to that definition to use the word here to mean that which is learned, for in society one important goal (though not always a consequence) of learning is the maintenance of social order (level of organization). In this paper I shall be concerned only with the process of storage of information in social systems, and not with content; nor will there be space for discussion of the important problem of the efficiency of the process. What I have to say derives in considerable part from observations made by my graduate students and me in elementary school classrooms in the United States in 1954. The conceptual scheme, therefore, while inspired in part by communications theory, is also empirically derived.

As a final note to this introduction, I would like to add that while the data used here place teachers in an inglorious light at times, I intend no fundamental criticism of teachers. I am a teacher myself, and though I am aware of many of our shortcomings, I am conscious also of the degree to which our profession has become the scapegoat of those who would place the blame for our contemporary desperation on teachers. Teachers, parents, and children can rarely be better than the total social system of which they are part.

A Note on Dichotomies

In the following sections I set up a number of dichotomous categories, and since American scientific culture hates dichotomies, I do not imagine that mine will fare any better than anybody else’s unless I point out that mine are formal models (Rosenbluth and Wiener, 1945) which seem useful as organizing points for a great deal of previously unorganized empirical material. Thus I do not assume that my models cover all possibilities or are even found in the "pure" state in the data. In discussing their own work, Rosenbluth, Wiener, and Bigelow (1943) point out that it is apparent that each of the dichotomies established singles out arbitrarily one feature, deemed interesting, leaving an amorphous remainder: the non-class. It is also apparent that the criteria for the several dichotomies are heterogeneous. It is obvious, therefore, that many lines of classification are available, which are independent of that developed above.

These remarks apply, without alteration, to the present paper.

Nature of general problems in the behavioral sciences. Naturally Wiener’s (1948, 1960) books have been especially provocative; but in addition Deutsch’s (1951, 1952) attempts to extend communications theory to the social sciences have been very stimulating to me. A valuable summary of communications theory is contained in Deutsch’s (1952) paper.

Thus I am not concerned with the brute of isolated "facts" like the date of the discovery of America, or the Australian word for paddle, but with the general problem of those configurations of knowledge and/or awareness that form the basis for human social life.

This note is written because Dr. CoLabard, in discussing my original paper, observed that I seemed to have set up a dichotomous world that did not account for the facts.

Section VII

CULTURE, EDUCATION, AND COMMUNICATIONS THEORY

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Introduction

The present paper is an effort to develop a frame of reference suited to the study of education as a social process. When one confronts the avalanche of stimuli that strikes the child as he struggles up the Himalayas of classroom learning experience, one becomes aware that the aids that have been developed in the laboratories of learning theory require supplements that might ease the transition from the relatively simple choices of preliminary experiments to the relatively complex ones of the classroom. This is not to say that learning theory as developed by Thorndike, Hull, Tolman, Skinner, Miller, Dollard, and others may not be applicable in some respects to classroom learning. Rather the point is that a conceptual scheme must be found for the social transactions of learning also. I have tried therefore to make suggestions, some of them drawn as metaphors from communications theory, about what such theoretical supplements might be.

I said that I have found the frame of reference of communications theory suggestive, and useful in a metaphorical sense, in attempting to understand learning in social situations. When I say "metaphorical sense," I mean that it is helpful to me to think about social events in terms of communications theory, bearing in mind always that society is not an energy system like a working telegraph line or an electronic computer. As long as we remember this, we avoid the errors of those social thinkers who imagined they could apply literally the laws of mechanics or physiology to society.

With these reservations in mind, I have attempted an examination, partly within the framework of communications theory, of the storage of information in social systems. Although in communications theory information is a mathematical measure of order (Wiener, 1950, p. 18), it does not do too much damage.
Some Principles of Process

Target-seeking and diffuse learning.—Target-seeking learning is the expression I use for learning in which the child is taught to seek directly a human "target," which will deliver negative feedback. Here the child seeks a teacher (as a parent, or the teacher in a classroom) who will correct errors or give goal-correcting signals. Diffuse-learning occurs where emphasis is not placed on the single target that constantly reflects corrective signals, but where, rather, many individuals correct behavior, and where the correction is frequently not sought directly. In target-seeking learning the individual is imagined to have, already built into him, a magnetic compass which automatically responds to the external magnetism of a single correcting source; in diffuse learning the individual is conceived of as wandering about in a random way, but pushed in the correct direction eventually by many impulses which we elicit by accident "bumping." Target-seeking learning, so it seems to me, is so well known from our own culture as to be self-evident without examples. Since diffuse learning is not, perhaps, so well understood, I give below some examples from observations of the Pilagã Indians of Argentina.¹

Darotoyi (male, probably in fifth year of life) is screaming because of a quarrel with an age-mate, Yorodaikolik. Adults in the village (not his parents, for they are not present) call out to Darotoyi, "Make your revenge." Yorodaikolik picks up two sticks and swings them at Darotoyi in a threatening way. Then Darotoyi is told by the adults to go home, and does so.

When Matakanã (female, probably in fourth year of life) is about to eat pig meat, two little boys yell at her, "It will bewitch you!"

A small boy is shooting at birds with a pellet-box, and the men and boys around call directions.

Ethnologists give Deniki (male, in the second year of life) a small piece of biscuit. He immediately turns away from our tent and goes toward his house, where his mother and three adult female housemates (Nenarachi, Nagete, Aranã) are sitting outside. As soon as he gets there ... Nenarachi says, "Give me some!" and Nagete says, "Give some to me your grandmother, give some to grandmother?!" Aranã also holds out her extended hand. Deniki gives nothing to anybody. Then his brother Yorodaikolik (male, probably in fifth year of life) ... comes to our door with Deniki and says, pointing to Deniki, "He's a stingy fellow."

One of the disadvantages in permitting many individuals to give signals is the confusion that may arise. The following is another sequence of diffuse learning events in which Deniki took part:

He goes toward Nenarachi. She shakes her fist at him. He smiles and moves away toward her husband. Then back to Nenarachi. She pulls him over

¹ In this connection—different learning techniques used in different cultures—see Batson (1947).

The writer and his wife lived with these Indians for a year. See J. Henry (1949 and 1951); J. and Z. Henry (1944); Schachtel and Henry (1942). All verbalizations were recorded in the native language, which was spoken by the ethnologists.

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on her lap in nursing position (her breasts are dry) and he reaches for her breast. "It is torn," she says, referring to her blouse. He reaches again, and she sets him on his feet. Deniki is on his way back to his mother, when she asks Nenarachi for a pin. Nenarachi calls him, but he keeps on toward his mother. Then his mother sends him to Nenarachi, and Fiyarasaim (ancient female housemate) turns him around by hand, he gets pin, takes it to mother, who uses it to extract thorn from his foot. . . .

Situations such as these, in which the child is expected to be sensitive to signals from many sources at once, probably call for a different kind of alertness from those in which there is only one source of signals. Diffuse learning calls for a multiple awareness—an awareness on several levels at once—probably with a corresponding easy breaking of contact; target-seeking learning seems to require "single-mindedness," "concentration," and high contact intensity. People exposed to much target-seeking learning are good concentrators but may find rapid shifts of attention difficult.²

It is likely that both target-seeking and diffuse learning occur in all human societies; but it seems also that one method or the other is emphasized more in one society than in another. It is likely also that one or the other process is used in different degrees at different age levels and in different contexts. For example, on the one hand Dorothy Eggan (1953, pp. 263, 285) says of the Hopi:

From birth, a child in this extended family normally sleeps in a room with ... his mother, father, mother's mother, father, or siblings. . . . All of these individuals . . . indulged, cared for, and disciplined him as he became older and required it, although he perhaps had most to fear from this mother's brothers.

Not only were there often several mother's brothers who divided the responsibility for the child's discipline somewhat, but in any case one of these was never the sole disciplinarian. . . . All persons . . . agreed that ceremonial parents, adopted relatives and paternal uncles, could and did scold them severely upon occasion. . . .

On the other hand F. Eggan (1959, pp. 31–32) says of Hopi fathers and sons:

. . . he [the father] is mainly responsible for preparing them to make a living. He teaches them to farm and herd sheep. . . . The position of father in relationship to his son is something like that of an older comrade and teacher. . . . The "ceremonial father" has the special duty of seeing his "son" through the various initiations. . . .

Thus it would appear that for different functions and at different times in the child's life among the Hopi, different methods of teaching are used. Specifically, in the case of four kinds of knowledge—values, interpersonal relations, subsistence techniques, ceremonial—the learning process and

² A comparison of these remarks with Rieseman's (1950) statement of the difference between the tradition-directed and the other-directed shows areas of overlap and also subtle difference.
the person or group of persons who teach are different. Thus the first two categories are taught by a broad group of blood and ceremonial kin, and the process is diffuse learning. The third and fourth categories are taught by blood and ceremonial parents and the process is target-seeking. Hence what is learned, who teaches it, and the process employed are related to the underlying socioeconomic and ceremonial structure of Hopi culture. Meanwhile we may note that the Pliagá and Hopi observations of many people teaching the same child at the same time would be difficult to duplicate in our own culture. As a matter of fact, the effort by several adults to teach a child at the same time often creates tension in the group in our culture, and under such circumstances, “One at a time—he’ll get confused,” is quickly heard. Since traditional China and the United States seem to be cultures in which target-seeking learning is closely related to a compact nuclear family organization, while diffuse learning is related to cultures where the family organization is broader—where responsibility and authority are distributed among a relatively extensive group—these two models are seen to be associated with types of societies exhibiting different steady-state processes, and different internal boundary configurations.

Another consideration important to the difference between target-seeking and other types of learning is whether the culture’s goals are in the past or in the future. Where, as in China, for example, or among American “upper-umpers,” the culture is thought of as anchored in the past, then feedback is constantly available to enable individuals to steer their course for all one needs to do to find one’s bearings is to refer to past models. For instance, Chiang Yee tells us in his A Chinese Childhood (1952, pp. 11, 13) how, in the presence of the clan books, his father would talk about the family ancestors of two thousand years ago, and once pointed out . . . how one of the fifty-first generation who did not follow the family rule as laid down by the first ancestor brought the family into disgrace. He was the youngest son, and being neglected, was always getting into difficulties.

In such situations there is no question of what to do about what: if the family history is contained in books that go back two thousand years, a target-seeking can always be found, somebody always has the answer, and target-seeking learning is feasible. On the other hand, where, as in our culture, goals are in the future and often not known, target-seeking becomes an increasingly difficult kind of learning to institutionalize, because nobody knows where the target should be anchored or, if it is moving, what its locus is. Hence, for a culture like the American ever since the settlement, it has become increasingly difficult to adhere to the more ancient forms of target-seeking learning. Thus boundaries are important determinants of the kinds of storage processes that are used: China’s traditional culture has been bounded by a clearly defined past, so that targets, such as tutors, parents, and grandparents—could serve as excellent teachers of all things; but in contemporary America nobody knows where the boundaries are, so that children who begin by scoffing at their parents end by ridiculing their teachers.
learned that cat is c-a-t, will soon be able to reproduce the correct spelling. This is true of all formal school learning, and much of it is of this simple, uninterpreted learning. Another kind of storage in which output is implied in input is that in which the child, on a given signal like “Readers,” uttered by the teacher, is supposed to perform a specific act, such as distributing the reading books to the other children in the classroom. Here the output, what the child does, is not the same as the input, but rather the signal calls forth a consequence which has been previously learned. I call this simple consequent learning. However, when a fourth-grade American child reads The Wizard of Oz (Gray, 1947) and is asked to tell how one “wins people,” he is presumably putting together complex past experiences into an interpretive system expressive of himself. This is therefore complex interpretive expressive learning.

The Wizard of Oz is a story of a wizard who transforms himself into a rabbit and confers magical powers on Auntie Grumble, an old woman and the most unpleasant person in Oz. Through the events brought about by these powers Auntie Grumble ceases to be “unhappy” and a “most unpleasant person.” The following from a lesson on The Wizard of Oz illustrates the problem of complex interpretive expressive learning, and also the process of spiraling:

Teacher (to class): Why wasn’t Auntie Grumble happy?
Pupil: Because she was grumblly and grouchy. People avoided her.
Pupil: She was mean.
Teacher: How did she win the people?
Pupil: She was happy.
Teacher: What did she do?
Pupil: She danced and laughed.
Teacher (to all the children): Be Auntie Grumble. You know what a pantomime is—you’ve seen it on TV?
Children indicate they know what a pantomime is.
Teacher: Do a pantomime to show how she is going to be happy after being grumpy.
Children put on long faces, and then gradually change to a smile, and bounce around in their seats.

Cultures vary in the degree to which they emphasize one or the other of these forms of storage processes. In the last case, the degree to which the child is really expressing himself rather than a generalized “other” is a problem related to the storage process also. For it is evident that in the American classroom the degree to which one is expected to or permitted to express one’s self is strictly limited. When we reach the fourth grade, complex interpretive expressive learning is already the product of simpler forms of learning, whereby the child learns what his “self” has got to be in order that he may get along in society.

Since this example illustrates spiraling learning also, we ought to have a brief look at it from that point of view. In spiraling learning the question arises, Where shall the “cut-off point” be? That is to say, where
shall the teacher stop asking questions, and when shall he cut off the students’ questions? For example, in the present case the teacher could have asked, “What do you suppose makes people unhappy?” “What is happiness?” “Is happiness the best thing in the world?” “What does one mean by ‘winning’ people; and is this the finest thing in life?” Socrates was forced to drink hemlock for asking such questions, and thus we conclude that spiral learning is the most exploitative form of education. For not only may some teachers fail, as did Socrates, to set any cut-off point, but also the spiralizing process may be internalized, so that the child begins to pay question-and-answer with himself. Such “play,” if engaged in by many people, can be threatening to the status quo. On the other hand what one observes in classrooms in our own educational system is that teachers—university as well as kindergarten—have internalized the acceptable cut-off points; for they know when to stop asking questions, and when to give no response to the questions asked them. Thus an interesting problem for students of education in all cultures is to discover where the cut-off points are in question-answer interchange.

Mono- and polyphasic learning.—Monophasic learning is the hypothetical case in which an organism learns one thing at a time. Possibly such learning occurs only in machines. In human beings, so it seems to me, the class of events in which only one thing is learned at a time would seem to have no members, but it is often helpful to imagine such a class, especially in connection with the human inability to learn only one thing at a time. On the other hand, just because human beings cannot learn only one thing at a time it does not follow that efforts have not been made to teach them as if they could. Let us look again at some examples. The first is from William’s account of learning the characters of the Chinese language in traditional China (1888, Vol. I, p. 543). The first step involved simply committing to memory the characters themselves:

The tedious of memorizing these unmeaning sounds is relieved by writing the characters on thin paper placed over copy slips. The writing and reading lessons are the same, and both are continued for a year or two until the forms and sounds of a few thousand characters are made familiar, but no particular effort is made to teach their meanings. . . . It is not usual for the beginner to attend much to the meaning of what he is learning to read and write, and where the labor of committing arbitrary characters is so great and irksome, experience has probably shown that it is not wise to attempt to learn them at once. No effort is made to facilitate the acquisition of the characters by the boys in school by arranging them according to their component parts; they are learned one by one. . . . [Italics supplied.]

Obviously this is not “pure” monophasic learning, for the children are not only being taught to recognize the characters by their shape; they are also being taught to associate specific sounds to them, and how to write them. However, the focus is on the single goal—the characters—detached from meaning or from any connection with the complexities of religion, the economic system, geography, etc. We shall presently see how different this is from polyphasic learning in a contemporary American classroom. Meanwhile let us look at a fourth-grade class being taught fractions in an American school:

Teacher goes to board: What is a fraction?
Tom: A piece of something.
Teacher sends Jim to board to draw a “piece of something.”
Hands are up now.
Bill: A clock has sixty seconds.
Teacher: Each minute is what part of the whole clock?
Bill got confused here, apparently trying to divide a five-minute period into intervals.
Teacher: Can you help him? What part?
Child: One-sixtieth.
Bill explains his dilemma.
Teacher: Count them, honey.
Bill counts, and finds what part of an hour five minutes is.
Jim is drawing a rectangle at the board.
Teacher: Are other fractions possible?
Linda: The window [i.e., one of the window panels].
Teacher: Point out part of the window. . . . Let us see what Jim has for us. What is it, Jimmie?
Jim: It’s a cake. [He has drawn a rectangle divided into four parts.]
Teacher: What do we do to change 3/4 to 6/8? Who remembers that? Good, which fraction is larger?
Teacher: Why is 3/4 larger than 6/8? [The numerator is on the bottom, which is the name of the fraction. (Teacher is at the board.) In adding and subtracting fractions forget it is a number. If it is apples or peaches or pears, you add them the same way. (She points to fraction on the board.) Can anyone see how you add them? You don’t add the denominators, because that is the name of the fraction. How would we add chairs, chairs, chairs? So you wouldn’t change them all. I am going to let you copy the problem and add them. The denominators are going to be the same. That’s another thing I’m going to help you with. Joey said the first fraction is 5/5, Is that right? It is one whole, and we are going to write it “5/5 or 1.” Albert, what would make the denominator different?

Here again, though the children are being taught a number of extraneous matters, like mutual helpfulness (“Can you help him?”), and that the teacher likes some of the children (“Count them, honey”), the class is concentrating exclusively on trying to learn fractions.

Polyphasic learning is the process of learning more than one thing at a time. Normal human beings cannot learn only one thing at a time; rather they learn a pattern. This capacity to learn more than one thing at a time—to receive complex in-puts—is exploited in different ways by different cultures, and in different ways in various periods in our own culture. The present tendency in elementary school education is to exploit consciousness such polyphasic learning capacities. In simple societies the storage processes often handle but very little information at a time; and even that information is relatively complex, the in-put process is not specifically developed with this complexity in the minds of the teachers. That is to say, for example, that while food-sharing among the Pilagá
Indians end up being not only the process of giving away one’s food, but also a way of operating a scale of social distance, food-sharing as information is not consciously taught as a social distance scale. It is the difference between saying, “Give food to people,” and saying, “Give food to your first cousins through your mother.” In the first instance the individual simply learns that he has to share food, in the second he is required to master a social system in connection with the giving of food. It is the second instance that is polyphasic in intent.

The present tendency in elementary school education in the United States is to exploit polyphasic learning capacities consciously. Thus a painting lesson becomes not only one in art, embodying the use of colors and brushes, learning the names of colors and how to mix them, and so on, but also a lesson in geography and human relations. A painting of the Sahara Desert becomes a vehicle through which to communicate information about Africa, Arabs, and the Mohammedan religion all at the same time.

The following extract from a protocol of observations in a fifth-grade classroom will further illustrate the point:

Teacher: What does art do for us?
Student: It cheers us up.
Teacher: It cheers us up. Yes, beautiful things will cheer you up when you’re feeling bad. What else does it do?
Student: It expresses yourself—I mean it’s not just copied.
Teacher: What does it express about yourself?
Student: How you feel.

Students go on to say that a happy artist draws bright colors, and an unhappy artist uses dark colors or gray. Teachers point out exceptions when the artist is producing a scene in which the subject is dark or gray. She says, “If a person is not disturbed, mentally or nervously, he tends to like bright colors, doesn’t he?” Teachers announce she is going to play records which a student has brought, and the class is to listen to them, get the feel and the rhythm—whether it is active, soft, soothing, or what—and then express themselves in a picture. She says, “You know, the more intriguing your picture is the more valuable it is. You may have a five hundred dollar picture when you get through.” (Both sides of the record are waltzes.)

Teacher stops the record, says, “Some of you are drawing before you feel the rhythm. You are bound to have a picture in your mind, but I’ll make a bargain with you. Listen to the rhythm of the music, and then just cut loose and express yourself this time, and we’ll draw the old-fashioned way another day this week.” Teacher stops the music and says, “If you were in New York in an art class, you’d be paying ten dollars for this lesson, and if you talked, out you’d go. It’s selfish to disturb your neighbors—now just be quiet.” Plays more music.

From this example we see that what is ostensibly an art lesson is exploited, as a polyphasic learning experience, for the purpose of attempting to teach, among other things, the following: (1) The immorality and even disease of being unhappy. (2) Notions of economic life and the market. (3) The myth of the pot of gold at the end of the rainbow (“You may have a five hundred dollar picture when you get through.”). (4) The importance of “cutting loose,” but under the proper circumstances. (5) The relationship (7) between music and painting on the one hand, and “self-expression” on the other. We observe also efforts to control children’s spontaneous expressiveness (dark colors should not be used); and above all, we can see that this art lesson is used to maintain level or organization in the American culture as a whole.

Since here, as in most of the procedures in these classes, spiraling methods are used, the reader should note the cut-off point. There is, for example, no inquiry about what “disturbed mentally or nervously” means; yet the child with a desire to use dark colors may be left feeling he is quite loathsome because of his wish to use them. For a truly sharp contrast between this painting lesson, as a polyphasic learning experience, and what is almost its opposite, the reader may refer back to the painting lesson described by Chieng Yee.

When polyphasic learning is utilized as a conscious storage process, two questions arise: (1) At what point does it become self-defeating because of the sheer quantity and complexity of the in-puts? (2) When information about many things is given, let us say, during an art lesson, and all the information has equal emphasis, how does the storage mechanism in the head operate? Possibly all a child may retain of a painting lesson may be that you are disturbed if you use dark colors.

It seems likely that monophonic emphases in education belong to different kinds of cultures. That is to say that although it seems unlikely that any culture attempts always to teach one thing at a time, some cultures will emphasize monophonic learning while others will emphasize polyphonic. It would seem that monophonic emphasis will be found in cultures where few and simple factors require tight, indissoluble associations. Polyphonic emphasis belongs to societies where what is required is the communication of much information which can be “moved around” inside the head with relative ease to form new combinations, where the important thing is not fixity and simplicity, but rather change and recombination. Again I would like to offer the contrast between rural China, as a culture where relatively simple and rigid combinations of information were emphasized along with monophonic processes, and contemporary Euro-American culture, as one where change and recombination are emphasized, along with polyphonic processes.

The general problem of quantity.—As cultures become more complex and increase their content, more information has to be stored in their carriers. This must be accomplished by storing more information per unit of time and by increasing the number of methods employed. For the time being we beg the important question of efficiency of teaching methods. Now if $n$ stands for the number of things to be learned, $t$ for the time spent in learning each thing, and $m$ for the methods used in teaching ($f$ stands for, is a function of), we may set up the following model:

$$n = f\left(\frac{m}{t}\right).$$
This equation suggests that as the number of things to be learned increases, the time spent on learning each thing must diminish, or more methods must be devised, or both. We can then perceive from the equation that as the number of things in a culture increases, the culture may enter a cycle from which there is no escape except by arbitrary, authoritarian fiat. Since an increase in \( m \) must also, \( n \) receives a "double" increment, for a new method (\( m \)) is itself another "thing" (\( n \)). If, for example, we add a compass (\( n \)) to a culture that never had a compass, then one not only must learn about compasses, but methods (\( m \)) must also be devised for teaching about compasses, as there were no such methods before. Thus two "things" (\( n \)) are added to the culture, not one: the material object, compass, and the method for teaching how to use it.

It is also true that as teaching methods increase in number there is always the possibility that they will trigger new perceptions which will then add to the value of \( n \).

As for \( t \), it is a matter of common experience to elementary school teachers that as the number of things they must teach pupils increases, the teachers must devote less and less time to each thing. In such circumstances learning how to switch at fifteen-minute intervals from arithmetic to writing to geography to music becomes a new skill, which is also important.

Interesting data bearing on these points are available from *Life*, May 11, 1953, where a picture story is presented of a high-school teacher of English, who . . .

uses 102 teaching devices. His students learn spelling through a kind of baseball game, grammar through a variation on bingo called Bingo*. He makes them keep journals . . . has them go through mock telephone conversations in class . . . He knew all along that once he got his excited 15-year-olds "reading, reacting, recording" they could be coaxed into reading and thinking about books they would otherwise shun. [Italics supplied.]

Thus this story supports not only the hypothesis of the necessary increase in teaching methods when the number of things to be learned increases, but also the suggestion that there is a hidden danger in employing new teaching methods, new perceptions may be triggered, which in turn lead to new knowledge.

On May 24, 1951, *Life* published an article entitled "Why Do Students Drop Down on First R?" The article, signed by John Hersey, was a summary of the findings of the Citizens' School Study Council of Fairfield, Connecticut. It illustrates the problems teachers, pupils, and parents have in coping with time and teaching methods. Throughout the article it is clear that speed, speed, SPEED in learning is the constant lath of teachers, students, and parents.

A basic principle of present-day public school education is that each child should be taught along at his own most suitable rate of speed in learning.

Children do not progress at the same rate of speed in all subjects.

In a public school classroom with from 25 to 40 pupils, the teacher simply does not have time to devote to special enrichment for advanced pupils; she has a hard time getting through the basic material for all. [Italics supplied.]

The fast learners are not always the fast performers; indeed they are prominent among the dawdlers, daydreamers, and out-the-window-gazers . . .

Some educators now believe beginners could absorb as many as 200 words in the first six months, some are used that the children want to learn.

If one were to ask, "What's the hurry?" the answer might be, "Because kids have to get on to the next thing, and the next, and the next." There are so many things to learn, and since speed itself is a cultural value, \( t \) is especially important in the equation in our culture.

The article emphasizes the pressure under which the American system places the teacher to develop her methods in order to meet the demands of cultural complexity and speed:

On top of all her other duties, the teacher who tackles reading is expected to be a psychologist, a literary tourist guide, a charming storyteller, a perfect grammarian, a steady workhorse with the mass of average pupils, and one with a special knack for bringing out the best in geniuses and morons. [Italics supplied.]

The relevance of this paragraph to the equation is as follows: Psychological insight into the nature of children and reading difficulties is a methodological tool (\( m \)) added to the pedagogical armamentarium of the teacher in order to reduce the amount of time (\( t \)) needed to teach the child to read (\( n \)) and to reduce the number of so-called reading failures. A "literary tourist guide" is also a useful instrument (\( m \)) in awakening interest in reading in children. And so it goes. The reason the teacher has to be all the things mentioned is that they all are expected to add to her methodological competence. The article continues:

What does the teacher do in the face of such demands? She does what one of the teachers we visited does, "I like the manual," she says, "If you follow that you can go far wrong."

But what does the manual urge? It urges a multiplicity of techniques and procedures that simply cannot be followed. The reading-readiness manual used by our teachers urges the keeping of a notebook containing a continuing checklist of the readiness of individual pupils. The checklist contains 32 items. A teacher who has 30 students in her class is therefore expected to keep running track of 1,560 items. . . . In higher grades the manual divides teaching into three parts for every single lesson into the following sections . . . [The names of eight different sections are given. Italics supplied.]

While this article makes clear the close interrelation between the number of things to be learned, the time available for each, and the number of methods urged, it suggests some further considerations. For example, when the aim is shifted from teaching a mass to giving attention to the individual child, then new methods have to be developed for getting at the idiosyncrasies of the individual child. This means in turn cutting
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culture is intolerant of jammed machines: the snickers of the children are an expression of the wish to kick and shake the machine in which the nickel has got stuck!

On the other hand, it should be borne in mind that the need to exploit to the maximum the organism's capacity for spontaneous expansion is a requirement of an expanding culture: though the process of putting them in jeopardy is dangerous to some, it is a steady-state requirement of one part of our culture. That such exploitation ultimately results in an over-all steady state is an open question. Meanwhile it is to be observed that the capacity to rise spontaneously to the management of a new problem is again a capacity to be learned. This underscores the circular character of the equation of which I spoke earlier.

It is to be noted that in the process of pushing some organisms toward new capacities we damage others. This makes us aware of the close relationship between social processes and human evolution, for those organisms that can accept the pushing, flow with the tide of evolution as it is at the moment, while those that are "jammed" by a fifth-grade failure may be forced to leave the field.

Noise—in communications theory noise refers to the uncontrollable random fluctuations of the apparatus (von Neumann, 1951). Such things as the hum in a telephone line or radio receiver are noise, because such sounds have no relation to the actual message that is being transmitted. We thus deal with two problems: lack of relationship of noise to message, and uncontrollability. In discussing this paper Dr. L. K. Frank suggested that noise ought to be handled as I have handled other concepts from communications theory. This suggestion, taken together with Dr. Coladacci's that some account ought to be taken of the relationship between intended and actual learning, which is really the same as noise in many instances, makes it imperative that a section of this paper be devoted to the problem of stimuli that impinge upon children from areas of awareness not strictly related to the explicit lesson at the moment.

It can be shown, I believe, that from a psychological point of view the problem of noise is really the classroom problem in our culture, for the unintended learnings that children pick up, almost as a radio picks up static from the atmosphere, are very numerous, exceedingly subtle, and almost uncontrollable. Let us look at a game of "spelling baseball" in a fourth-grade class:

Children form a line along the back of the room. There is to be "spelling baseball," and there is a measuring cup: "If we have 2/3 cup here, and we pour it all out, what? There is much noise, but teacher quiets then. Teacher has selected one boy and one girl and sent them to front of room to choose their sides. As the boy and girl pick children to form their teams, each child chosen takes a seat in orderly succession around the room. Apparently they know the game well... Now Tom, who has not yet been chosen, tries to call attention to himself in order to be chosen. Dick shifts his position more in direct line of vision of the choosers so that he may be chosen. Jane, Tom and Dick, and one girl whose name Observer does not know, are the last to be chosen. Teacher now has to remind choosers that Dick and Jane have not been chosen... Teacher gives out words for children
to spell, and they write them on the board. (Each word is a "pitched ball," and each correctly spelled word is a "base hit." The children move from "base to base" as their teammates spell the words correctly.) With some of the words the teacher gives a little phrase: "Tongue-watch your tongue; don't let it say things that aren't kind; butcher-the butcher is a good friend have to dozen-12 of many things-knee-get down on your knee; pocket-keep your hands out of your pocket, and anybody else's. No talking!" Teacher says, "Three outs," and children say, "Oh, oh!" . . . "Outs" seem to increase in frequency as each side gets near the children chosen last . . . Children have great difficulty spelling August. As children make mistakes those in seats say, "No." Teacher says, "Man on third." As child at board stops and thinks, teacher says, "There's a time limit; you can't take too long. Honey. At last, after many children fail on August, a child gets it right, and returns grinning with pleasure to her seat . . . (Observer notes: Motivational level in this game seems terrible. They all seem to watch the board, know what's right or wrong, and seem quite keyed up. No nagging in moving from base to base.) . . . Child who is now writing Thursday stops to think after first letter, and children snicker. Stops after another letter. More snickers. Gets word wrong. . . . (Frequent signs of joy from the children when their side is right.)

Here learning how to spell is made part of a competitive game in an effort to eliminate "boredom." However, what happens here, as may happen in the use of mechanical filters, is that one noise is substituted for another; while boredom drops out, competitiveness is reinforced. Another important noise is the desperation of a child chosen last--they learn they are cultural rejects; and their low valuation by the group is excruciatingly obvious, for the teacher even has to remind the choosing that these children have not been picked. Additional noise is provided by some of the teacher's short phrases: "watch your tongue," "get down on your knee," "keep your hands out of your pocket, and anybody else's;" are suggestive. The child may learn from these phrases that the teacher thinks that people should sometimes get down on their knees; he may wonder why he should keep his hands out of his own pockets, and be frightened that the teacher should suspect that he wants to put his hands in other people's. He learns also, perhaps, that the teacher stands for morality. Finally the children themselves introduce noise into the system by snickering at comrades who find the tasks beyond their capacity. In all this the child is on public view; all the children in the class see that he is or is not chosen and when; that he spells correctly and quickly or that he is slow or fails. He learns a conception of himself in which failure and success, being chosen or rejected, being fast or slow, wrong or right; . . . Before closing this section it will perhaps be interesting to look at a situation from traditional China. The example again comes from Chiang Yee's *A Chinese Childhood* (pp. 81-82).

Once when [my] youngest uncle had, for some reason or other, offended the tutor, "Old Beard" made him kneel down in the middle of the courtyard. To make him keep his back straight a huge square inkstone full of water was placed on his head. The tutor's seat being directly opposite him, he could not move for fear of spilling the water. [He had to kneel about half an hour.] My childhood was not without its problems, and I think that it is important to remember that even in the most distant culture, even in the most isolated society, people have their problems, even in the most remote place, even in the most isolated population.

In the metaphorical sense in which the term is used here, we can think of the educational "apparatus" as including teacher, all students, and a particular child, who, let us say, is at the board trying to spell a word, or is kneeling with an inkstone full of water on his head. We can then see that there are noises that originate inside an individual's head (like a phantasy of being a wrestler), and noises that originate outside the individual student (like the snickering of the class at his failure to spell Thursdays). It is clear, then, that different problems of control (of "random fluctuations") confront us, depending on whether we are concerned with one type of noise or the other.

One more interesting comparison between machines and human beings remains. In using a machine one makes a sharp distinction between noise and message, in the sense that the noise may be ignored except in so far as efforts are made to suppress it. This is not true of human communication. In human learning, however, the noise is often learned with the message, and it is not ignored by the person; the child learning to spell, for example, does not, in our culture, ignore the deprecating snickers of his classmates if he fails to spell a word.

I have said that in the sense of all those unplanned learnings that take place when human beings are educated, is one of the central problems of learning in any culture. As such it requires an extended treatment, which is quite beyond the scope of this paper, although I hope to give it extended treatment in a later publication. Here I have just tried to present enough to show the character of the problem and how it might be approached.

In discussing this section with Karl Deutsch he argued as follows: It is not quite proper to call noise the things I have characterized as such in the spelling lesson. He urged that the spelling lesson is, in a certain sense, a screen for the most important learnings, which I have called noise. He further argued that the culture is most interested in, and hence the most important part of the lesson, is that children should learn how serious it is to fail, how important it is to succeed, what they must do to stop being cultural rejects, that knowledge is power, that they must develop themselves so as to be able to function as a team (as in baseball), that the culture hates slow people and rewards fast ones. These are the really important lessons to be learned, for when you are adult nobody really cares whether you can spell or not, but they do care whether you know how to co-operate, whether you know how important it is to succeed, and
so on. I confess I am sympathetic to this view of Deutsch’s, and his observations point up the great difficulty one runs into in transferring the frame of reference of communications theory from engineering to social science. Meanwhile let us note that this very effort has suggested some interesting cultural problems.

Conclusions

Even if we take the position of the “life adjustment” school of education, it would be difficult to show that education is anything more than the acquisition, interpretation, and integration of information. Hence the student of education cannot ignore the contribution of communications theory. But in education we also deal largely with information that is traditional and of a high level of standardization. Hence education comes within the purview also of cultural anthropology. Thus educative processes, communications theory, and culture theory ought to be brought together in a systematic way. This paper is an effort to show how this might be done, and to show also that simple, invariant categories of theoretical significance can be set up and used for the cross-cultural study of education. The paper is an effort to show how methods must change with content and how the time factor presses constantly upon us in our own culture as we increase the scope of our knowledge. While such formulations may not at present be considered laws, they are useful as heuristic devices and suggest a direction in which some laws of social learning may be sought.

Throughout the paper an effort has been made to show that what is taught, how teaching is done, and who does it to whom, are related to total sociocultural systems. A culture’s values and goals, its social organization, technological developments, and the characteristics of its processes of change and stability all affect the What, the How, and the Who of teaching and learning. Even if the metaphors and their related categories could be shown not to suit the data, it seems to me that this contribution from the theoretical framework of anthropology—that educational patterns are related in complex ways to over-all cultural ones—is useful.

References