

CUMULATIVE DEFICIT IN COMPENSATORY EDUCATION

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The term *cumulative deficit* has become part of the specialized vocabulary associated with the concept of "cultural deprivation." The purpose of this article is to delineate the meaning of the term *cumulative deficit*, to distinguish it from other, related terms, and to outline briefly some hypotheses concerning its psychological basis.

Progressive Achievement Decrement

Cumulative deficit is best regarded, at present, not as a directly observable fact, but as an inference or an hypothesis. It is but one of several hypotheses which attempt to explain a fact, or set of facts, that can be referred to as *progressive achievement decrement* (PAD). New terms can be a nuisance, but this term has the advantage of being a neutral, descriptive term without bringing in any theoretical or explanatory notions. It merely describes the raw material of our problem, namely, the observation that a large proportion of children who come from a low socioeconomic background tend to fall further and further below the mean of national norms in school achievement as they move from kindergarten to high school.

It is this progressive achievement decrement that is of such great concern to educators, for it involves a considerable segment of our population and has drastic social and economic consequences for society in general, to say nothing of the personally damaging effects to the individuals who are victims of PAD. There now exists keen public awareness that the great task facing educators, psychologists, and sociologists is the discovery of the causes and cures of the PAD that blights the future of many children growing up in impoverished circumstances.

There can be no doubt about the basic fact of PAD. It exists. In many schools in depressed areas the average achievement decrement, even as early as the fourth grade, is as much as two or three grade-levels below national norms, according to standard achievement tests. Many school dropouts fail to show any increase in school achievement for several years preceding the time they finally drop out of school. Under *these* conditions, dropping out represents no educational loss.

PAD is found not only in measures of school achievement but also in tests of general intelligence. Most intelligence tests, of course, are

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also measures of achievement, involving vocabulary, general information, comprehension, reading skill, and so forth. Between first grade and high school many culturally disadvantaged children show a drop of as much as 20 points in IQ. The majority of such children begin school with IQs and Achievement Quotients in the range of 90 to 100. By the time they reach high school age the majority of these individuals will test in the range of 70 to 85.

The most interesting and important fact, however, is that not *all* children who enter school with IQs in the lower half of the normal range (i. e., 90 to 100) show a decrement in IQ or achievement as they grow up. It is almost exclusively the children of low socioeconomic status (SES) who show this relative decline in intellectual ability.

The big question is: Why do children of low socioeconomic status show progressive achievement decrement while middle-class children, by and large, do not?

We can consider the PAD in terms of learning rate. Whatever the reasons may be for individual differences in learning ability, individual differences clearly exist. It is possible to observe something closely akin to the PAD in school learning when we compare the learning curves obtained from a number of individuals in a laboratory learning task, such as paired-associates or serial rote learning. When we plot the average learning curve of slow learners and compare it with the average curve of fast learners, we notice that even though both groups show about the same level of performance at the beginning of the learning trials, they diverge more and more as practice continues. This divergence among learning curves is typical of growth curves in general. The degree to which a slow learner's performance falls below the mean learning curve for all subjects at any given stage of practice is directly analogous to the PAD in school learning. We can view schooling as a prolonged period of learning; achievement tests administered at regular intervals throughout the course of schooling form a learning curve. Now, as is true of most learning curves, if all subjects begin at nearly the same level of performance, and if they differ in *rate* of learning, the divergence among subjects will inevitably increase as a direct function of amount of practice. The slow-learning subjects thus will display a PAD. The only chance for the slow learners to catch up to the performance level of fast learners depends upon at least two conditions: the slow learner can attain the fast learner's performance level if (a) the task being learned has a ceiling or asymptote such that, after mastery is attained, further practice adds only negligible increments to performance level, and (b) the slow learner spends more time in practice than the fast learner.

Is there any possible way of getting around these two requirements? One would hope so, because school learning does not have a ceiling—

as soon as one thing is mastered, something new is introduced; and the fast learners do not wait for the slow learners to catch up. Furthermore, since success in learning acts as its own reward, fast learners are inclined to spend more time at their lessons than slow learners. Thus it is true also in the realm of intellectual development that "the rich get richer and the poor get poorer."

The hope of many educators lies in the possibility that changing the conditions of learning for the slow learners might somehow permit them to learn the same material at the same rate as the fast learners. Improved teaching methods, if applied to fast learners as well, might, of course, also boost their learning rate even more than it does for the slow learners. But at least the absolute level of performance would be boosted for all pupils. There is also the possibility that manipulating the conditions of learning in diverse ways that are optimal for each individual will decrease individual differences in learning rate and consequently reduce the amount of PAD. The aim, of course, is to pull slow learners up, not to hold fast learners down. Persons working in curriculum development and teaching methods put their stock in the possibility of improving achievement by tailoring the curriculum and instruction for the diversity of needs, abilities, and backgrounds of the many kinds of children who come into the public schools. Evaluation of the possibilities in this direction is extremely difficult and complex. In general, it can be said that most variations of classroom teaching methods which have been tried in the past have had disappointingly meager effects on PAD. The overall differences produced by various teaching methods are minute as compared to the range of individual differences that emerge under any one method. But there has been little fine-grained research on adapting the conditions of learning to individual differences, and it would be unwise to draw conclusions at this stage that would discourage further efforts to discover ways of improving instructional methods along these lines.

Relative and Absolute Achievement

While most parents are concerned about *comparative* achievement—that is, how their child compares with others in achievement—educators are concerned with *relative* achievement—that is, the child's achievement in relation to his supposed *potential* for achievement. The problem for the educator is the child who, for some reason, fails to achieve up to some expected level. The expected level of potential against which achievement is evaluated is usually based on teachers' judgments and the results of various psychometric tests. But the practice of evaluating the child's achievement in terms of his ability can prevail only within limits. The schools, and society in general, have a certain baseline ex-

pectation for practically all children who attend public schools. The only avowed exceptions are the three or four per cent of children who are in some way organically handicapped. These baseline expectations involve standards of competence in such skills as the 3 R's, without which the individual is a liability in our economy. The general alarm we see today is due to the large proportion of children, practically all from low SES backgrounds, who fall below these baseline standards throughout their schooling. There are not enough menial occupations to employ the large numbers of persons whose educational attainments fit them for nothing better. It is this phenomenon, which grows in magnitude year by year, that has stimulated all the interest and concern with the topic of cultural deprivation. The term "cultural deprivation" itself, of course, implies a theory of causation of the PAD.

Cultural Deprivation and Underachievement

Thinking and research on cultural deprivation and on the methods of alleviating its consequences, such as compensatory education, are based on the assumption that the vast majority of low-achieving, low SES children are *under-achievers*. It is presumed that their actual school achievement falls below their potential, and that their achievement would be much greater if only all of their potential could be mobilized. They are thought to differ from middle-class children mainly in the degree to which their innate potential is stimulated and channeled into the kinds of learning required in school.

Since this assumption can seldom be supported by demonstrating any marked discrepancy between measured IQ and school achievement (the usual basis for diagnosing underachievement among middle-class children), it is maintained that IQ tests are inappropriate as measures of the intellectual potential of low SES children. The argument is well-known: Since IQ tests are themselves achievement tests reflecting environmental influences, they can only measure intellectual performance and not potential. So-called "culture-free" and "culture-fair" tests have been developed in hopes of getting around this objection to the usual intelligence tests, but with highly dubious success.

Cumulative Deficit

Cumulative deficit, or CD, is the term for the currently prevailing hypothesis concerning the causes of PAD. The essence of the CD hypothesis is this: All learning beyond the first few weeks or months of life depends upon previous learning. Knowledge and ability develop in a hierarchical fashion; the development of each new level is facilitated by transfer from earlier learning. More complex forms of learning build on simpler forms of learning. When the habits, skills, or cognitive structures that are prerequisite for some "new" learning have not been

fully acquired, the capacity for the new learning will be impaired: learning will be retarded, inefficient, incomplete, or even impossible, depending upon the degree of inadequacy of prerequisite skills. Since learning builds on learning, weakness at any stage creates still greater weakness at later stages. Because subsequent learning depends upon transfer from prior learning, learning deficits are cumulative. Thus the term *cumulative deficit*.

This seems to be a reasonable working hypothesis of the chief cause of PAD, for several reasons. In the first place, this account of the development of learning ability as a hierarchy of transfer functions is in accord with modern theoretical views of the nature of learning and intellectual development. In the second place, it is well known that low SES children generally begin school with fewer of the prerequisite skills for school learning than are possessed by middle-class children. Finally, the cumulative deficit hypothesis has rather explicit implications for means of remedying PAD.

Other Factors in PAD

Before listing the elements of CD in greater detail, we should note some other hypotheses that are advanced to explain PAD. Actually, the problem is not so much that of determining which of these hypothesized factors is a valid explanation of PAD as of determining the relative contributions made by each of the factors. More likely than not PAD is a resultant of many factors. Besides cumulative deficit, the most frequently mentioned are: (a) innate differences in learning ability; (b) deficiencies or differences in motivation, attitudes, and values; and (c) differential educational treatment associated with the quality of educational facilities, instruction, etc.

Innate Differences in Learning Ability

In our society some 50 to 80 percent of the variability in measured intelligence can be attributed to heredity. The question of present concern is the degree to which social class differences in ability (which are a fact) are attributable to genetic factors. It is likely that a substantial proportion of inter-class variability has a genetic basis, but at present there is no evidence as to how much this proportion is. In the United States any answer to such a question would be especially complicated by the fact that the variable of social class is so confounded by the variable of race. In a racially homogeneous society there is probably a greater chance that innate ability will act as a determinant of the individual's social class than in a society in which there is the possibility of racial discrimination. For when racial discrimination exists, factors other than ability can predominate in determining the individual's social and occupational status. For this reason it is desirable, in studying

social class differences in intelligence and educability, to take the factor of race into account. Failing to distinguish between races in our research on the determinants of PAD can only obscure our findings. For example, innate intelligence may well be more highly correlated with the quality of the environment among the white population than among the Negro. Similarly, it would be unwise not to take account of race in assessing the results of compensatory educational programs or other forms of intervention intended to alleviate PAD. Unfortunately, racial minorities and civil rights groups tend to object to the identification of the child's race on school records, etc., and they frown upon research in which the racial variable is an explicit feature of the experimental design. This is obviously short-sighted and self-defeating, as would be any restriction that blocks the delineation of the factors that contribute to PAD.

While it might be possible to explain PAD in terms of innate differences in learning ability, there seem to be other related facts which are not so easily comprehended in terms of this hypothesis as in terms of cumulative deficit. One observation concerns the differences in non-academic learning between children of low and middle SES who are matched on IQ and school achievement, particularly those in the IQ range from about 65 to 85. In nearly all types of performance that do not involve verbal or symbolic abilities, the low SES children appear to be generally superior to middle-class children of the same IQ. Interestingly enough, this does not seem to hold true in the average and above average range of IQ. Though this seems to be a reliably and commonly reported observation by teachers and school psychologists, it should be subjected to scientific inquiry. It would be interesting to know, for example, how culturally deprived children compare with middle-class children in various forms of nonverbal perceptual-motor learning. Pursuit rotor learning, for example, is positively correlated with IQ in middle-class children. Thus it measures some aspect of intelligence and learning ability. When culturally deprived children perform better on such tests than we would expect from their IQs, there is added support for the cumulative deficit hypothesis. The most valuable tests for our research on the causes and cures of PAD are those which correlate highly with measured IQ and school achievement in middle-class children but which do not correlate highly with these variables among culturally deprived children, while at the same time maintaining high reliability of measurement in both groups. Such tests probably measure something very close to innate or biological intelligence. Low school achievers who perform well on such tests are probably the ones who will benefit most from compensatory and remedial education. Tests based on informational content are much less likely to meet these criteria than tests that assess on-the-spot learning and retention of tasks that depend little upon trans-

fer from previous learning. Relatively culture-free tests can provide the only satisfactory baseline from which to assess the culturally deprived child's educational attainments. The fact that past efforts to develop culture-free tests have met with little success does not mean that it is forever impossible to devise such tests. Also, the often repeated statement that innate intelligence cannot be tapped by psychological tests is directly belied by the evidence on the inheritance of intelligence. It would be practically impossible to account for the results of studies on the inheritance of intelligence based on comparisons of identical and fraternal twins if it were not assumed that intelligence tests to a large extent reflect innate ability.

Motivation, Values, and Attitudes

It is often said that culturally deprived children do poorly in school because they are not sufficiently motivated to succeed. Their environment, the argument goes, has not inculcated the values and attitudes that favor school achievement. The evidence for these statements are the PAD itself, plus the fact that low SES children seem to spend less time in school learning activities than do middle-class children. Thus these motivational factors do not seem convincing as a primary cause of PAD. Motivational and attitudinal factors are probably best regarded as secondary and derivative aspects of cultural deprivation. They are correlates and consequences of PAD more than they are basic causes.

A child is said to be poorly motivated when he persistently makes no attempt to do what the teacher tells him, when he does not attend to what the teacher says, and when his behavior disrupts others from paying attention to the teacher or to the activities the teacher is trying to promote. On the other hand, a child who persists in the tasks set for him by the teacher, or in tasks of his own devising which the teacher approves, he is said to be motivated. It can be seen that the term is merely descriptive, not explanatory. Attention, persistence, and the like, depend on a number of variables. Two of the most important of these are the appropriateness of the assigned task for the child's ability and the child's prior history of reinforcement (or reward) for the elements of the behavior involved in the task. When learning is hindered or blocked, for whatever reason, and the child's performance does not result in readily perceived and satisfying consequences, the child begins to display all the symptoms we recognize as "poor motivation." But here we are dealing with consequences, not primary causes, of failure to learn in school.

When such interfering behavior occurs, of course, it represents time-out from learning. It is mainly because of this reciprocal relationship between the time-out behavior we label "poor motivation" and the time spent in actual learning in the classroom that "motivation"

appears to affect rate of learning. The "motivated" child spends more time learning, but this is saying no more than "the child who spends more time learning spends more time learning." And of course he learns more than if he spent less time.

The most conspicuous and disturbing "time-out" behavior we see in the culturally deprived child—and it is in evidence as early as the first grade—is a kind of aimless hyperactivity, inattentiveness, and distractibility. One first-grade teacher, for example, estimated that, on the average, the amount of time per child spent in a condition conducive to learning from instruction is probably not more than a total of two hours per week, out of the 20 hours the child spends in school. The achievement records of many of these children make it doubtful that even as much as two hours per week is spent in learning.

One of the major challenges in combatting PAD is to discover the origins of this hyperactivity syndrome (which in many ways simulates the symptomatology of brain damage) and to find ways of preventing its development. While it probably begins as a *symptom* of learning disability due to cumulative deficit, it later becomes a cause—probably the single most pernicious factor contributing to PAD. The ultimate consequences seen at high school levels are demoralization and the development of rationalizations of educational failure. The anti-intellectual, anti-educational, anti-achievement, and anti-middle-class values and attitudes that begin to explicitly emerge at this stage are more of the nature of advanced symptoms rather than causes of PAD. These attitudes, however, may well take on causal properties when their victims in turn become parents of another generation of culturally deprived children. And thus the cycle repeats and snowballs. The whole phenomenon of "motivational slump" is probably easier to prevent than to cure. But since the condition already exists on a large scale, research efforts must be aimed at both prevention and cure.

Poor School Facilities

I mention this only because I so often read, especially in the popular press, that a large part of the trouble with culturally deprived children is due to the schools they attend being less adequate in terms of physical facilities, teacher-pupil ratio, etc. than the schools for middle-class children. The quality and dedication of the teachers are also often included in this diagnosis. While there is undoubtedly some truth in these comparisons of schools in low and middle SES neighborhoods, I think the facts have little, if anything, to do with PAD. For aesthetic and hygienic reasons one surely desires an attractive, well-equipped school plant. But to believe that these obviously desirable features will make any appreciable difference to PAD is to head for almost certain dis-

illusionment. Nor will moving the best teachers from middle-class schools into schools for the culturally deprived make much difference, even if we use only those teachers who evince genuine dedication to the challenge of educating the culturally deprived. These things have been tried, and apparently they are not enough. This is not to say that teachers differ in their effectiveness in working with the culturally deprived. They do differ markedly. But whatever the relevant talents are, they probably have little to do with the teacher's dedication or other characteristics that a sentimental view attributes to the "ideal" teacher.

One of the finest schools I have ever visited in terms of all the usual criteria of an excellent school—it was set up in a culturally disadvantaged neighborhood as an all-out effort to alleviate PAD—still had about as large a PAD as any other school in similar neighborhoods. On the other hand, the most fantastically run-down and curiously impoverished-looking school plant I have ever seen anywhere is a famous private school in England, where many of the prime ministers, noted statesmen, and distinguished intellects of British history received their early education. Had I not known the school's name, I would have exclaimed "Deplorable!" If low SES children in the U. S. were required to attend school in these same classrooms, many of the public would be outraged about "unequal facilities." There would seem to be justifiable cause for riot. Yes, improve school plants and facilities and teacher-pupil ratios, by all means, but not with the hope that this will significantly boost the educability of the culturally disadvantaged. To accomplish this much more radical measures will be required.

Components of Cumulative Deficit

When in the life of the child does the cumulative deficit begin, and what are its psychological components? Current research in this field is aimed at finding answers to such questions. Though a great amount of investigation is in progress, all of the answers are not in, by any means. However, some of the most salient hypotheses and findings are listed under a number of headings.

Biological Effects of Environmental Stimulation

The effects of early environment are biological as well as psychological. Experiments with rats, for example, have shown that early environmental stimulation increases the thickness and weight of the cortical areas of the brain and alters brain chemistry in ways that are positively correlated with learning ability. It seems not at all improbable that the human brain is affected in a similar way by early stimulation, although this has not yet been directly established. But the possibility that an impoverished early environment can have organic effects on brain development must not be overlooked.

Attentional Learning

Attentional behavior is acquired and developed in the first years of life, and there is evidence that attention—probably the most fundamental prerequisite of all later learning—is more highly developed in middle-class than in low SES children. Attention develops through visual and auditory stimulation in conjunction with the parent-child interaction. The one parent-child activity that probably does more than any other to develop attention (and to create differences between lower and middle SES children in school readiness) is the practice of reading to the child from an early age. Two-year olds will closely monitor every sentence of a favorite nursery rhyme or story—even though they may not yet understand most of the words—and will promptly notify the parent of any departure from the text. Many low SES children begin kindergarten without ever having developed this ability. If any single component of cumulative deficit can be pointed to as the most crucial and the most pervasive in its effects, it is probably the poor development of attention during the preschool years.

Perceptual Abilities

The auditory and visual perceptual abilities of low SES children have been found to be less well developed than in middle-class children. These abilities are acquired very early in life through looking at, listening to, and handling a great variety of things. Culturally deprived children begin school with poor ability in auditory and visual discrimination, the cornerstones of reading readiness.

Verbal Mediation

Low SES children are verbal in the sense that they use language in social interaction, but they are relatively nonverbal in the sense that they have little tendency to use language as an aid to thinking and problem-solving. Language and verbal mediation are powerful intellectual tools without which most forms of conceptual learning are practically impossible. Evidence so far indicates that the culturally disadvantaged have not strongly acquired the habits of verbal mediation which facilitate learning, retention, and problem solving.

Specific School Skills

Culturally disadvantaged children enter school with less knowledge and fewer skills that directly transfer to school learning. Most of the paraphernalia and activities of the kindergarten are familiar to middle-class children. But they are often foreign and bewildering to the culturally deprived child, whose transition from home to school therefore calls for a much more drastic adjustment. To give some idea of the magnitude of the differences that can exist by kindergarten age, it was

found last year in one school in Berkeley that every entering kindergartener was able to read (some of them at second-grade level), while in another school a few miles away not one child in the kindergarten could name or recognize a single letter of the alphabet. A year later many of these children in the latter school were still struggling to discriminate among large printed capital letters; some still found it difficult to see the difference between, say, the letters A and K.

The Need for Early Intervention

These, then, are the areas of deficiency existing at the beginning of schooling. They snowball as the cumulative deficit which creates the progressive achievement decrement. Current research is being directed at pinpointing the specific nature of the deficiencies in each of these areas at various age levels, in order to gain knowledge of their developmental history that will suggest the optimal ages for preventing or counteracting the cumulative deficit. Research is also directed at discovering the most effective methods of intervention.

All indications so far suggest that the chief hope for decreasing PAD lies in combatting the cumulative deficit as close to its sources as possible, in the preschool years. But we do not yet know just how early in the life of culturally deprived children intervention will be necessary (either directly, or indirectly through parent education) or for how long after entering school they will continue to need special treatment in order that they may be able to hold their own alongside children who have been more favored by their early environment.

We will always have to provide for individual differences in ability, of course, because environment is not all. But, paradoxical as it may seem, one goal of a democratic society is to insure to the greatest extent possible that individual differences in educability are due to hereditary rather than to environmental factors.

Suggested Reading

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