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Readiness to learn occurs when a child has achieved cumulative learning of component subskills and the developmental maturity necessary to integrate these subskills into the desired skill. Readiness is relative, however, not only to the skill, but also to the technique of instruction. Thus, readiness for learning a particular skill by different techniques may come at different times. Attempting to force instruction on a child who is not ready can cause the child either to learn the skill by a more primitive technique (one which has little transfer value to other learning) or to "turn off" to learning altogether. "Turning off" means extinction or inhibition of behaviors necessary to learning, such as attention and active involvement. Many school learning problems, particularly those of disadvantaged children, might be avoided if more attention were paid to readiness in the primary grades, when the danger of "turning off" because of lack of readiness is greatest. Experimental programs are needed that would actually delay formal instruction (while filling in necessary experiential factors) until readiness is apparent. (MH)

Understanding Readiness: An Occasional Paper

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UNDERSTANDING READINESS: AN OCCASIONAL PAPER

Recent research papers in child development and educational psychology reflect a renewal of interest in readiness among educational researchers. There is a new awareness of the importance of the really old notion of readiness and of the need to reexamine the diverse phenomena associated with this concept in light of recent theory and research in child development, individual differences, and the psychology of learning and instruction. The fact that empirical researchers in psychology and education are again seriously approaching the problems of readiness, now with more sophisticated theories and research methodologies than were available in the former heyday of the concept, is an important trend in the right direction.

A generation ago, readiness in a biological-maturational sense was of greater interest to educational psychologists and was regarded more seriously than it has been in the past decade, which has been dominated largely by conceptions derived from theoretical positions of extreme environmentalism and behavioristic learning theory. In its most extreme form, this view holds that the degree of readiness for learning at any given age is merely the product of the amount and nature of the learner's previous experience. Readiness is viewed as the amount of previous learning that can transfer to new learning.

There can be no doubt about the *fact* of readiness; that is, the common observation that certain kinds of learning take place much more readily at one age than at another. No one disputes this. Disagreements arise only when we try to *explain* readiness. The theoretical explanation of readiness is important, of course, because much of what we do about readiness in educational practice will depend upon our conception of its nature.

The Nature of Readiness

For the sake of conceptual clarity, one can state two distinct theories of readiness. One theory can be called the *growth-readiness* view of mental development. It is associated with such eminent psychologists as G. Stanley Hall and Arnold Gesell, and it holds that certain organized patterns of growth of neural structures must occur before certain experiential factors can effectively contribute to development. The rate of intellectual development is seen as due primarily to internal physiological mechanisms and their orderly, sequential growth, rather than to inputs from the environment.

The contrasting viewpoint emphasizes learning as the major causal factor in development. The simplest, most extreme statement of this position is simply that humans, like all mammals, possess the neural structures for the formation of associations between the sensory inputs from receptors and the output mechanism of the effectors. This is, in short, the capacity for acquiring stimulus-response connections or habits. The sets of habits which we identify as intelligent behavior are seen as being built up through the acquisition of habits and chains of habits which interact to produce complex behavior. Thus mental development is viewed as the learning of an ordered set of capabilities in some hierarchical or progressive fashion, making for increasing skills in stimulus differentiation, recall of previously learned responses, and generalization and transfer of learning. In recent years this viewpoint has been most notably developed by Gagné (1965, 1968), who refers to it as the *cumulative learning* model of mental development.

Probably everyone who has attended to the relevant evidence in this field would agree that *both* the *growth-readiness* and the *cumulative learning* theories are necessary for comprehending all the facts of the matter. These two aspects are not at all mutually exclusive but work hand in hand to produce the phenomenon we observe as cognitive development. There is little doubt that the physical maturation of the brain, particularly the cerebral cortex, underlies the development of

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particular cognitive abilities. The developmental sequence of these abilities or, more exactly, of the readiness to acquire them through interaction with the environment, is especially evident between birth and seven or eight years of age. In fact, we know that not all of the brain's potential neural connections are physiologically functionable until at least seven or eight years of age in the vast majority of children.

The orderly sequence of maturation of neural structures is such that the capability for certain kinds of learning and performance falls along an age scale. Standard intelligence tests, such as the Stanford-Binet, yield scores in terms of mental age and attempt to index the child's level of mental maturity. These standard indices, especially in childhood, unquestionably measure a composite of factors associated with both neurophysiological maturation and cumulative learning; there are more specialized tests which clearly measure more of one of these factors than of the others. Acquiring the names of objects — learning common nouns, for example — is highly dependent upon experience once the child begins to talk; the child's vocabulary of common nouns at a given age may thus be conceived of as cumulative learning. The ability to copy geometric forms of increasing complexity, however, seems to depend more upon maturational than upon experiential factors. For example, many children who can easily copy a circle or a square cannot copy a diamond, but the reverse is not true. There is a sequence or hierarchy in the emergence of some abilities. The average five-year-old can easily copy a square. But he must be six before he can easily copy a square containing a single diagonal, and he must be seven before he can copy a diamond. Intensive training in the specific act of copying a diamond is surprisingly difficult and generally ineffective in the average five-year-old. At seven, no training is necessary.

Everyone will agree, too, that these sequential stages of capability are not abrupt steps but that these are transitional stages from one to another. Some transitions are relatively rapid, so that in the preschool years an age difference of just a few months can make for quite striking differences in the child's learning capability for certain tasks.

In learning, as in perception, often the whole equals more than the sum of the parts. It is in the child's progressing ability to *integrate* the component subskills that the phenomenon called readiness is most apparent. Prior acquisition of the subskills is usually necessary but often not sufficient for learning a particular skill requiring the integration of the subskills. It is the integrative process, the development of a higher-order "master plan," that depends most upon the maturation of brain structures. The physical and mental *subskills* for drawing a diamond are clearly possessed by the five-year-old child. The abstract concept of a diamond, however, is still beyond him, and he therefore cannot integrate his subskills into the total performance of copying the figure of a diamond. He lacks the necessary program, the master plan, so to speak. If anyone doubts this, let him first try to teach a typical five-year-old to copy a diamond, and then to teach a seven-year-old. It is a highly instructive experience to the teacher and provides a most tangible demonstration of the meaning of readiness.

A task with more clearly defined subskills lends itself even more readily to a demonstration of the interactive effects of mental maturation and cumulative learning. Learning to play chess is a good example. I was able to observe the simultaneous roles of maturation and cumulative learning quite clearly while trying to teach my daughter to play chess when she was five years of age. At the time, I was especially interested in Gagné's formulation of cumulative learning in terms of learning hierarchies — the idea that each new step in learning is dependent upon the prior acquisition of certain subskills, and that learning takes place most efficiently when we insure that all relevant subskills have been mastered prior to the next-to-be-learned skill in the learning hierarchy. The notion of a hierarchy of skills seems clearly applicable to the teaching and learning of chess, and I proceeded carefully to teach my five-year-old daughter the game of chess with this hierarchical model in mind.

First, I had her learn to group the chess pieces into their two main categories, white and black. At five this was so easy for her that it hardly needed to be taught, as shown by the fact that she would spontaneously sort out the shuffled pieces in terms of their color when putting them away in the two compartments of the chess set's wooden storage box. If she had been only four years old, it might have been necessary to spend some time teaching her to categorize the items on the basis of color, but by five she had already acquired some concept of classes of objects that look alike in terms of some attribute — in this case, color. The next step was to learn the names of the six chess pieces, an example of paired-associates learning. Mastery of this was attained within a few trials and was accomplished with evident pleasure at having learned something new.

The next day's lesson consisted of learning the proper placement of the pieces on the chess board. This was learned, also with evident pleasure, in one brief session, but there was a slight retention loss before the next day, and further practice in placing the pieces was needed to bring this performance up to mastery. Then, one by one, the rules for moving each of the pieces were learned — another instance of paired-associate learning, but this time requiring practice with each piece in a number of different positions so that the general principle of each piece's movement could be acquired. This aspect of the learning also progressed quickly and easily. It seemed like fun to my daughter, and she appeared "motivated" and eager to learn more in the next lesson. Her learning had proceeded so smoothly and easily up to this point that I almost became convinced that if each step in the learning of the subskills of chess were carried to mastery and if interest and motivation persisted, each subsequent step would prove as easy as the preceding one. This was conspicuously not the case.

After the subskills of chess had been learned and the object of the game was explained and demonstrated repeatedly, we tried to play the game of chess, using all that had been learned up to that point. But a game did not emerge; good moves were reinforced by praise, illegal moves were prohibited and had to be taken back, poor moves resulted in the loss of a piece, and half the time bad moves were not made to result in a loss, in order to avoid too much discouragement. Further coaching resulted in no discernible improvement, there was no coordination or plan in the movement of pieces such that an actual chess game would result, and learning seemed to come to a standstill. Moreover, at this stage interest and motivation took such a slump that even some of the earlier acquired, simple component skills deteriorated. Further lessons led to boredom, inattentiveness, restlessness, and finally complete rejection of the whole enterprise. To continue would have required extreme coercion on my part, so we quit the lessons completely. A few weeks later we tried checkers, which she learned easily. It was sufficiently less complex than chess, and she had no trouble playing a reasonably good game. Learning and improvement in performance in checkers was a smooth, continuous process, and at no point did my daughter show signs of "turning off." Checkers became her favorite game for a time, and she often coaxed me and others to play with her.

What was the difference between chess and checkers? I doubt that I was a better teacher of checkers than of chess; I doubt that my daughter was more motivated to learn checkers than chess or that checkers was in some way more "relevant" to her than chess. I believe it was a difference in the complexity of checkers and chess and of the level of complexity that my child at age five could cognitively integrate into the total act of playing a game of checkers or chess.

A most instructive part of this experience to me was the rapidity of motivational slump and psychological "turn-off" when instruction persisted beyond the level of readiness. The same phenomenon must occur in the learning of school subjects as well as in the present chess example. I doubt also that what I observed could be explained entirely in terms of my having used inappropriate teaching methods at the final stage of the chess instruction.

Exactly one year later, when my daughter turned six, I again got out the chess set. By this time she had lost most of her negative reaction to it, and we ran through the component skills again; relearning was rapid. The only source of difficulty was some negative transfer from checkers; she now had to learn that chess pieces do not take other pieces by jumping over them but, rather, by displacing them on the same square. I believe she would have relearned faster had she never practiced checkers. But it was a trivial difficulty. What was interesting was that this time, though my instructional technique was no different from that used before, there was no hitch in the learning, and a smooth, easy transition was made from the learning of the subskills to learning to integrate them into playing a real game of chess. Simultaneously, there was a growing interest and motivation, and my daughter's skill in the game itself showed continuous improvement with practice. For many weeks thereafter, the first thing I heard from my daughter every night when I arrived home from the office was, "Daddy, let's play chess!"

This is a clear example of learning readiness in both of its aspects — the need to have already acquired the component subskills underlying the next level in the learning hierarchy and the need to have reached the level of cognitive development necessary for the integration of the subskills into a functional whole. Learning is a normal biological function. Children do not have to be cajoled, persuaded, coerced, manipulated, or tricked into learning. Given the opportunity and the appropriate conditions, including readiness, children simply learn. The most effective reinforcement for learning or the behaviors that promote learning (such as attention, effort, persistence, and self-direction) is the child's own perception of his increasing mastery of the skill he is trying to acquire. When this perception is lacking, learning bogs down, and external reinforcements or rewards are usually inadequate to maintain cognitive learning. The child's *efforts* are rewarded, but not the cognitive processes that lead to further mastery; and the end result is frustration and turning off in the particular learning situation. This reaction can become an attitude that generalizes to many similar learning situations; for example, school learning in general.

An important aspect of readiness is the child's ability to perceive discrepancies and approximations in his own behavior in relation to a good model or plan. It is becoming increasingly clear from the research on cognitive development that the child's capacity for plans increases with age and is underpinned by genetically coded neurophysiological developments. Any complex integrative activity — playing chess, reading with comprehension, doing arithmetic thought-problems — depends upon the development of these plans or cognitive structures. The child adapts his behavior to the model or plan and the self-perception of successive approximations provides the reinforcement (reward) that shapes behavior in the desired direction. This is the essence of cognitive learning. Though several years ago I believed that the child's learning of language was the chief instrument of his cognitive learning abilities and that these abilities were almost entirely dependent upon his use of language and his acquisition of habits of verbal mediation, my reading of more recent research in this field inclines me to reject this view. The evidence leads me to closer agreement with the position expressed by Sheldon White that ". . . the gathering evidence seems more and more to suggest that the child's progressive sophistication in language between five and seven is not the cause, but is rather the correlate of, his progressive sophistication in learning" (White, 1968, p. 3).

The Relativity of Readiness

The age for readiness for some particular learning is rarely confined to a single point on a developmental scale for any given child. Readiness cannot be determined independently of the method of instruction. A child can evince readiness for learning to read, for example, at age three by one method of instruction and not until age six by another method. The materials and methods that will work at three will work at six, but the reverse may not be true. For example, most three-year-olds would not learn to read in the typical first grade classroom nor with the size of type typically used to print first-grade primers, nor by a phonic method. Individual instruction, using very large, poster-sized type, and a "look-say" method will permit many three-year-olds to learn to read, although such reading at three is probably a quite different process psychologically than reading at six. In other words, what appears superficially as the same behavior may be acquired by different means and involve different psychological processes at different developmental stages. The often superficial nature of the resemblance of the two behaviors can be observed in the extent and nature of the transfer of learning. The three-year-old who learns to read "leg," for example, will be at a loss when the new word "peg" is presented, and it will take as long to learn "peg" as it would to learn "can." For the six-year-old, reading need not be so much a form of audio-visual paired-associate rote learning as it is a form of problem-solving using phonetic mediators. Therefore there will be a high degree of transfer from "leg" to "peg."

Little is known about the extent to which the readiness factor can be minimized in learning by manipulating instructional techniques. Experiments on such tasks as copying a series of geometric figures of increasing complexity suggest that, at least in this realm, performance is far more dependent upon maturational factors than upon any variations that different instructional techniques can produce. Differences in instructional techniques in most forms of school learning may well be of maximum importance at the threshold of readiness, although beyond this threshold a variety of techniques may be relatively indistinguishable in their effectiveness.

Ignoring Readiness

What happens when we ignore the readiness of children who are of approximately the same chronological age but different readiness levels and attempt to teach all the children the same thing in the same way? Obviously we will observe marked individual differences in the speed and thoroughness with which the children learn, and we may be inclined to increase our efforts and persistence in teaching the slower learners in order to help them catch up to the others, or at least to try to achieve the same degree of mastery of the subject as attained by the faster children, even if it takes somewhat longer.

Aside from the accentuation of individual differences in the classroom, are there likely to be other effects of ignoring readiness with possibly greater psychological consequences than those of merely making more visible individual differences in scholastic performance? We do not have any firmly established answers to this question. However, recent animal research on readiness factors in learning and some of my own observations of certain classes in which many children appear not to be learning much of anything at all, despite heroic efforts of the teachers, lead me to hypothesize that ignoring readiness can have adverse psychological effects beyond merely not learning what is being taught at the time it is being taught.

These adverse effects seem to take two main forms: (1) The child may learn the subject matter or skill by means of the cognitive structures he already possesses; but because these structures are less optimal than more advanced structures in the sequence of cognitive development, the learning is much less efficient and results in the acquisition of knowledge and skills with lesser capability of transfer to later learning. The increasing breadth of transfer of learning is a chief characteristic of the sequence of cognitive development. (2) The second adverse effect of ignoring readiness by persisting in instruction beyond the child's present capability is to cause the phenomenon referred to earlier in the chess example as "turning off." This amounts to an increasing inhibition of the very behaviors that promote learning, and I believe it can become so extreme that it may eventually prevent the child from learning even those things for which he is *not* lacking in readiness.

"Learning to learn," or what psychologists call the acquisition of learning sets, is of greater educational importance, and requires more complex cognitive structures, than the learning of any specific associations or facts. All animals are capable of forming new associations between stimuli and responses, but only higher mammals are capable of learning-set acquisition to any appreciable degree, and this capability is not easily demonstrated below the level of primates. Much research on learning sets has been conducted with monkeys and apes. This research clearly shows that learning to learn, more than any specific learning, is dependent upon maturational factors. Since a high degree of control can be maintained over the experiences of monkeys in the laboratory, it is possible to assess the relative importance of maturational and experiential variables for different kinds of learning and to study the consequences of forcing certain types of learning before the maturational factors are optimal for that particular learning.

Research on primates leaves no doubt that learning ability increases with age up to adulthood and that the asymptote of capability for various types of learning comes at later and later ages as the complexity of the learning task increases. The five-day-old monkey, for example, forms conditioned reflexes as rapidly as the adult monkey. The speed of learning object-discriminations, on the other hand, does not reach its maximum until about 150 days of age. When monkeys are given a *succession* of object discrimination problems, each involving different visual discriminations, the monkeys' learning speed gradually increases from one problem to the next. The first problems may require 100 to 200 trials to learn a single discrimination; but after the animal has learned to learn by being given a sequence of many different object discrimination problems, these discriminations may be learned in only one or two trials. In other words, the animal is said to have acquired a learning set for object discriminations and in this type of learning is capable of close to 100 per cent efficiency; that is, learning in the fewest possible trials.

It is known that the speed with which learning sets are acquired depends upon the monkey's age; that is to say, its maturational readiness for learning set formation or interproblem learning. Young monkeys (60 to 90 days old) show much less readiness for learning set formation than older monkeys (150 to 300 days old), as reflected in the great differences in learning rates. The most interesting finding, however, is that the monkeys trained at the earlier, preoptimal age for learning set formation apparently do *not* eventually catch up with the older monkeys, even when they finally reach the same age as that at which the older monkeys were trained with much greater ease. In other words, the early training not only was less efficient, but it resulted in these young monkeys' attaining an asymptote at a lower level of proficiency than that attained by older monkeys with much less training. The too-early training resulted in a low ceiling for the subsequent development of this particular ability.

Harlow, who conducted these experiments, concluded

these data suggest that the capacity of the two younger groups to form discrimination learning sets may have been impaired by their early, intensive learning-set training, initiated before they possessed any effective learning-set capability. Certainly, their performance from 260 days onward is inferior to that of the earlier groups with less experience but matched for age. The problem which these data illustrate has received little attention among experimental psychologists. [And, we might add, educational psychologists.] There is a tendency to think of learning or training as intrinsically good and necessarily valuable to the organism. It is entirely possible, however, that training can either be helpful or harmful, depending upon the nature of the training and the organism's stage of development (Harlow, 1959, p. 472).

For the neonatal and infant rhesus monkey each learning task is specific unto itself, and the animal's intellectual repertoire is composed of multiple, separate, and isolated learning experiences. With increasing age, problem isolation changes to problem generalization, and this fundamental reorganization of the monkey's intellectual world apparently begins in its second year of life. From here on, we can no longer specify the monkey's learning ability for any problem merely in terms of maturational age and individual differences. The variable of kind and amount of prior experience must now be given proper value. (Harlow, 1959, pp. 477-78).

The shift in cognitive style in the second year of life in the rhesus monkey, described by Harlow, seems to have its counterpart in the human child between about five and seven years of age — the age at which children universally begin their formal schooling. Sheldon H. White (1965) has adduced a diversity of data in support of his hypothesis that adult mental organization is hierarchical, consisting of two main "layers": an associative layer laid down early in development and following conventional associative principles and a cognitive layer laid down in later childhood. The formation of the cognitive layer is most marked between the ages of five and seven. Between these ages children show a transition from a type of performance in learning situations characteristic of lower animals in similar situations to a type of performance characteristic of adult humans. Thus, it is during this period of most rapid qualitative changes in cognitive processes that consideration of readiness factors of the maturational type is of most importance. The period is better thought of as extending from age five to ages eight or nine, to include more or less the full range of individual differences in making this cognitive transition. Tests such as the Stanford-Binet, the Piagetian developmental tests, and the types of tests and indices described by Ilg and Ames (1964) are the best means now available for assessing readiness for cognitive learning in this age range.

As I mentioned before, the second major type of difficulty that can result when readiness is ignored is what I previously called "turning off"; that is to say, the extinction or inhibition of those forms of behavior which are essential aspects of learning — attention, self-directed effort, rehearsal, and active involvement. Signs of discouragement, waning interest, boredom, and the like are merely surface indicators of the inhibition of learning.

The psychological mechanism by which turning off comes about is well known in laboratory research on learning and was first described in detail by Pavlov under the names "experimental extinction" and "conditioned inhibition." It is a reasonable hypothesis that these processes operate in school when certain analogous conditions prevail in the learning situation. The essential condition is responding without reinforcement or with very inconsistent reinforcement. In animal learning, reinforcement or reward must be external; it is dispensed by the experimenter, usually as bits of food, to strengthen the responses defined as correct by the experimenter. Withholding reinforcement results in decrement or extinction of the response in question, and the stimuli that are present while this extinction process is underway become conditioned inhibitors; that is, the mere presence of these stimuli can come to inhibit the class of responses with which they were associated during extinction.

In humans, reinforcement can be external or internal, so to speak. External reinforcement in the pupil-teacher relationship generally involves both approval and praise by the teacher and "informative feedback" from the teacher as to the correctness or incorrectness of the child's responses. But more important in human cognitive learning is internal reinforcement resulting from the learner's self-perception of his own behavior and its approximation to self-perceived goals. Behavior is sustained and shaped by reinforcement or feedback. If there are no internalized standards or structures as a basis for feedback concerning the approximation of one's performance to the standard, then reinforcement must be external. A simple, clear-cut example is the comparison of a beginning student on the violin and a professional musician. The former must have a teacher to provide immediate feedback on the correctness or incorrectness of performance; the standard is in the teacher's head, so to speak, and not the pupil's. When the professional practices a new piece, on the other hand, his activities are reinforced by his successive approximations to his own internalized standards, which have been acquired through years of musical training, and the subtleties of which can only be referred to as musical talent.

Human cognitive learning (as contrasted with rote learning and motor learning) depends in large part on such internalized regulation of the learning process. The source of self-informative feedback is highly dependent on readiness, the capacity for plans or models to which the child's performance can achieve successive approximations. There is a difference in readiness, for example, between the child who reads by naming symbols (words) he has rote-learned and the child who perceives reading as making an effort to extract meaning from the printed words. Much of the activity of the latter child is self-instructional. Children who do not engage in self-instructional activity do not make normal progress in school. Forced practice in the absence of internal reinforcements, I suggest, can lead to extinction of the behavior being practiced.

Readiness in the cognitive sphere is largely the ability to conceptualize the learning task, to grasp the aim of one's efforts long before achieving mastery of the task. The relative ineffectiveness of shaping one's behavior to external requirements as compared with internal requirements is perhaps seen most dramatically in the child's efforts to copy geometric figures of varying difficulty. Unless the child can internalize a conceptual representation of the figure, he cannot copy it, even though the model is directly before him. Partly for this reason, as well as for its correlations with school readiness, the Ilg and Ames figure copying test is probably one of the most convincing and valuable measures of cognitive development in the preschool years and throughout the primary grades (Ilg and Ames, 1964).

Conclusion

Many school learning problems could be circumvented if more attention were paid to readiness in the primary grades, when children's learning is most easily turned off through extinction due to inadequate readiness. The risks of delaying instruction too long seem much less than the possible disadvantages of forcing instruction on a child who is still far from his optimal readiness for the subject of instruction.

We need much more experimentation on readiness; that is, trying the same instructional procedures over a much wider age range than is ever the case in traditional schools. It may well be that some sizeable proportion of children in our schools will, for example, be better readers at age twelve if they began reading instruction at age eight than if they began at age six, and this may apply to the learning of most scholastic skills. The high rate of reading failures and other deficiencies in basic scholastic skills found among high school graduates in groups called disadvantaged can hardly be explained in terms of deficiencies in basic learning abilities. It would seem necessary to invoke turn-off mechanisms at some early stage of their schooling to account for some of their marked educational deficiencies. Experimental programs of primary education that pay special attention to readiness factors in learning and actually *delay* formal instruction (meanwhile inculcating prerequisite experiential factors) until readiness is clearly in evidence are needed to test this hypothesis for its practical effectiveness in improving the ultimate educational achievements especially of children called disadvantaged. It is among this group that turning off in school is most evident.

I suggest that more of the factors which cause turning off are found within the school than outside the school and that among the prime causal factors is an inadequate recognition of the importance of readiness, both in terms of cognitive maturation and cumulative learning. Compared with the potential benefits of such experiments as suggested here in terms of the readiness concept, the risks seem almost trivial. It appears that considerably more bold and daring educational innovations are called for if we are to improve the outcomes of schooling for the majority of children called disadvantaged. The present large-scale programs of compensatory education, which so far have failed to yield appreciable scholastic gains among the disadvantaged, are psychologically and educationally probably still much too conservative. A variety of much more radical educational experiments, with the outcomes properly assessed, would seem to be indicated. At least a few such experiments should give extreme emphasis to readiness factors and to the avoidance of turn-off in school learning.

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