest that the theme running through most of my remarks is this; the appeal of the new technology may be in the wrong direction. It may be viewed as the solution to many of our most pressing problems. But actually the problems that really need to be solved are outside the realm of technology. In fact the solutions technology provides might introduce problems with which it cannot cope. Enamored by the technology we might ignore the real shape and substance of the educational enterprise. Like the field general, in the fury of battle, we might be heard to exclaim, "Having lost sight of our objective, we have redoubled our efforts."

IMPLICATIONS OF TECHNOLOGY FOR TEACHING AND LEARNING

Dr. Asahel Woodruff

We're getting two major kinds of contributions from technology. One of them consists of the technological tools that are coming into our hands. When we talk about tools we must never lose sight of the fact that the focus of technology in this respect is on peripheral aspects of education rather than on central factors.

Technological Tools

The first tool that caught everyone's attention was the teaching machine. You remember its history and its rise and fall. It's practically gone now, although I think perhaps not forever. We may get it back again in a more useable form and under more useable circumstances. We have the computer, we have multi-media forms, and we're now operating across the country a very powerful workshop through AACTE on media and their role in education. We have other things that are not technological tools but are of this general nature--such things as non-grading, which is an administrative device or organization in the nature of a tool. Team-teaching is a somewhat similar kind of instrument, and there are others. There is, in fact, a long list of such tools that have appeared from time to time. They are really peripheral to the main business of education.

All tools are instruments. Their value depends on what they facilitate. This has been very well expressed tonight. Tools do not determine goals, and the industries that produce them will not determine goals for a number of reasons. That responsibility has to rest with the people themselves in a country like ours--the people who are the beneficiaries of education; and by that I mean not only the individual citizen but the users of the products

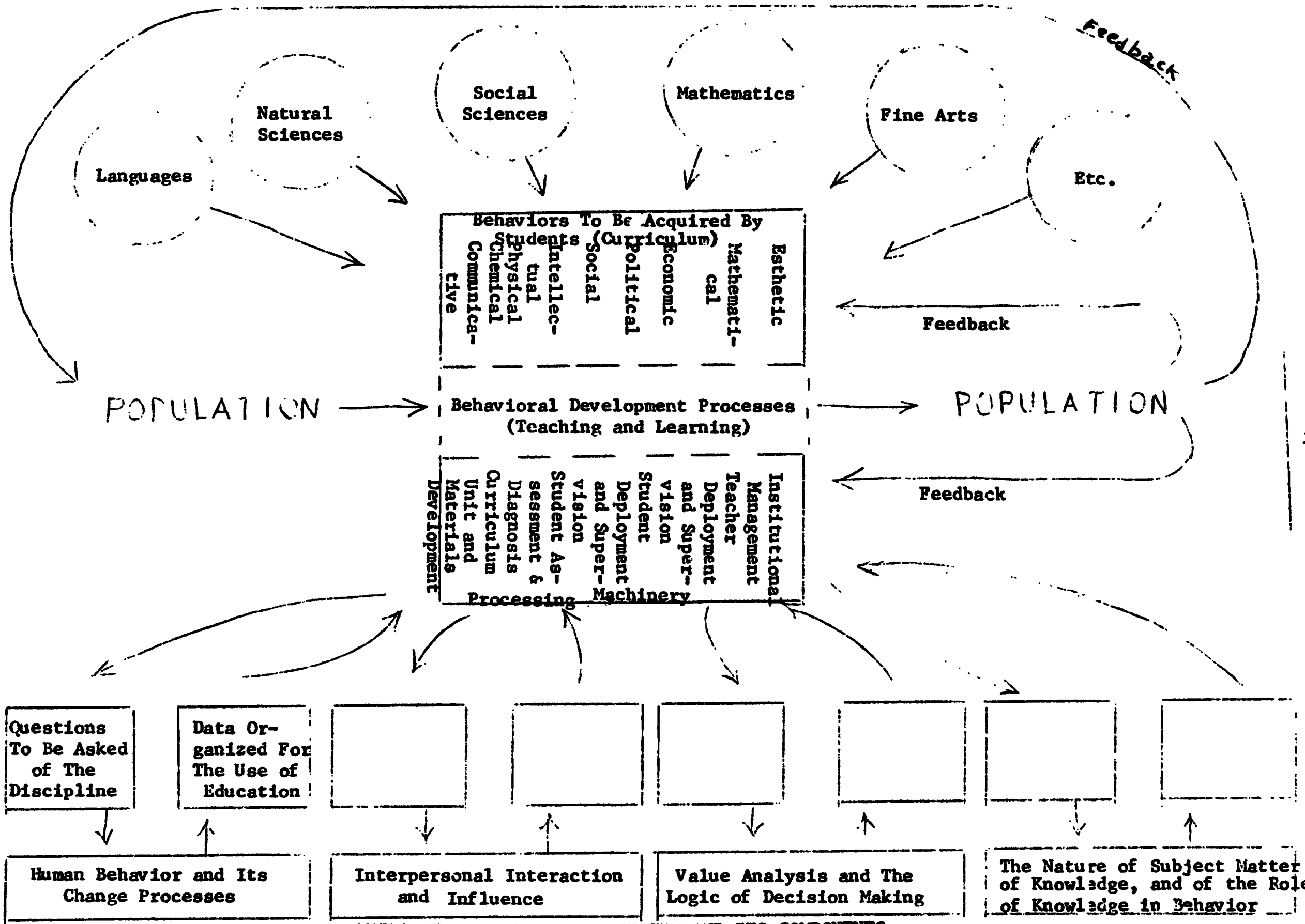
of our schools--industry, business, the professions, and so on. These are the people who ought to be talking with us and to us about the nature of the goals we should serve in education. Tools can promote efficiency, but a very fundamental fact to keep in mind is that it does no good at all to become more efficient in presenting a poor curriculum or in using efficient but ineffective unit contents and methods. The means may lead to efficiency but not necessarily to good education.

Secondly, our society really has difficulty thinking in terms of ends and means. This is one of the themes on which Dewey dwelt. In his book on the nature of thinking he went to some great pains to describe in detail the relationship between ends and means and their roles in human thinking. He pointed out many of the mistakes we make when we confuse means and ends, and how we do the confusing. But we're exhibiting this behavior all over again in education right now. Our attention goes quite spontaneously to these very attractive devices--and they are attractive. They're highly visible and very exciting. Compared to them a teaching objective is colorless and boring. The use of objectives in education has been one of the most painful and laborious things we've ever tried to deal with. We're fed up with admonitions to start all of our work with objectives. As a matter of fact, people in the testing field tell us from their observations and their attempts to correlate tests to instruction that objectives are not influencing the content of instruction to any extent at all in American education today. The influence is coming largely from textbooks and outside extraneous factors of that kind. So that the attempt to develop and use objectives has been a real washout as far as educational practice is concerned. Nevertheless, the critical element in education is not the technological tool; it is the objective, and then the content that is used as the implement for reaching

that objective. Let me move on to another aspect of this.

Quality Control Systems

Another contribution that has come from technology is the know-how about producing a quality product efficiently. This is a different kind of contribution--not a tool now, but an internal, operational know-how. One of the things we have learned from industry might go under the general heading of Systems Analysis. I know you're familiar to some extent with the nature of this kind of thinking. We have a Systems Analysis operation at the Systems Development Corporation in Santa Monica, intensely interested in education. Suppose we were to apply, as I think we might very well need to do, the notion of system analysis to an educational operation and see if we could picture an educational enterprise in these terms. If we were to do that we might come up with something very much like this (See Figure 1, page 12). The box in the center is the educational system. The production line runs right through the middle of it. As in all production enterprises, we have four components here. One of them is an expected end product coming out at the end with certain specifications about which we've been pretty foggy for the most part. Another one is the raw product going in at one end which will pass through a treatment and come out in some form. The third element is a treatment to be applied to the raw product-in case of an automobile it might be a coat of paint or any other of a number of things. The fourth element is the process of applying the treatment. We have all four components in education. We've been very imprecise about recognizing that we even have four such distinct and yet inter-related components working together. The treatment we think of generally as subject matter. The process of application we think of largely as methods of teaching. The raw product is, of course, the students coming into the school and the finished



MODEL OF AN EDUCATIONAL SYSTEM AND ITS COMPONENTS

product is the student going back into the population. Of course, there's a good deal more involved in it if one were to look in some detail at each of the elements that make up this product.

Now one of the important characteristics of industry and business is that they have (and I want to come to this as my next know-how item out of technology) a quality control system operating. This means that when the product comes out at the end of the treatment they have some way of measuring how much of the originally intended characteristics the product has. That information is fed back immediately, both into the treatment itself and into the process of applying the treatment, so that they maintain a constant corrective operation between what happens as a result of one treatment, and what is done the next time. This is a very powerful mechanism--a very strong shaping influence. Businesses that do this kind of thing succeed; and businesses that don't do this fail. I know we don't like to be compared to profit and loss organizations but if you just forget the profit and loss aspect of it, we have every reason to be compared to a production enterprise. We need to be even more concerned about a quality control operation than business does because we're dealing with a much more precious commodity. When we make a mistake we can't throw it into a discard pile and forget it. We just can't afford to make that kind of mistake.

Let me emphasize that quality control is often misinterpreted by educators who seem to distrust it. For instance, we are inclined to think of it as control of the faculty. This it never will be, never should be, and never really can be. I'm working at the present time on a committee in the eight state M-step Project in education. Our committee is charged with coming up with a prediction for the 1980's of how many and what kinds of professional personnel we will need in the state of Utah. On my committee is

a consulting industrial engineer. I'm getting some very interesting and provocative ideas from this man. He's an exciting person with a lot of imagination and a lot of sympathetic interest in education. Quality control does not mean control of a person. It means control of the quality of the product. Now let's be perfectly clear about that distinction. A quality control system, instead of being a threat to the technological people in the operation, is the best provision to help them succeed. There's nothing else that can be as useful and as helpful to the members of a production team as a good sound quality control system.

What is a system and how would you apply the idea to education? A system is one cycling production unit that comes to some kind of a recognizable accomplishment where certain kinds of end characteristics can be measured. The most basic unit of all is one teacher and a group of students. That is a system, a production unit in a technological sense. Who would get the information from the mesurement? The teacher would. It doesn't go anywhere else-it's of no use anywhere else. It's useful only if it comes back to the teacher who is applying the treatment so the teacher can sy "that didn't turn out the way I expected it to" or "what's wrong with the way I work?" Then the teacher can look at his operation, make the necessary corrections, try it again, and get another feedback, and so on.

This is not a Gestapo system in any sense at all. It's a self-administered internal quality control check. We've got to learn to use this kind of operation in education. I think this is one of the most powerful contributions that technology can give us.

Another production unit is a whole program where teachers are involved cooperatively in producing some common end product. In teacher education we ought to be working coordinately, although a good deal of the time we are not. We act as if the treatment each one of us gives to a student is

complete, separate, and self-sufficient all by itself. Clearly it is not. We were talking earlier tonight about organizations for teacher education on campuses--whether we should divide into departments or not. Most of us are divided into departments. By definition a department is a self-sufficient, academic unit that has to have no help from any other unit on the campus to accomplish its central purposes. From that point of view, a department, a segment of the field of teacher education is a contradiction in logic. We simply can't divide up that way. If we do have departments, we will have to ignore those lines and work across them. Hypothetically, we do have a program but if we don't see it as such, and make it possible for the product coming out of that program to be measured and get a feedback into the whole program operation, then we're ignoring our best opportunities for real internal growth and improvement.

What is our production process? We are interested in producing changes in behavior. At least we say we are. If we really mean that, let's see what this requires of us.

Criteria for Objective

What is a behavior? I suppose most of you are already somewhat familiar with Bob Mager's interesting little book, Preparing Instructional Objectives. He's producing some additional things at this point that are also exciting, but let's go back to the first statement I have ever seen in educational literature that gets close to having real meaning in this regard, "Behavior is any visible activity displayed by a learner." Or to put it in different terms, behavior is that which the individual does in his daily adjustmental life to interact with his environment. Mager says a behavioral objective is the behavior you'd like your learner to be able to demonstrate at the time your influence over him ends. He emphasizes an overt behavior, and an overt specific behavior. A specific behavior is not a general behavior. There is

no such thing as general behavior. There is nothing but specific acts in specific situations. We can't change behavior in any general way at all. This is literally impossible. We know this from our studies in educational psychology, and from any form of study of human learning and human behavior. We know, furthermore, that there literally is no such thing as learning per se. There is nothing but behavior, and we know, furthermore, that behavior changes only when it is going on. That is, whatever aspect of behavior you're concerned about changing, that aspect of behavior has to be occurring before you can change it. The feedback process we were looking at a moment ago, operates on the individual just as it does in a production enterprise.

Let's quickly recognize Mager's criteria for a behavioral objective.

1. It names a specific overt behavior.
2. It tells exactly what the behavior consists of.
3. It may exclude related but unwanted behaviors.
4. It describes the conditions under which the behavior must occur.
5. It specifies the criteria of acceptable performance.

These sound like fairly simple straightforward guidelines to follow. Even so, it takes awhile to learn to write a statement that meets these criteria. The most common failure is to describe what the person will be doing when he is exhibiting the behavior. We name something instead of literally describing it. We can't set up an instructional program for a behavior until we have literally and accurately described it.

The Learning Cycle

Now think of behavior again in a system sense. Let's use the system notion to try to understand individual behavior. A human being is a closed energy system. He's a circulating cycle just like any other of cybernetic system. He too has an input through his sensory organs consisting of preception of his surroundings. That input goes into the brain where it is

stored, and while it is stored it is also being assembled and organized by the brain. The brain is a continuously thinking mechanism. It never stops thinking. We can't turn it on or off. It's going all the time.

Thinking consists of organizing the inputs that have come in through perception. We gradually evolve patterns that begin to make sense to us, so that what we see outside becomes identifiable, differentiable, and predictable. We call those organizations concepts. Once those concepts are formed they permit us, through our ability to predict, to decide how to react to a particular situation. Thus we make decisions that are based on these concepts. A decision is really quite a complicated phenomenon and a very fascinating one. First of all, a decision is a prediction. Now think of yourself in a particular situation, and you'll recognize instantly that as you begin to visualize or entertain some line of interaction or reaction, you do in effect say to yourself, "I think if I act this way this is what will happen." So you pick a line of action that will produce what you want to happen as well as you can. This is a prediction. In fact it is a two-fold prediction. That prediction involves not only saying to yourself, "I think this is what will happen," but also saying to yourself, "When it happens I think this is the way I'll feel about it." Here we must note that both our comprehension and our evaluation of any given object are inseparably connected. Recognition of what's happening and recognition of how one feels about what's happening are always involved in human experience and are always present together. All concepts have this double component. There's no such thing as feeling separated from knowledge, unless you define knowledge in terms of verbal information, which we have generally done in education. When we define knowledge as verbal information, we do have an almost complete separation between knowledge and feeling. But interestingly enough, that kind of knowledge has practically nothing to do with behavior.

Now if we put together the three or four things I've just said, they constitute a devastating message about education. We are not working on the variables that control behavior when we dispense verbal information. We are giving people a treatment that has no connection at all with the way they behave, and which, therefore, can have nothing to do with their motives and the control of their actions outside of school.

Having made a decision, the individual acts on it and carries out his intent, or tries to. There are two or three things about this trial behavior that we need to see quite clearly. In the first place the thing that makes it a powerful factor in changing behavior is that it counts--it's for real. When you act in natural life you can't back up and say I didn't do it. The behavior has occurred and it has a consequence, and that consequence is going to impinge on you and on other people, too. It counts, you see. And, therefore, that consequence is either going to help you or hurt you. It doesn't take very long for a youngster to find that out. He soon begins to be a little cautious about the way he responds to things, because he knows his response is going to come back at him. He gets a feedback from it through his perceptual channels and into his storage and organization bin. We have the same cybernetic cycle operating here--that shaping cycle that I mentioned a moment ago with reference to a production system. What's in storage guides decisions and actions, and what happens as a result of those actions reshapes what is in storage. I want you to know that the cycle I'm talking about is an out-of-school cycle. This is the model of out-of-school behavior. This does not operate in school, and the reason it doesn't primarily, is that we have cut out half the process. We activate the perception and organization reasonably well, although with a lot of breakdown, but we do not activate the phases of decision and trial, and as a consequence we're getting no feedback that can affect behavior from the

kinds of things going on in school. There are other problems involved there, too. But this is the major one.

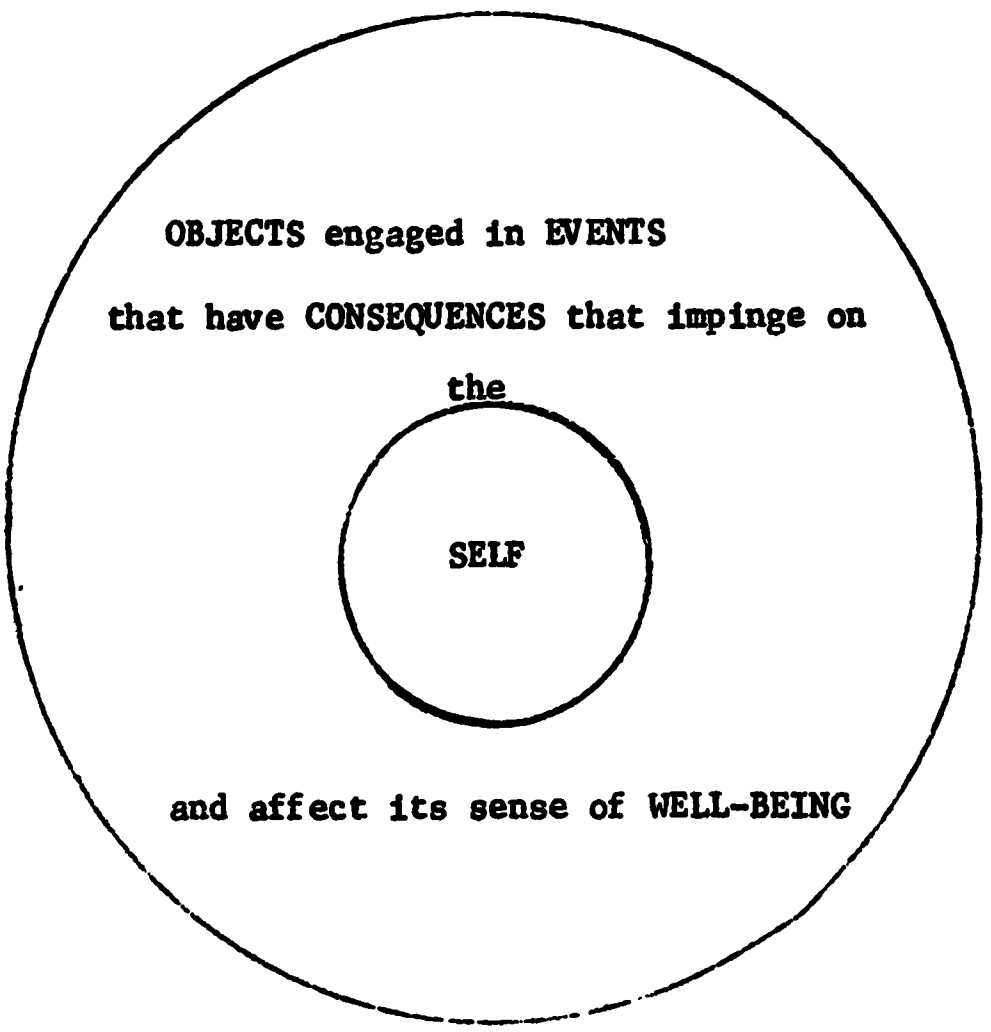
Environment for Learning

This is an out-of-school model of human behavior. Let's look at the setting for behavior. The individual is obviously interacting with something which is around him and outside of him so let's put him in that context and see what the picture then starts to look like.

Now we're talking about subject matter, which consists of the environment around the person. There are five component elements of the person and his environment that make up the whole complex. We live in a world made up of objects of many, many kinds. Don't just think of visible, physical objects. The molecule is an object. An atom is an object. A song is an object. A painting is an object. A person's feeling is an object if I can somehow get to it. It's something in nature. There are many, many different kinds of objects. But our world is made up of objects. Those objects are involved in events; they are doing something. The objects are the actors in a constant flow of events, and those events have consequences. Some of the consequences we perceive readily and some we don't perceive at all, but they're all there. Those consequences, one way or another, manage to impinge on the self, and they affect its sense of well being. These five components are the five kinds of subject matter we ought to put in our curriculum in school. I'm assuming that we really mean we want to affect the behavior of students. And if we want to affect the behavior of students, then these five components are the things he has to cope with. So we ought to be talking about, or working with these five components of subject matter. (See Figure 2 page 20)

Figure 2

SUBJECT MATTER COMPONENTS OF ENVIRONMENT



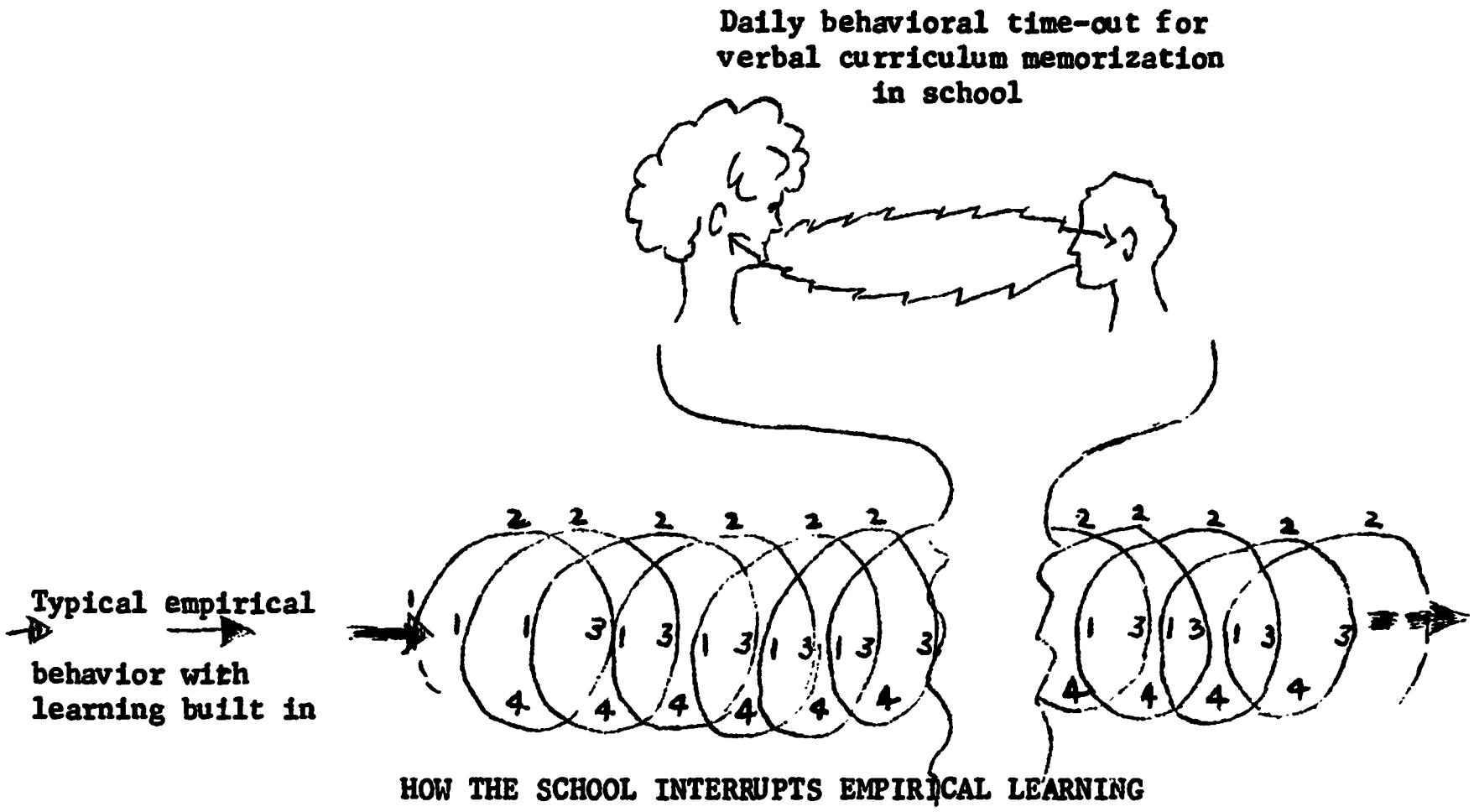
The usual interaction between a person and his environment follows the cycle I was talking about just a moment ago. But we break it up in school, and this is the way we break it up (See Figure 3, page 22). The whole cycle includes perception, organization or conceiving, decision-making, and trial. The person goes through it again and again and again, until 9 o'clock in the morning when we take the student out of his real environmental learning setting, and put him in a classroom where we bombard him with verbal barrage. Then at 3 o'clock in the afternoon, or somewhere there about, we release him again and he goes back out and the learning cycle starts all over again. The learning that affects his behavior is occurring out of school, not in school. What we are imparting in school is verbal information. This has a role to play in decision-making and behavior, but it is a minor role--not a central role; and when a student lacks the conceptual structure around which data can have some meaning he cannot use verbal information in decision-making. So, you see, we're working on the very false assumption that we can stop learning, take the person aside and load him up with information, and when he goes back into his regular learning and behaving situation the plugged-in information will somehow reach in and affect his behavior. This is a perfectly false assumption. We have to abandon that assumption and get rid of the tactics based on it.

Conditions for Learning

What can we do about it? We have in the literature in psychology and education a lot of very useful building materials for a revolution, for rebuilding the educative operation. A great deal of it has come to us through technological kinds of investigation. The information has come from precise and careful study.

I know you're familiar with many of the components I want to mention

Figure 3



HOW THE SCHOOL INTERRUPTS EMPIRICAL LEARNING

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here, but let me quickly name a couple that I believe are more conspicuous than the others. Most of you are familiar with Flanders work in interaction analysis. The amidon and Flanders manual for making interaction analysis provides for recording verbal acts on a matrix, interpreting them, and showing what's going on in a conversation. This is one component. It is attractive, but it is not a complete answer to your problems. We are tempted to say, "This is great. If everybody knew how to record an interaction analysis on himself, and then correct his verbal behavior so he could teach better, we'd solve all the problems of education." But this is only one component in the whole picture.

Another one that is becoming very visible right now is the study of non-verbal communication. Charles Galloway at Ohio State University is helping us to understand this phenomenon. He says, for example, that the non-verbal expression that goes back and forth between people is what makes the verbal communication believable or unbelievable. That's a very nice distinction and a very real one. Galloway is working on a system for recording non-verbal communications analytically just as Flanders and Amidon have done with verbal communication. Don Cruickshank at the University of Tennessee and other people are working on what they call simulation, the use of simulators in providing almost real experience to learners so that they begin to get back into that whole cycle again instead of having just part of it in operation. There is another tool that makes use of technological instruments as well as analytical devices. Micro-teaching has been developed at Stanford University and is spreading across the country. Workshops are being conducted in which people are studying how to use micro-teaching to help teachers learn how to teach.

There are quite a few more. But what we've got to do now and what some of us have been attempting to do, is to gather those bits together to see if

we can develop a total map of the conditions of learning in the classroom.

The following are some of these conditions:

1. The Learning Task That is Presented to a Learner

   Its nature
   Its order and flow pattern
   Its availability to the learner
   Its self-administering quality
   The quality of its learning materials (All forms of media serve here)
   The availability of its learning materials (Storage and retrieval systems can serve here)
   The adequacy of materials for student needs.

2. The Working Climate and Degree of Commitment by Teacher and Learners

   Their personal relations
   Their working rapport
   The meaningfulness of the tasks to the learners
   The teacher's visible commitment
   The level of learner arousal
   Degree of individuation of learning (Storage and retrieval systems here)
   Detection and alleviation of prerequisite gaps
   Reinforcement of desired learner behaviors

3. Devices Used to Influence Student Behavior

   Range from high in education and low in control, to low in education and high in control

4. Reality of the Experience and Level of Mental Activity Activated in Learners

   Perception
   Conception
   Decision making in real situations (Can be vicarious if simulation or identification is vivid)
   Trial in real situations
   Feedback from consequences of behavior in real situations
   Level of conceptual thought processes:
      Repeating information
      Describing something real
      Analyzing something real
      Organizing ideas
      Interpreting-explaining
      Predicting-concluding
      Inventing-creating

5. The use of the Verbal Process

   Teacher-student verbal ratio
   Verbalism-meaning ratio
   Data-concept relation

This is just a topical list of five categories of classroom conditions. After you have examined them for a moment I want to show you in preliminary form an analytical instrument for identifying what's going on in the classroom, within each of those broad categories. (Table No. 4, pages 26, 27, 28)

Probably the most important aspect is the quality and availability of the learning tasks that are required of students. What kind of a task do you put before a student-how available is it? There are several items there that can constitute a major component of classroom learning conditions.

A second one is the working climate and the degree of commitment by both the teacher and the learner. The teacher may be excited or apathetic. There is the personal relationship between the teacher and the student. Beyond that there is a working relationship between them regardless of how they may personally feel about each other. There is the teacher's use of reinforcement for appropriate student behavior, and so on.

The third aspect consists of the devices the teacher uses to influence student behavior. This goes back to the very early work on democratic and authoritarian ways of dealing with people, which I think we're seeing very much more fundamentally now than merely authoritarianism and democracy, so to speak. We have the possibility of setting up a real continuum of control or influence devices. They range from those which are high in educational value and low in control to those that are high in control and low in educational value. When you show this continuum to a teacher, there is an almost instantaneous recognition of his tactics, and often a little gasp as he says, "Gee, am I doing this? Is this where I'm working on this continuum?" Now and then a teacher says, "Heaven help me. I'm doing everything down at the bottom of this list and nothing at the top." That's a kind of frightening thing to recognize but it is a crucial matter. We are

GUIDE TO INSTRUCTIONAL ANALYSIS

Teacher_____

School_____

Date_____

Grade_____

Subject_____

Pupils: Boys_____ Girls_____

Length of Time_____

Description of Lesson_____

_____

_____

_____

Observer_____

ADW January 1968

GUIDE TO INSTRUCTIONAL ANALYSIS

WORKING CLIMATE AND TEACHER-PUPIL COMMITMENT TO TASKS

1.	Personal Reactions to Pupils	Strong +	Neutral	Strong -
	Approval-Disapproval			
	Acceptance-Rejection			
	Affection-Disaffection			
	Compassion-Hostility			
	Interest-Disinterest			
	Defense-Aggression			
2.	Teacher-Pupil Working Rapport	Warm	Adequate	Cold
3.	Meaning & Significance of Tasks	Clear/stimul.	Clear/Accepted	Unclear
4.	Teacher's Personal Commitment	Vital/Excit.	Active/Interesting	Listless
5.	Degree of Individuation	All Individualized		All Grouped
6.	Level of Pupil Arousal	Active Self Direction	Responsive Participation	Passive Reception / Inattention
7.	Detection & Alleviation of Gaps	Alleviated	Perceived/Not Allev.	Not Perceived
8.	Reinforcement of Pupil Behaviors P=Positive N=Negative)	Always	Sometimes	Never

9. DEVICES USED TO INFLUENCE STUDENT BEHAVIOR

Indirectly eliciting comprehension for more effective self-direction	Directing behavior with limited comprehension	Controlling behavior without comprehension
Activating Recall & Conception By: A. Eliciting Predictions		
B. Eliciting Conclusions		
C. Eliciting Identifications or Descriptions		
Activating Perception By: A. Eliciting Descriptions		
B. Eliciting Identifications		
	Describing	
	Giving Data	
	Stating Conclusions	
	Stating Predictions	
	Stating Moral Precepts	
		Prescribing-Regulating
		Criticizing or Disapproving
		Physically Managing
		Commanding
		Threatening
		Aggressive Forcing

QUALITY AND AVAILABILITY OF LEARNING TASKS

10.	Source of New Tasks	Independent of Teacher	Partially Independent	Teacher Only
11.	Objective: Behavioral / Conceptual — Not Evident	Clear		Unclear
12.	Order of Unit Contents — A: Coordinate or Sequenced / B: Empirical or Arbitrary	Well Programmed		Not Programmed
13.	Source of Working Directions	In Materials	Teacher/Written	Teacher/Oral
14.	Source of Learning Materials	Independent of Teacher		Teacher Only
15.	Content-Materials Coordination	High		Low
16.	Appropriateness of Materials	Appropriate		Inappropriate
17.	Adequacy of Materials	Highly Adequate		Highly Inadequate

18. STUDENT BEHAVIORS AND LEVELS OF THOUGHT ACTIVATED

BEHAVIORAL AND CONCEPTUAL ACTIVITY													ONLY VERBAL ACTIVITY	
PERCEPTUAL INPUT AND CONCEPTION RESPONSES								INSTRUMENTAL RESPONSES		RESPONSE IMPACT			M	N
A	B	C	D	E	F	G	H	I	J	K	L			
Perceiving	Describing	Analyzing	Reviewing and Organizing	Interpreting and Explaining	Concluding	Predicting Consequences	Inventing and Creating	Decision-making: Personal or Vicarious	Trial: Personal or Vicarious	Reaction Result in Evidence	Result Perceived: Personally or Vicariously	Dispensing of Verbal Information by the Teacher	Rehearsal by Students	

VERBAL-CONCEPTUAL RATIOS AND BALANCE

19.	Teacher-Student Verbal Ratio	All Student 100%	50%	All Teacher 100%
20.	Verbalism-Meaning Ratio	Meaningful 100%	50%	Verbalistic 100%
21.	Data-Concept Relations	Fully Related 100%	50%	Fully Unrelated 100%

concerned about it both because of the control factor and because of the thinking factor. If we could loosen up the control and evoke thinking we would change learning greatly. Control devices stifle thinking.

The fourth area concerns how real the experience is that is going on in the classroom, and what level of mental activity is elicited from the learner. Is he looking at and reciting back verbal information, or is he actually perceiving real things and forming concepts about real things, or is he actually engaging in some form of analysis, or is he arriving at conclusions, or is he going still further and using information to make predictions, or is he going still further and doing some kind of creative work with them?

The final area relates to the use of the verbal process. Who is doing the talking, and what is he saying? Is it meaningful or meaningless? We now have five areas of the total classroom condition mapped out. From this beginning we can begin to be more precise about identifying the conditions which are capable of producing changes in the behavior of students.

Let's take the working climate section which happens to be the first section on the actual guide. Among personal reactions to pupils we can identify several dimensions. One goes from strong approval over a neutral area to strong disapproval. One goes from strong acceptance to strong rejection. There are several others. We may now become rather discriminating as to the kinds of personal relations which move to be conducive to good learning.

In the area "Meaning and Significance of the Task" we are concerned first with whether the directions are clear and stimulating. Another concern is whether the teacher's personal commitment is vital and exciting, or just active and interesting, or listless and dull. We know what effect this has on students. Another concern is with the degree of individuation being

provided. Can students work at their own pace and get to their tasks when they need to, or do they all have to wait for others and do the same thing at the same time? What about the detection and alleviation of missing prerequisite or gaps? The reinforcement of desired pupil behaviors is another concern. Some of our operant conditioning psychologists tell us that they rarely see a teacher reinforcing the kinds of behavior we want, and they rarely see reinforcement being used in actual instruction. They say this is one of the basic reasons for our failure to affect behavior.

Section four is concerned with the continuum I mentioned earlier. The kind of influence that liberates and stimulates thinking consists of helping people perceive and recall real things, helping them recognize things they perceive, turning them into meaningful ideas by identification and description responses, helping them reach conclusions about what they've seen, and then helping them use those conclusions predictively. This is very high order of thought and a very freeing kind of thought. The teacher does not give these processes to students, but helps them develop them.

By means of this kind of analysis we can now describe and promote the conditions that will produce behavioral change in the classroom. If we can maintain the conditions at the desirable end of each of those continuum, behavior will change rapidly. If we maintain the conditions at the other end, behavior will not change very much ar at least not in the direction of our objectives. If we are clear as to our objectives, and maintain the conditions that will change behavior, we can literally affect America's life through education. Assuming that we have been able to state clear, specific behavioral objectives, we can make these conditions serve the purpose of producint those behaviors in the students. There is a lot to be said about how to write behavioral objectives, how to turn them into units, and so on. We can't do anything with that task tonight, but it's possible to cope with it effectively when we have time to do it.

By contrast our traditional teacher education programs, just as our teaching in the public schools, have no specific goals. We have only general goals. We have never driven ourselves to the point of saying specifically and exactly what we expect to produce. And because of that we have no goal-shaped teacher education programs. By and large what we have is a requirement of 36 quarter hours, or 20 semester hours, or so many courses, or certain groups to fill; but we have no criteria of competence and no feedback system operating with a quality control process.

Contributions of Technology

Now with this background in the practical side of teacher education and classroom teaching let's come back to the general question of technology. What is its contribution? We have three kinds of technological tools. One consists of sensory communicators. These are the tools we more commonly speak of as media. Let's look for a moment at the distinction between media and verbal language. This distinction, I'm sure, is quite foggy as judged by the way we use media in our classrooms. When we're talking about media we are talking about images. By contrast, when we talk about language, we are talking about symbols or signs. The dominant kinds of symbols are words. When we use (Table 5) "media" we are implicitly talking or thinking about portrayal, whereas language refers to representation through verbal description or definition. Media implies perception, whereas language is able only to activate recall and interpretation. These are two quite distinct things. Media are used at their best only for helping students <u>see</u> something we want them to see. And the word "see" now represents hear, smell, taste and touch and all other sensory processes. Media are not used at their best, in fact they are usually misused when they are used to transmit language.

MEDIA - IMAGES - PORTRAYAL - PERCEPTION

LANGUAGE - SYMBOLS OR SIGNS - REPRESENTATION - RECALL AND INTERPRETATION

EDUCATIONAL USES OF MEDIA AND LANGUAGE

I remember seeing a very funny little exhibition by the media people from San Diego State College at one of our conventions on media several years ago. It showed the teacher with a lot of fractions written on the blackboard, using a pointer and helping the students memorize fractions. Then she got the idea that she ought to be using the new media, so she persuaded the principal to buy a projection machine. Electrical outlets were put into the room. The next picture showed her with a machine. On the slide and on the wall were those same fractions. She was pointing them out again to the students so they could memorize them. This is a severe misuse of media--its not a substitute for the human voice. It's a mechanism by which we can stimulate <u>perception</u> but not communication in the verbal sense. The best use is to bring a student face to face with an actual referent or a vivid portrayal of it so he can perceive it for himself.

The second kind of tool consists of simulators. We've already referred to Cruikshank's simulation movement and to the television tape which simulates teaching. That is, the small classroom simulates teaching, and the television tape helps the person immediately see what he did and how he performed. These are devices for putting learners through almost real experiences, so they can perceive all the flowing qualities of the experience in relatively realistic form.

Our third kind of tool consists of storage and assembly systems which provide rapid retrieval of information assembled in whatever form the operator prescribes. In spite of the very impressive facility of these machines it is important to remember that none of them think and none of them make decisions. They only do what they are told by their human operators. Even the computer has to be programmed. It can perform practically any operation the operator can program for it. Sometimes it gets close to what goes for

thinking in many people. But it has no imagination and no values, and these are the precious commodities that distinguish men from everything else in the universe. These tools are subservient to human purpose and to human decisions. This points up their third major characteristic again-their role as means. The educator must know what end he wants to obtain in every specific lesson. And he must know the conditions required in the learning situation to produce that end. If he knows these two things he can use technology to facilitate the teaching process. Because machines are complicated we need the help of technological experts in their selection and use. Here again, however, we face the tendency to let the technologist prescribe the ends for us and this is just as inappropriate as it would be to expect the machine to establish our goals. If the technologist participates in the selection of goals he must do so out of another form of expertness than that which is required to manage the machine. The objective has to be known first--the content then is subservient to the objective and then we can start to talk about the use of technology in education.

When we have good content there will be less of the restlessness and dissatisfaction with results which drives us to new gadgets. I'm stimulated here to remember a statement made a little earlier of the common phenomenon of "no significant differences." I thoroughly agree with the analysis I have heard other people make that the reason we are getting no significant differences is that we're dealing with non-significant variables in the first place. And when we identify the things that really count we're going to get significant differences. So far we are not doing that. We owe one rather considerable debt to the technological field. When its precise methodology is brought to bear on teaching problems we begin to see those problems far more completely and realistically than we have ever done before. The advent

of the first teaching machines brought with it a major breakthrough in our comprehension of the true properties of the teaching-learning interaction. Do you remember the thing that was central in that operation? The first real discovery we made was that if you're going to build a successful program for a teaching machine you've got to know in advance what's going to happen in the interaction between the teacher and the student. Teachers did not know that. We have never known that. We've always played by ear. We've gone into the classroom saying "I can take care of it when it happens." Haven't we now really? But the programmer had to figure this out ahead of time; otherwise the program was no good. So right away we learned from the teaching machine that we must be able to anticipate ahead of time what's going to happen and provide for it, and we must provide immediate feedback. When these and other similar factors go into operation, progress begins to occur.

From here on we will have a partnership of instructional knowledge and technological knowledge. Or if you will, a partnership of goals and content on the one hand, and machinery on the other. Or if you will, a partnership between software and hardware, to use the most current terms.

Good education will be the product of both working together for ends neither one alone can produce. Each must maintain its appropriate role, and we in education most of all must remember what those roles are. The most sobering challenge we face is that of the setting of realistic instructional objectives. This is first in importance. It is followed by the specifications of the learning conditions that can bring about the achievement of the ends. I hate to think of the alternative, but there are others who will gladly make those decisions if we don't do it promptly and well. The tremendous know-how of modern America is being turned loose on education. The

time has come for all of us to start running if we hope to stay out in front of our own parade.

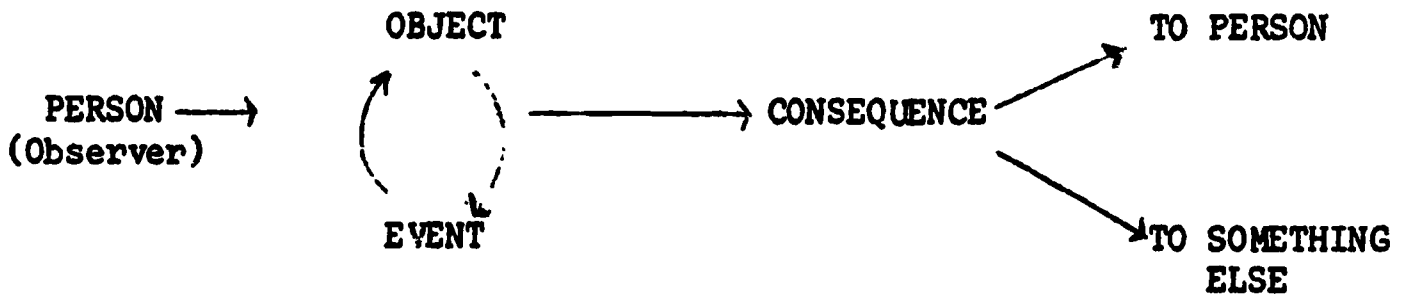
I'm going to attempt now to put together an old story I've heard with a little parable type trimming and see how it comes out. A lively and hilarious group of people drove up to an inn and went in for some refreshments after which they piled back in the carriage and left. An hour later a tired and weary man trudged into the inn. "Have you seen a group of people in a carriage?" he asked. "Oh, yes," replied the innkeeper. "They stopped here an hour ago and then went on. But you look tired. Come in and have a drink." "Oh, no," said the weary traveler, "I've got to hurry along and catch the group. You see I'm their leader." Now I say unto you that the members of the lively and hilarious group are the sons of the world of research and technology. Verily, verily, they are a hard lot to lead.

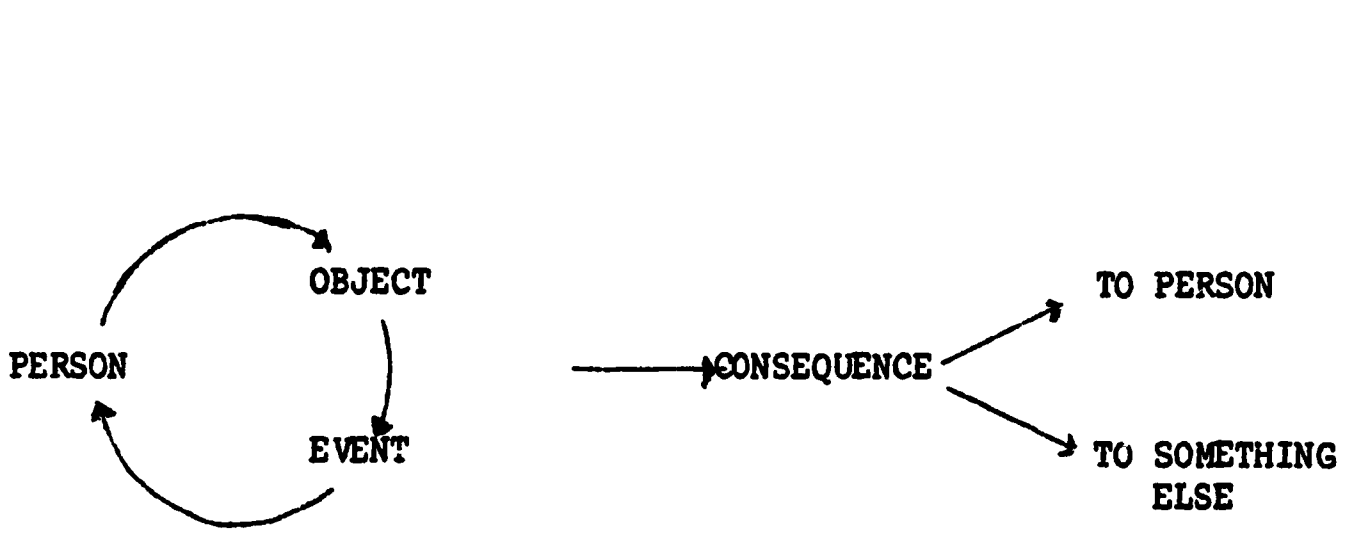
MODELS FOR USES OF TECHNOLOGY

Dr. Asahel Woodruff

Technology is incidental, really, although that's the theme of our conference. It's incidental in promoting comprehension and behavioral change. What we are really interested in is developing realism. Realism is developed primarily through involvement. This word involvement is a very central, operational idea here. Technology often helps us to get students involved but there are other ways of doing it too, as has come up several times in these discussions. I think, for instance, we often forget that the chalkboard is one of the most versatile media we have and it can be used in a very wide variety of ways. A story is another very good one. A good, well-told story is a tremendously powerful instrument for getting involvement. Also, you can, by means of paper and pencil materials, create real involvement. I saw that happen in a 5th grade classroom in Geneseo, New York, where the teacher simply handed to the students one sheet of paper. On top of it was a picture of Mr. and Mrs. Smith and their four children. Next was a statement that Mr. Smith makes $200 a month and that is all he has to spend. Next was a list of the things that have been proposed by the members of the family that they buy. And then there was the statement, "Now you decide what they should purchase." These kids got tremendously involved in this problem. At first, they were a little light-hearted about it, but within two or three minutes they were getting serious, and evidences of real concern began to show up. We could see them, watch them all; we were right there with them. They got quite concerned about the fact that they hadn't taken care of some things they knew darn well that family had to have. And yet they had spent the whole $200. Well, that was involvement. With a very simple tool--very easily done.

This might also be of some interest in this connection. (See Figure 6) There are really two ways in which we can have a pretty good involvement





TWO COMMON FORMS OF PERSON-ENVIRONMENT INTERACTION

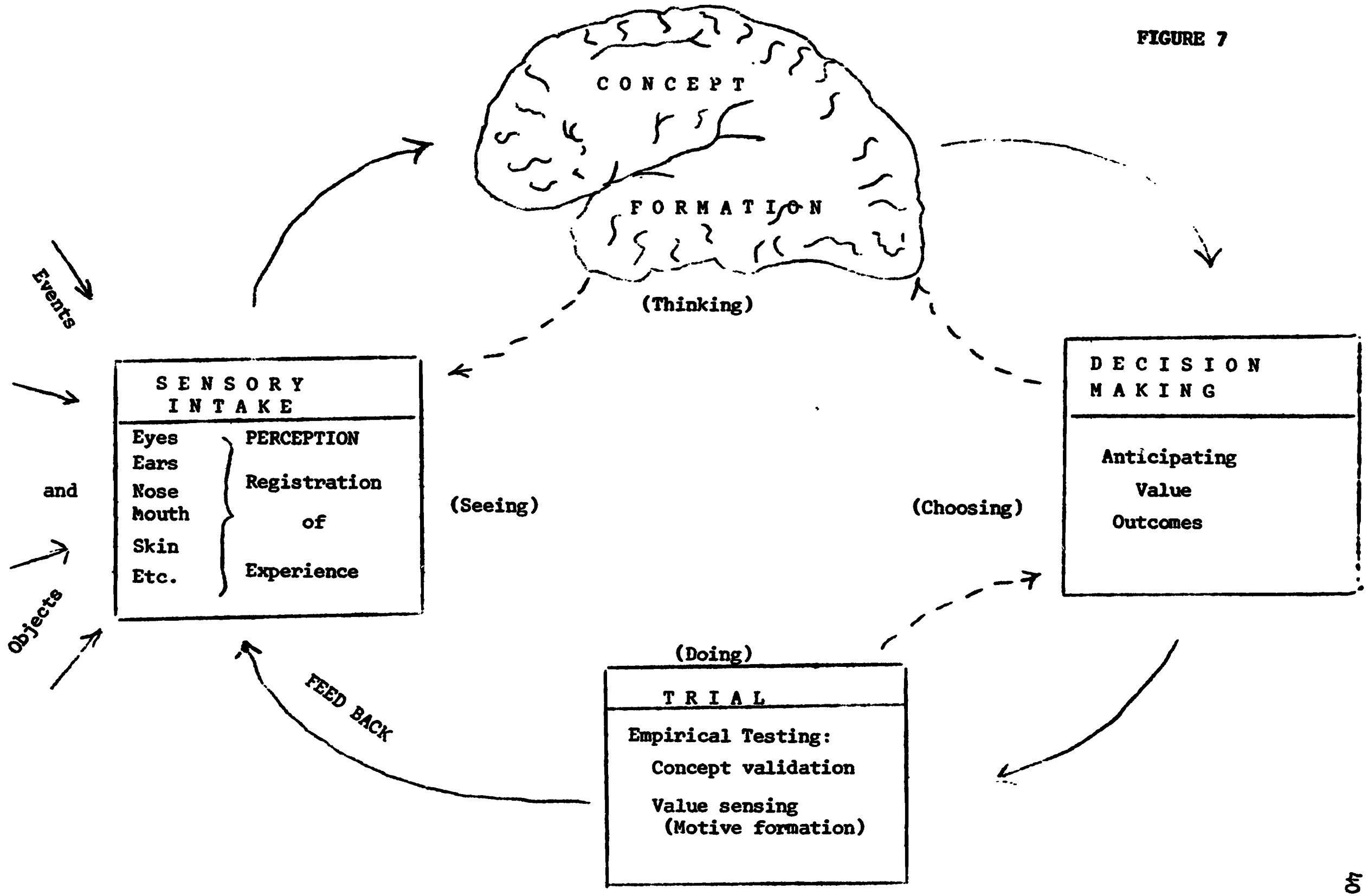
10/23/67 ADW

with actual and real experiences. I have tried to illustrate them here. In one instance you have a person standing by watching the interaction between other objects and events and not actually being himself involved in it. But he can see it going on and he can see the consequences it produces to some other person or to some other thing. Direct observation is a powerful means of perceiving inputs that can turn into vivid concepts.

Another one is indicated below, where the person himself is involved in the interaction. The consequence applies to him and to something else too. These are two simple ways of approaching involvement, and they are both effective. The bottom one is liable to produce more motivation than the top one. But the top one ought to produce quite good perceptual understanding of what the person is seeing.

Let me switch to another question that has been raised today. What about the verbal process? Is it useful or useless? Is it as bad as I said it was last night? In some respects it is and in some respects it isn't. I think our real problem, or question is, how should the verbal process be used in teaching? Where does it fit? What can it do? What does it not do well, and so on? The critical issue is the appropriate use. Here I think we need to distinguish between portrayal and perception. I know this distinction doesn't come quickly. (Figure 7) Perhaps these illustrations will help point up what I'm talking about. This is what we mean by perception: The person can perceive some kind of an observable referent by training his senses on it. He then gets a percept in his mind that corresponds to that referent. This percept is a mental image of what the individual has seen. By way of contrast, this is a pretty fair representation of the verbal process. I've tried to show that the teacher is not in the cycle of perception, concept formation, decision making and trial, and the teacher can't get inside of it. The teacher is outside of it, and the teacher can send a wash of

FIGURE 7



COGNITIVE CYCLE IN BEHAVIOR AND LEARNING

Asahel D. Woodruff (5/8/63)

verbal material across the top of the student, but it may never enter into his learning cycle. One of the very potent ways in which this verbal communication can help is to direct attention.

I think if I were going to describe in one brief phrase what is the best use of verbal communication, it would be to direct attention. That is a very powerful and useful implementation of verbal communication at all four points. Directing attention while the person is perceiving, helps him perceive better. You don't tell him what it is; you show it to him, and then draw him to it so he sees it better and better. While he is interpreting what he is seeing you direct his attention to what he did perceive, help him recall it and think about it. This allows him to organize it in the light of his total perception, instead of forgetting some of it and leaving it out. The same is true in the step of making decisions. You help him think about the issues that he knows about already, but that might otherwise overlook, so that he makes a better decision. Also, as he performs his actions, you can verbally remind him or draw his attention to things which will make a better performance. Particularly with reference to the feedback, this is critical. Many times we misinterpret what is happening because we don't perceive it well, and somebody like a wise teacher or parent can help us to get over that kind of difficulty. (Figure 8) Let's put these together into a little more complex kind of a picture. Here I've tried to illustrate the perceptual process of portrayal which results in a kind of constant cycling back and forth between two functions. One function is identification and one is differentiation.

There are very basic psychological processes that we're much aware of. Through verbally aided identification and differentiation we finally get a rather clear mental image of something. This then feeds into recall, the conceptual process which consists of recalling and reviewing all that we know in the past that has any relevance to what we're thinking about. We begin to form concepts this way.

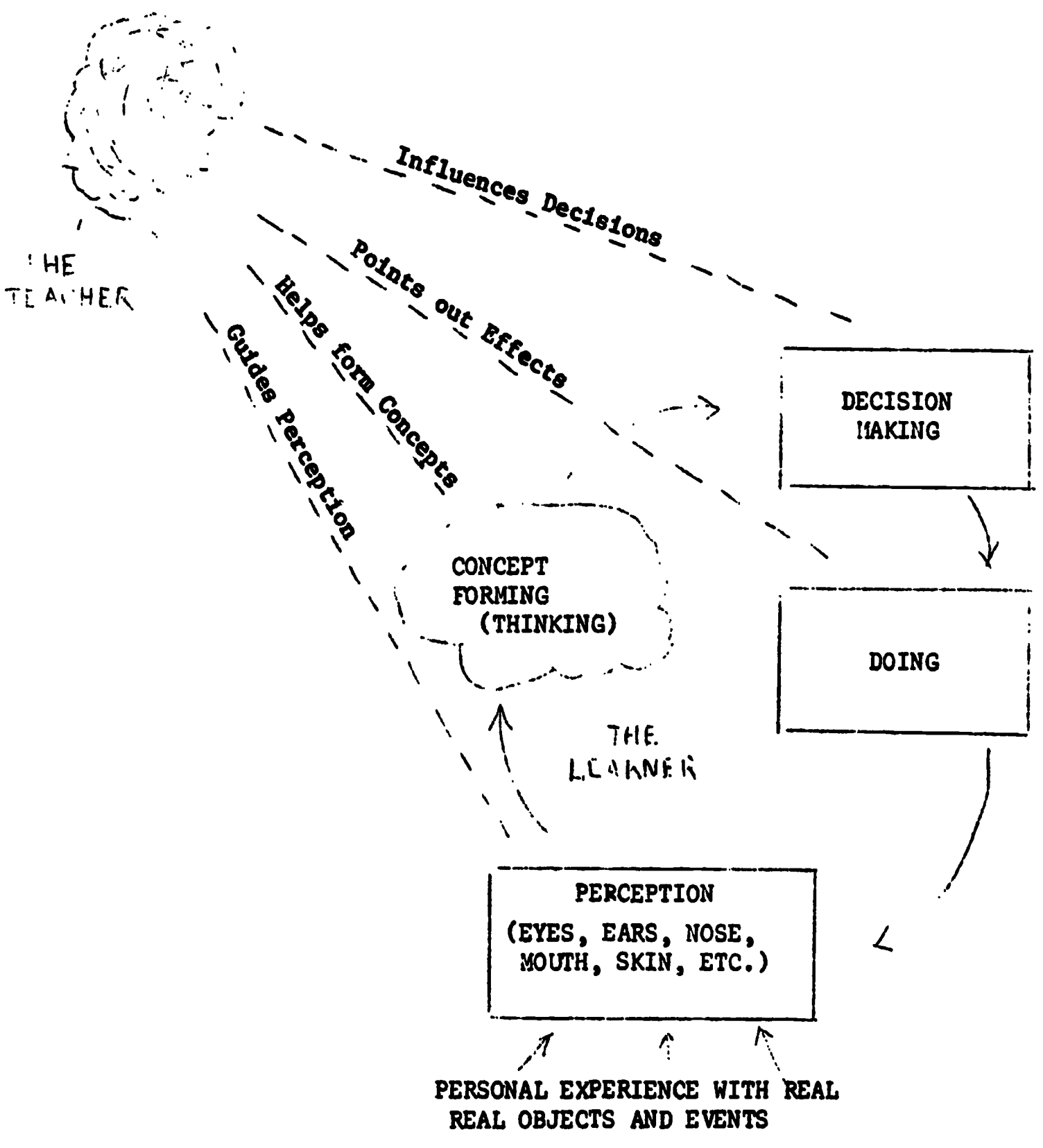
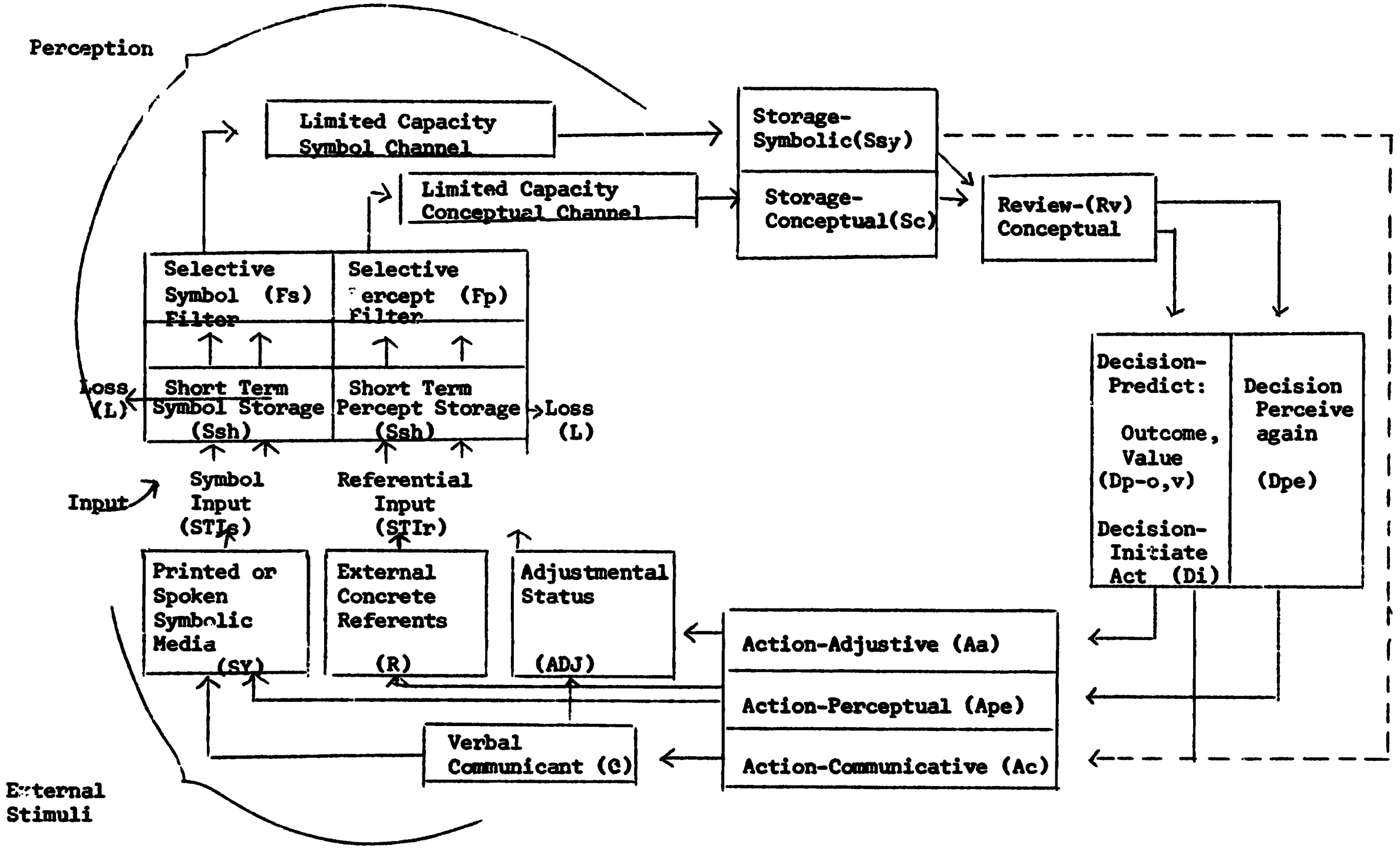


FIG. 9 VERBAL STIMULATION IMPOSED ON THE COGNITIVE CYCLE

This is a verbal process; that is, this is where verbal behavior on the part of the teacher turns out to be very useful and powerful, and where a book is particularly helpful if it is well written. The same verbal assistance may be given to the decision making, adjustive action, and the feedback processes. I have tried in a very rough way to show what kind of teacher behavior helps a person perceive, helps him think, helps him make decisions, helps him perform his actions, and helps him interpret the feedback.

I want to show you another model which is that same cycle (figure 9) but complicated somewhat by the division of verbal input from perceptual input. Two channels are shown. From the inside channel the person gets an input from actual perception. This input goes up into his storage area where it gets organized by review into concepts, then continues through his decision making and through his adjustmental actions, followed by feedback. But we can also have verbal input. I will use an extreme case in this illustration. Let's say that you give to a student some kind of verbal statement for which he has no comprehension whatever, one that is just a pure verbalism to him. In this case, the verbal input has its own channel. It too goes into a possible storage area but the storage process here is not recognition--it's memorization. That's different from a conceptual process. If the individual has conceptual meanings that those stored words are related to, and he understands the relationship (he's familiar with it), these symbols then can evoke again a conceptual response. But if that relationship is not there, the conceptual bridge cannot be crossed by that verbal material, and all that is left for the individual to do is simply repeat it. It doesn't enter into decision making, it comes back out as repeated verbal materials. So verbal material should be used only when there is something already in storage that may be stimulated and brought back into thoughtful reaction.

Now another question that came up was, "How do you write behavioral



Cybernetic Model of Behaving-Learning Cycle

FIGURE 9

objectives?" Do we have any objectives in teacher education? I commented in one group that I thought we didn't have any, and I could almost stick by that without qualification.

Let's run very quickly through how you might write a behavioral objective. First of all, let me remind you that an objective is the behavior you would like your individual to demonstrate at the time your influence is over. It's a visible activity displayed by the learner. There's another definition that says an objective states a specific act, together with certain limitations to it so that we are not left with any ambiguity about what we're talking about. Now that means we're talking about behaviors, and one of the first jobs is to clarify in our own minds what kinds of behaviors there are in which people engage. There are quite a few different kinds, and yet the list is not infinite at all. It's very finite, and I think this comes pretty close to exhausting it. (Table 10) This grows out of some work we've been doing with teachers to define behavioral objectives. We've wound up now with three major kinds of behaviors that we engage in constantly. There are very pervasive; you can find them in every subject matter field, you can find them in all walks of life. Two of them are identifying and matching things (type 1) and performing instrumental acts (type 2). We won't have time to go into them in depth, but look particularly at IIA. These are decision execution behaviors--very important in the life of a thoughtful person. In the performing of these decision-execution behaviors, we tend to use, especially in the decision part, all of the identification and matching behaviors (type 1) and to help us see where we are, recognize a situation, and so on. Then we use the motor acts and pattern behaviors to carry out the decisions we make. You can work from this chart directly to some of the behaviors that constitute teaching performance. You can see them easily in this model. If you're willing to work on the assumption that the teaching act is supposed to facilitate learning, then it means we are to

PERVASIVE TYPES OF BEHAVIORS FOR INSTRUCTIONAL UNITS

Type 1: Identifying, Discriminating and Matching
(Covert Behaviors)

A. PERCEPTION OF REFERENTS in the environment.

B. THINKING about what has been perceived in both present and past and ORGANIZING IT CONCEPTUALLY.

C. IDENTIFYING AND DIFFERENTIATING referents and their various properties and uses.

D. COMPARING AMD MATCHING referents and their properties and uses.

E. IDENTIFYING (choosing) A GOAL (a condition or product to seek, produce, or accept).

F. CHOOSING MATERIALS (or elements of any kind) required for producing the goal.

Type 3: Verbally Communicating
(Overt Linguistic Expressions of Type I Behaviors)

A. VERBALLY IDENTIFYING referents and discriminating among them.

B. SPEAKING OR WRITING discursive sentences to express one's thoughts and judgments.

C. REPEATING memorized information or other symbolic materials.

D. USING TAXONOMIC AND TOPICAL SYMBOLIC HIERARCHIES to represent bodies of information.

Type 2: Performing Adjustive (Instrumental) Acts upon the Environment
(Overt Nonverbal Behaviors)

A. MAKING AND EXECUTING DECISIONS:

Locating and securing materials required for reaching a goal.
Preparing the materials for processing into the goal or product.
Processing the materials into the goal or product.

B. PERFORMING MOTOR ACTS in any of the foregoing behaviors.
e.g. Using a knife, sawing a board, bowing a violin, making a broad jump, reading a prepared paper, conversing on a casual level.

C. FOLLOWING CUSTOMARY PATTERNS AND ARRANGEMENTS in any of the foregoing behaviors.
e.g. Setting a table, arranging a room, observing a schedule, exhibiting a customary manner, carrying out a stabilized set of steps in a process.

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facilitate the student's movement through the behavioral cycle. The teacher will be able to write a behavioral statement which tells: What the learner will be doing when he performs the behavior; the conditions under which the behavior is to be demonstrated; and the minimal level of performance that will be accepted. Teachers out to be able to write a behavioral statement that does this.

Here's another one. The teacher will be able to set up a sequence of social living behaviors that are useful in daily life outside of school, and another sequence of learning behaviors that will enable a student to engage deliberately in self directed learning in school.

Third, the teacher will be able to phrase questions about a social phenomenon in a form that elicits analysis of the phenomenon and avoids the repetition of items of information.

Here's a fourth one. The teacher will be able to portray a social process and its consequences to students with enough realism to enable them to identify instances of it within their own experience.

Or a fifth one. The teacher will be able to endure and maintain silence when students are thinking, will wait until the response can be formulated, and will recognize this condition when it exists.

Here are others. A teacher will be able to recognize his own non-verbal expressions and shape them so they support rather than conflict with his verbal communication. The teacher can distinguish between a relevant and irrelevant comment and retrieve the direction of the discussion without distress to the irrelevant student. We could go on forever, but these are the kinds of behaviors I think we ought to be looking for.

These behaviors don't fall within particular subject matter fields. They cross all of them. We are going to have to forget much of the methodological distinctness we now have between departments and between subjects in teaching.

We should start looking at functions, and join together in recognizing and writing these objectives. Then we can achieve these functions among students. We have a long way to go. What I've shown to you here today and last night is crude. I'm not demonstrating it fully in my own teaching--very poorly as a matter of fact, and my conscience bothers me because of this. But I think I'd rather talk about it and do what I can to drive myself and everybody else into it, than keep it under cover until I'm perfect. I'm afraid I'll never arrive at that point, and I doubt if any of us will. But I'm willing to expose my own inadequate operation at this point. We have hold of something here that's worth its weight in gold to us. We might just as well face it and flounder together. Let's be good Britishers. Let's muddle through this together until we find a way to make it work. I think we can. I don't have any doubt about it.

SUMMARY OF IMPLICATIONS

Participants in the group discussions of the Seminar were asked to consider, in relation to the technology of education, what is now being done in their institutions, and what is implied by our present knowledge and uses of technology for the future direction of teacher education programs.

Reports from these discussions indicate the following three primary areas of concern. These three areas represent some degree of accomplishment and a great degree of challenge within each of the institutions represented.

1. There is a movement in several teacher-education programs toward more empirical experiences for students; and there is the feeling that these experiences need to be increased even further. This trend is accompanied by the development of courses that are move "relevant", "real", and "honest" than courses have been in the past. Illustrations of this trend included:

a) Course work is provided, other than student teaching, in which students spend up to one-half the semester in school classrooms.

b) Students are given opportunities for trial teaching. Their efforts are taped, viewed, criticized, discussed by colleagues.

c) Individuals are observed and advised early in their educational career concerning their qualifications for teaching.

d) More direct experiences for students are being offered through simulation, micro-teaching, and of TV.

e) Interaction analysis, and analyses of non-verbal behaviors, are offering students more direct information on their behavior as teachers.

f) Opportunities are offered for students and staff to teach and live in culturally different areas (e.g. inner city) for part of a semester or a complete semester.

Summary of Implications (cont.)

g) Child development courses include considerable opportunity for students to observe children engaging in pertinent tasks at particular stages of development.

h) Students are helped to overcome fear of handling mechanical items by having them actually use new equipment.

2. There is a growing concern for writing the objectives of education, and relating these objectives to evaluation of learning. This concern has led to increased efforts in identifying general educational objectives and objectives for specific courses and grade levels. Furthermore, this concern for developing teachers' abilities to write objectives has necessarily led to a closer identification of the objectives developed for courses in teacher-education.

3. Technology has assisted in making change a factor of the culture. Teachers need to develop, and need to help their students develop, the flexibility to change within established or well-recognized personal or educational goals. Chief among the problems in this area is the impossibility of thinking within two imcompatible models simultaneously. Any structures being considered under a new model look impossible under the viewpoint of the older model. One needed flexibility is the ability to break loose from the orientation of a traditional view in order to consider a new concept. Areas where this problem might be illustrated in education are:

a. The difficulty of considering new methods in the context of viewpoints based on traditional conditions of working as a teacher.

b. Viewing class hours as necessarily being of a particular length.

Summary of Implications (cont.)

c. Continuing courses necessarily identified by particular content, and falling in a particular sequence.

d. Accepting new models of scheduling.

e. Abandoning some traditional forms of reporting and evaluation, and attempting other methods.

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