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SEQUENCE IN LEARNING--FACT OR FICTION.

BY- MIEL, ALICE
NATIONAL EDUCATION ASSN., WASHINGTON, D.C.

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DESCRIPTORS- *SEQUENTIAL LEARNING, PROGRAMED INSTRUCTION, *CHILD DEVELOPMENT, SEQUENTIAL APPROACH, *FLEXIBLE PROGRESSION, *CURRICULUM DESIGN, CURRICULUM PLANNING, COGNITIVE DEVELOPMENT, CONCEPT FORMATION, PROBLEM SOLVING, *INDIVIDUAL DEVELOPMENT, SOCIAL RELATIONS,

SEQUENCE IN LEARNING IS USEFUL ONLY AS IT CONTRIBUTES TO THE CONTINUITY OF A CHILD'S OVERALL DEVELOPMENT. CHILDREN MAY NOT GO THROUGH THE SAME SEQUENCE TO ARRIVE AT A SIMILAR POINT OF UNDERSTANDING. EDUCATIONAL PROGRESS IS INDICATED BY A CHILD'S GROWTH IN THE DEVELOPMENT OF STRATEGIC CONCEPTS, IN WAYS OF PROCESSING INFORMATION, AND IN WAYS OF RELATING TO PEOPLE. A COMBINATION OF THE POOLED JUDGMENT OF ADULTS, HELP FROM RESEARCH ON CHILDREN, AND HELP FROM THE CHILDREN THEMSELVES IN PLANNING THE USE OF THE SCHOOL DAY TOGETHER WITH AN OPEN CURRICULUM DESIGN WILL FOSTER CONTINUITY IN LEARNING. IF LEARNING IS TO BE MEANINGFUL, THE TEACHER MUST BE FREE TO SELECT EVENTS AND PROBLEMS OF IMMEDIATE INTEREST TO THE CHILDREN, AS SHE ENCOURAGES CONCERN FOR OTHER PEOPLE AND PROVIDES FOR INTELLECTUAL DEVELOPMENT. ONE EXAMPLE OF A CONTINUITY THREAD WHICH COULD COVER TRADITIONAL TOPICS AND NEWER GOALS MIGHT BE "CHANGE," A MODERN CONDITION TO WHICH INDIVIDUALS ARE EXPECTED TO ADAPT. THE COGNITIVE TASKS OF GROUPING AND LABELING, INTERPRETING AND MAKING INFERENCES, AND PREDICTING CONSEQUENCES CAN USEFULLY BE APPLIED TO SUCH A BROAD TOPIC. THE CHILDREN CAN BEGIN WITH SPECIFICS AND THEN EXPAND INTO MORE GENERAL SUBJECTS. THIS DOCUMENT IS AVAILABLE FROM THE DEPARTMENT OF ELEMENTARY-KINDERGARTEN-NURSERY EDUCATION, NATIONAL EDUCATION ASSOCIATION, 1201 SIXTEENTH STREET, N.W., WASHINGTON, D.C. 20036. (MS)

Once there was an art supervisor who convinced herself that young children would paint better pictures if they first learned to handle the brush. So she devised a sequence of experiences leading up to painting pictures with mixed colors. Step 1 was to paint in the air with a dry brush. Step 2 was to paint on the blackboard with plain water. Step 3 was to paint on paper with only one primary color.

At that point the children took over their own sequence for they discovered that their neighbors had another color and that it was easy to trade paint brushes or to dip into the neighbor's jar with one's own brush. The children skipped right over Steps 4 and 5, painting pictures first with two primary colors, then with three, and proceeded directly to Step 6, mixing their own colors.

The words *sequence in learning* call other pictures to mind: carefully worked-out programs to lead students step by step toward a new piece of knowledge, otherwise known as programed instruction; a plan for helping children memorize addition facts before they are asked to deal with subtraction; a requirement that letters and their sounds be mastered before words are presented in a reading class. All of these suggest someone's notion of sequence in learning.

Unquestionably, there is sequence of a sort in all learning. One event certainly follows some other event in the period of time between a stage of no knowledge or skill in a particular area and the point of rather full control of an idea or a skill by an individual. A child will not learn to assign correctly the general classification of *father* to only certain men until he has had enough experience to generalize upon. To take another example, a child surely must have some exposure to a language before he can communicate with others in that language.

But to agree that there is sequence in learning is not to say that all of our assumptions about natural or normal sequences are valid. In fact, certain long-held assumptions are turning out to rest on a shaky base.

□ There is danger in *insisting that great masses of children follow indefensible sequences in learning.* Some years ago students of child development could state positively that most children used separate words as they began to talk and only later joined them to make connected sentences. Now young children brought up on a diet of TV viewing babble in patterns that have the rhythm of complete sentences before they say anything distinguishable to another person. Their first meaningful talk also comes in the form of complete sentences.

Old assumptions about the best order of learning mathematics are being questioned. Few believe any longer that mastery of addition must precede introduction to subtraction or, for that matter, that arithmetic must be fully comprehended before geometry or algebra can be approached. The many children who have been given a chance to learn mathematics in a different sequence have shown how mistaken the former conviction was.

Some notions about sequence die hard, however. An example is the logically appealing one, currently being revived, that in social studies children should start with a supposedly simple primitive culture before attempting to understand a complex modern one.

□ Another trap to avoid is to assume that *all children necessarily go through the same sequence in arriving at a similar point in learning.* We cannot assume that a sequence that appears to be useful or even necessary for many children is a requirement for all.

Most children learn to talk after hearing others talk, but not so with deaf children. They must have a different sequence. Many children may seem to benefit from fraction disks in working out certain arithmetic problems, but a few are ready to work directly with numerals and should not be forced to use semiconcrete materials that they do not need. Children who come to kindergarten or first grade already knowing how to read should not be put through the same beginning reading paces as other children. Not all children learn spelling in the same way, so it is wasteful to make each one go through the same elaborate process of word study.

**Alice Miel, Teachers College, Columbia University**

☐ There is the indefensible assumption that *progress should be steady*. For example, no adult chooses all of his reading matter at the "stretch" level, yet we worry if a child elects now and then during school time to read a book that we believe is too easy for him. Studies of patterns of book selection by children in individualized reading programs show that children vary the level at which they read, sometimes choosing a more difficult book, then seeming to rest with one that can be finished with little effort. No teacher can make such a decision for a child.

Nor can a teacher know just how many explanations and practice periods will be required before each child in his group has caught on to a new process in arithmetic. Sometimes children who seem to be making no progress but are allowed to work in an unpressured way arrive at a point of clear understanding quite suddenly and unexpectedly to both themselves and the teacher.

☐ The most subtle trap of all lies in the widespread belief that *sequence in the curriculum means an ordering of topics to be studied* in any one area of the curriculum. The problem of curriculum planning then becomes one of deciding whether "the postman" or "transportation" or "Indians" belongs in second-, third-, or sixth-grade social studies, if at all; in which grade children should study their own state, rocks, and long division; and a host of other topics.

The difficulty is that there are so many possible topics and so many equally good orders of topics. In social studies, in particular, to include any one topic, important as it may seem, is to leave out a dozen others that are as easily justified.

☐ Another questionable belief about sequence in learning is that the *coverage of a topic is in itself a guarantee of any particular level of intellectual activity or any progress in understanding basic concepts*. Children may go through their early schooling dealing with subject matter in a most elementary fashion, limited to memorizing facts and relating one fact to another in the same simple way, whether in nursery school or sixth grade. They may experiment with magnets in kindergarten and again in fourth grade without deepening their understanding of magnetism. Another weakness of determining the stage of learning by checking off completed topics from an ordered list is that in spite of collecting a considerable amount of information in social studies, the learner may fail to develop social skills and good feelings toward his fellowman.

Perhaps the idea of sequence in learning would present fewer traps for teachers if it were placed in the context of continuous progress of each learner, often referred to as the *overall continuity* in education. *Continuity* comes from a Latin word meaning "hold together" and implies concern with how the parts of the educational process hold together to build something of worth. *Sequence* comes from a Latin word meaning "follow"; therefore, the concern is with the best order of educational activities for achieving a specific, limited goal.

A useful program of education will contain many learning sequences. But no matter how they are ordered in relation to one another or what follows what, ordered sequences cannot add up to a complete education. They cannot guarantee continuity in a person's overall development.

There is continuity in development if there is forward movement. What is carried forward by the individual must contain stable elements that make a connection with the individual's past, but the elements must be sufficiently transformed to meet new conditions and expectations in the individual's present and future.

Elementary school is a place where children can expect help in becoming the kinds of individuals they want and need to be in order to live with satisfaction to themselves and others in the world that is emerging. Such living requires that children be informed (or be able to become informed) on matters of import in their work, community, and family; that they care about what happens to others and to themselves; and that they be able to relate with dignity and warmth to fellow humans.

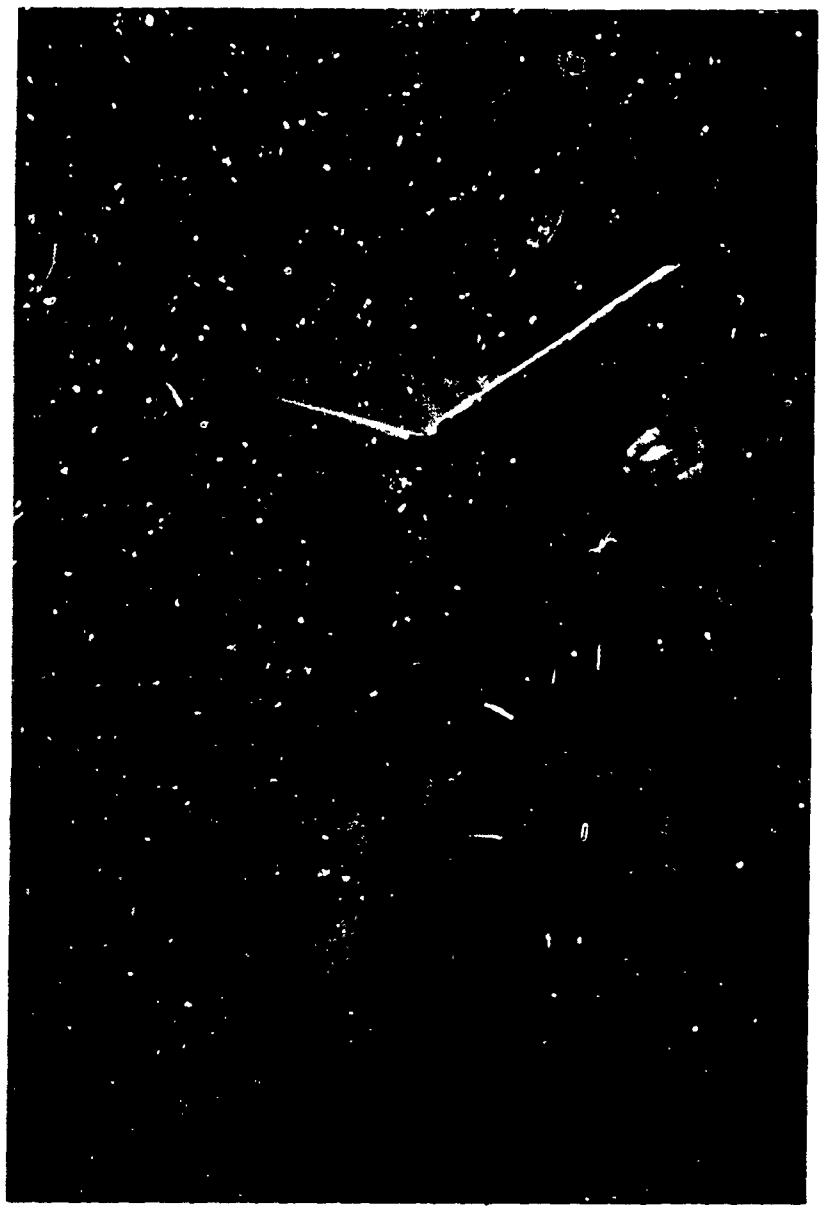
This means that in the long run we should be concerned with each child's continuity —

- In the development of strategic concepts.
- In the development of ways of processing information.
- In ways of feeling about and relating with people.

Let us consider how such continuity may be fostered and what is the role of various learning sequences in the total process of education.

## Continuity in Concept Development

When abstract ideas or strategic concepts are set forth as the threads of continuity in a curriculum, the design of the curriculum differs greatly from that of a topic-centered curriculum. Suppose, for example, that teachers of children of different ages in a school agree that the concept of *change* will be one thread of continuity in the curriculum. A wide choice of topics in differ-



Vygotsky (1962, p. 104) has written on this point:

> What the child can do in cooperation today he can do alone tomorrow. Therefore, the only good kind of instruction is that which marches ahead of development and leads it; it must be aimed not so much at the ripe as at the ripening functions. It remains necessary to determine the lowest threshold at which instruction in, say arithmetic, may begin since a certain minimal ripeness of functions is required. But we must consider the upper threshold as well; instruction must be oriented toward the future, not the past.

Hunt (1961) has used the term *finding the match* to express the same idea of locating the "ripening function." Almy (1966), as well as Hunt, is helping American teachers make use of Piaget's study of Swiss children. Wann and associates (1962) have reported on work with teachers who are helping young children in their struggle to master concepts. As more teachers make and share their own discoveries about useful ways of helping children move ahead, all of us will be the richer.

## An Open Curriculum Design

Teachers will be helped in using new ways of organizing their students' experiences if they are released from fixed sequences in learning and encouraged to use sequences that are more appropriate for their own children. Just as important, teachers will need to release themselves from unfounded notions about learning sequences.

If children are to make overall continuous progress in their development, their days must be varied and flexible. Time allotted for a particular activity should be stretched or shortened as teacher judgment and child readiness dictate. Children should also be provided with the opportunity to secure different perspectives. The idea of securing different perspectives—great depth on one occasion, a mountain-top view on another, cross sections, closeups, comparisons, patterning of raw data, panoramas—can be applied using varying subject matter as well as returning to the same area of content.

Sequence in learning is fact not fiction. If introduced to help a particular child when he seems ready to profit from it, a learning sequence becomes a part of a larger movement in the overall development of that person. Thus the continuous growth of each learner is provided for. Sequence in learning is useful only as it preserves continuity in education.

Those interested in enhancing creativity in children's thought processes will want to consult the work of Torrance (1962), who has concerned himself in particular with sequences of experience in developing divergent thinking.

## Continuity in Social Relationships

A third essential thread of continuity in the development of a person is maintenance of good feelings toward self and other people and skills of relating with fellow human beings. Concern with intellectual development need not, in fact must not, preclude development of a person who cares about people. Concepts of *justice, loyalty, brotherhood of man, interdependence, trust,* and *responsibility* must be tested and refined in actual living or they are worthless.

Specially designed learning sequences are just as necessary for maintaining this thread of continuity as they are for the others. The inequities, cruelties, and neglect suffered by many of the world's people will require widespread participation in efforts that are informed, skillful, and warmed by the heart. For this reason careful planning of experiences leading to responsible social skills should receive high priority among teachers of fours and twelves and in between.

If we are to give up such comfortable habits in curriculum planning as depending on sequences of topics arranged according to some logic, we must have something defensible to count on instead. Four kinds of help seem to be possible:

- Pooled judgment of adults
- Help from the children themselves
- Help from research on children
- An open curriculum design.

## Pooled Judgment of Adults

To foster continuity in the development of a person requires adults to project into the future to gain a long-term view of the child and to decide on a few key emphases for which the teacher and, we hope, parents, too, will assume joint responsibility. Whatever the organizing center is—be it concepts, processes, or topics—let each be selected thoughtfully and let it become the peg on which broad experiences may be hung. In this way children's thinking and emotions and social well-being may all be advanced together.

Each teacher who assumes responsibility for a child for a year or more ought to know and care about where the child is at that time and what school and home have contributed so far. His planning and his teaching ought to reflect this knowledge and feeling. Even after the child moves beyond his direct guidance, the teacher should continue to care about and help plan for the child's well-being.

A group of teachers with shared responsibility for groups of children ought to gather and weigh all the evidence they can on the continuities or lack of continuities in each child's total development. Their further planning and action should reflect their findings on the child's successes and failures to date and should be based on the best ideas each teacher can contribute for helping children to progress.

## Help from the Children Themselves

A learning sequence is an external affair, an ordered series that can be planned and provided by someone other than the person to be educated. It can, in fact, be designed for the use of many individuals and groups.

Continuity in the development of a person is an internal affair, a movement difficult to observe and one which cannot be managed by someone else. Even if a teacher were to have a class containing only a single pupil, he would not have sufficient information, without help from the child, to dictate his every step in education.

A teacher who desires to promote continuity in the development of each young person in his charge will do well to take the children deliberately and openly into partnership. Not only will the children make more progress along lines that they have selected, but they will be taking steps toward independence in learning.

The teacher who invests time in planning with his group how they will use the school day and together manage their shared classroom space and facilities will make gains for himself and the children in time, ideas, and motive power. This may be supplemented with guided opportunity for individuals to make certain decisions about their own use of time within the overall framework. The chances that individuals will make continuous progress are greatly heightened by such a procedure.

## Help from Research on Children

When a teacher departs from familiar external sequences, he seeks a specific kind of help from research, such as ways of reading clues in children's behavior regarding points where they need and are ready for assistance and ways of picking up cues from them as to where the teacher may enter in with a suggestion of activity or material or a question to clarify or stir up thought.

ent subjects thus is opened for use in gradually widening and deepening such a concept—changes in weather and seasons and their concomitant effects; changes in color when paint is mixed; changes in the use of land over a period of time; changes in living following certain inventions; changes in mathematical operations; changes of key in music—the possibilities are endless.

Of course, the master teacher will know better than to announce: "Now, children, I am going to teach you the concept of change" and proceed to present the children with generalizations leading to this concept. Out of many examined experiences, children can come to their own conclusions, often sensing the importance of the concepts long before they make such declarations in precise language. They must come to feel comfortable in a world where change is the expected phenomenon and become interested in how human beings achieve enough stability to cope with change without either stagnating or going berserk.

Certain concepts, such as *justice* and *responsibility*, are people-centered and, thus, value-centered. But these concepts may still be approached through one or more sets of specifics chosen from many. Therefore, teachers are free to select events and problems at the growing edge of society, matters not yet in the textbooks but ones that have great meaning for children. Such material may help children build strong, basic concepts that serve as cement in building sense out of the bewildering world of happenings. As Whitehead (1929, p. 3) wrote:

> From the very beginning of his education, the child should experience the joy of discovery. The discovery which he has to make is that general ideas give an understanding of that stream of events which pours through his life, which is his life. . . . The understanding which we want is an understanding of an insistent present.

Other concepts that give the teacher a wide choice of subject matter are *interdependence*, *variety*, *authority*, and *order*. In building toward any of these concepts, various specific learning sequences will be required. For instance, in developing a concept of *order*, a useful activity might be the study of some of the ways in which the local community, the state, and the nation manage the problems of many people living and working within a certain geographical area.

## Continuity in Information Processing

Thought processes may also furnish a thread of continuity in a curriculum. The most thorough and complete example of such a curriculum design is *Science, A Process Approach*, a series of teacher texts worked out by the American Association for the Advancement of Science (1965 and 1966) for use in elementary schools. The entire set of materials is meant to help children develop several levels of intellectual skill—comprehension, application, analysis, synthesis, and evaluation of knowledge.

Taba (1964), in her studies of how elementary school teachers may improve children's thinking, has arrived at three levels of cognitive tasks:

- Grouping and labeling
- Interpreting and making inferences
- Predicting consequences.

She has found that with each new topic for discussion it is essential that the children have ample time to deal with specifics at the first level of grouping and labeling in order to have success in manipulating information at the other two levels. Again, sequences in learning that are on target appear to be useful as a part of a broader forward movement along a continuous line of development.

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**ALICE MIEL**
*Chairman, Department of Curriculum and Teaching*
*Teachers College, Columbia University*

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Address communications to:
**Department of Elementary—Kindergarten—Nursery Education**
**National Education Association**
**1201 Sixteenth Street, N.W.**
**Washington, D.C. 20036**