DOCUMENT RESUME

ED 141 316 SP 011 179

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TITLE A Realistic Expectation for Cognitive Growth During Transescence.
PUB DATE Mar 77
NOTE 8p.; Paper presented at the Annual Meeting, Association for Supervision and Curriculum Development (Houston, Texas, March 19-23, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Adolescence; *Cognitive Ability; Cognitive Development; *Curriculum Planning; Developmental Stages; Educational Objectives; *Growth Patterns; *Middle Schools; *Physiology
IDENTIFIERS *Brain Development; Epstein (Herman); Transescence

ABSTRACT

This document cautions against high expectations on the part of educators for rapid cognitive growth during middle school years--and urges a rethinking of curricular structure for those years--based upon neurological data concerning brain growth patterns. Empirical research (case studies, autopsy studies, cadaver research) conducted by Epstein has borne out that brain growth is found to be consistent with two components: (1) increase in body size and (2) a set of five descrete periods of growth occurring in the age intervals three-ten months, two-four years, six-eight years, ten-twelve years, and fourteen-sixteen years. In approximately eighty-five percent of all youngsters, brain growth ceases between ages twelve-fourteen. Predictions concerning abilities for cognitive growth potential in the period two-four years and six-eight years are borne out by the fact that Head Start programs, conducted in the four-six year period, are generally much less successful than programs conducted during either the earlier or later period. Extrapolating these results to the middle school years, and recognizing the need for further study, the argument is made for concentration upon reinforcement of existing cognitive skills and reinforcement of psychomotor, affective, and self-concept development, rather than upon cognitive growth. Concentration in these areas would better prepare the transescent child for the next spurt in brain growth and cognitive growth potential. (MB)

A REALISTIC EXPECTATION FOR COGNITIVE GROWTH DURING TRANSESCENCE

C. F. Toepfer, Jr.

If the middle school concept is to refine its effectiveness for transescent learners, it can no longer subvert the established, holistic needs of these youngsters into programs of overbalanced, cognitive predominance. Cognitive growth during transescence must be viewed as part of a longitudinal pattern. This cannot be expected on a constant continuum throughout the elementary, middle, and high units of the school system. Data increasingly confirm that if middle grades curriculum building emphasis suffers from cognitive myopia, even the cumulative cognitive growth in transescents will be frustrated. The middle school can assure that cognitive growth will continue during transescence, only if it organizes a learning environment which provides a necessary setting for social and emotional self-clarification, confidence, and growth.

Don Eichhorn has pointed out the importance of physical and social implications during emerging adolescence. While an inevitable phenomenon, pubescence is a varying occurance. Traditionally, school programs have not responded to the needs of individuals in their pubescent achievement. The prime facets of transescent growth <u>are</u> physical and social, but the impact on the individual during transescence is an emotional one. However, the school continues to ignore this emotional trauma for middle grades youngsters and is content to fawn over cognitive growth in isolation during this delicate time in the life-frame of students. We fail to heed the early research of Brookover and others. William Purkey substantiates this in his work <u>Self Concept and School Achievement</u>. Purkey's evidence indicates that, during the middle school years, the addition of educational experiences leading to affective growth results in cognitive growth as well. There is positive correlation between poor self-concept and lack of cognitive achievement.

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In the past year, I have begun to work with Professor Herman Epstein of Brandeis University in examining the implications of his study of brain growth and development for emerging adolescence.

In his study of the growth of the human brain, Professor Epstein has the empirical support of case studies, autopsy studies, and cadaver research. His data and its impact for education during the middle grades will be published in the 1977 volume of Transescence: The Journal of Emerging Adolescence in July, under the title, "A Neuroscience Framework for Restructuring Middle School Curricula." This is a summary of Professor Epstein's thinking as it has implication for organizing learning in the middle grades.

In approximately 85% of all youngsters, the brain ceases to grow between the ages of 12 to 14. This hiatus in brain growth approximates the transescent's pubertal metamorphosis. Epstein contends that for parents and educators to expect continued cognitive growth during this period is unrealistic because of the hiatus in brain growth. This leads to the recommendation that middle school programs focus upon refinement of existing cognitive skills of learners during this time rather than forcing them into frustrating experiences of attempting to learn new cognitive skills at a time when absence of brain growth cannot support this new learning.

The human brain increases in weight from 350 grams at birth to about 1400 grams at brain maturity at about age 17. This increase has been found to consist of two components. The first component is one which is proportional to the increase in body size. The second component appears in a set of five discrete periods of growth, approximately in the age intervals of 3 to 10 months; 2 to 4 years, 6 to 8 years, 10 to 12 years, and 14 to 16 years. These brain growth spurts appear in normal children from quite a number of countries.

The significance of the spurts is likely to reside in some of the special functions of the brain, because it would otherwise make no sense to have such a

set of spurts. This conjecture turns out to be correct because if we look at the development of mind (as distinguished from brain), correlated spurts can be found in mental age and a number of intelligence-associated tests such as tests of memory, vocabulary, or language utilization.

There is some preliminary evidence that these brain growth spurts also correlate in age with learning capacity. Data has established a peak around age 11 and a very low (near zero) value for "gf" (the fluid intelligence factor) around age 13 to 13.5 years. In addition, as can be seen from examining the ages of the growth spurts, the spurts appear at the turning points of the classical main stages of Piaget's set of intelligence development periods. In this sense, they may turn out to be the biological basis of the Piaget stages.

How can we use this knowledge of the existence of correlated spurts in brain and mental functioning? Naturally, any such use is on the level of working hypothesis, for inferences are not of the nature of mathematical inevitabilities. This thinking led Professor Epstein to investigate the periods of very slow growth lying between the spurts because it seemed plausible that such periods might represent periods during which it would be hard for the individuals to develop new thinking competencies required for new cognitive development.

The first such period lies between about ages 4 and 6 years. This is approximately the period of standard Head Start programs. If there is a direct connection between our spurts and the capacity to develop intellectually, we are led to the hypothesis that these standard Head Start programs should be very much less successful than similar programs situated during the age 2 to 4 years spurt period or during the age 6 to 8 years period.

A recent summary of the first decade of experience with early childhood intervention programs identifies this prediction to be correct. Six programs which cover the age 2 to 4 years period all seem to be much more successful than the standard programs. First data on the age 6 to 8 years programs also show a much higher level of success.

On the basis of this kind of correct prediction, it is possible to examine the other slow brain growth periods. The more striking one is the age 12 to 14 year period, corresponding roughly with grades 7 and 8 of middle school years. The prediction here would be that it is relatively more difficult to initiate novel intellectual processes in the middle grades years than in periods both preceding and following this period. Another aspect of this prediction is that it should be characterized far more by increments in already initiated and learned cognitive skills than in the acquisition of new skills. Thus, achievement levels could well outstrip the other aspects of school performance during these years. Emphasis on affective and psychomotor aspects of learning should also receive increased attention and opportunity during this slow brain growth period.

Based upon such hypothesis-formation, the first thing to do is to examine the performance of middle grades learners to see if it is, in any sense, correct to characterize these youngsters as being relatively refractory to the acquisition of novel intellectual skills. If so, a recommendation would be to indicate that desirability of altering curricula for the middle grades to avoid such introduction of new cognitive skills and to include a much larger component of experience and practice of skills already acquired in the cognitive area. This component could be interfaced with experiences related to the affective growth in activities stressing the development of social and emotional skills related to identity stabilization and self-concept clarification.

The details of such an approach would have to be worked out with the input from educators knowledgeable about emerging adolescent learners. The goal would be to help such students acquire, during the middle school years, the background necessary to permit them to take advantage of the next brain growth spurt which covers the years usually spent in high school. Indeed, one major aspect of this project would be to avoid exposing students to inputs which "turn" students "off"

at this time, so that they are only poorly ready for the next brain growth spurt during high school, and only poorly capable of taking advantage of their next brain/mind growth spurt.

What we may view from these concerns and the data provided by Professor Epstein is the need to set aside whatever blind faith we have held in the myths concerning acceleration of new cognitive learning in the middle grades. Certainly, both theorists and practitioners in the middle school arena must study carefully what we have been doing and what evidence suggests as the best alternatives for refining the effectiveness of the middle school curriculum. The Epstein data also indicates our need to study further what Piaget has surmised about "formal operations" in learning during the middle school years. To expand the Piaget frame; it appears that we must also examine the learning theories of Lev Vygotsky. Important sources for those interested in exploring this dimension include the research of Mary A. and B. F. Zendar and Patricia Kennedy Arlin.

Epstein is working with middle schools in ten downstate New York school districts to develop some experimental programs. These efforts will seek to reinforce existing cognitive skills of students rather than to introduce new ones.

There will also be an increased emphasis on psychomotor, affective, and self-concept concerns in these experimental efforts.

This is certainly necessary to validate the imperatives for process in the middle school as we are recommending. Complete study of the Epstein data should provide the final convincing argument that expectations for cognitive growth in the abstract during the middle school years are ludicrous and unachievable.

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