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ABSTRACT

It is generally recognized that a positive relationship exists between language ability and mental ability as measured by a standard intelligence test. The relationship has been suspect, however, since the understanding and use of words play so large a part in many of the intelligence tests. The question has been raised of whether a child earns a high score on a verbal intelligence test because he/she has a good command of language, or whether he/she has a good command of language because of verbal intelligence. This review of historical research addresses the relationship between language and intelligence. The review focuses on studies of cognitive development which relate, in some respect, to the various definitions of intelligence. (Contains a 53-item bibliography of research published between 1926 and 1969.) (NKA)

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SUMMARY #5: REVIEW OF HISTORICAL RESEARCH

The Relationship Between Language and Intelligence

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The Relationship Between Language and Intelligence

It is generally recognized that a positive relationship exists between language ability and mental ability as measured by a standard intelligence test. The relationship has been suspect, however, since the understanding and use of words play so large a role in many of the intelligence tests. The question has been raised of whether a child earns a high score on a verbal intelligence test because he has a good command of language, or whether he has a good command of language because of his verbal intelligence (Jersild 1968). This has been termed the *"overlap"* (25) of linguistic ability and general intelligence (Watts 1944). Although the relationship between verbal ability and measured intelligence is most striking, the intelligence tests are highly correlated with and probably depend on facility in language. This note of probability of the dependence on language suggests the limitations of these intelligence tests and the controversy over the validity of the scores (Mussen 1963). It can be expected therefore that a nonverbal type intelligence test would yield an IQ score representing those intellectual or cognitive abilities not specifically determined or affected by linguistic ability. If, however, as has been suggested by **Bruner** (1964), **Piaget** (1958), and **Vygotsky** (1962), language facilitates thought processes, Jersild's question relating to the verbal-type test may be applicable whether the child in required to respond verbally or not. In addition to following directions, given verbally or nonverbally, one may question whether the child is using language in solving manipulative and perceptual problems presented in the testing situation. **Dixon** (1967) observed that children who can talk over the steps and operations as they carry them out have a better chance of succeeding *"even when their companion says nothing"* (24). **Bruner** (1968) has referred to the abstract uses of language which are divorced from the concrete situation

or context of an action with which the child must *"follow the lesson,"* (71) or in the testing situation, follow directions.

A nonverbal test of intellectual abilities was administered by **Sandel** (1970) to determine the intelligence rating of first-grade children whose oral and written language production was evaluated by IQ category.

The Concept of Intelligence

Intelligence has been described, defined and debated with respect to what it is as well as to what it is not: The components of intelligence have been studied in what **Jersild** (1968) terms the *"anatomy of intelligence"* (487). **Spearman** (1927) described intelligence as consisting of a general factor (g) representing the total mental energy at an individual's command and operating through the channel of specific ability. **Thurstone** (1938) identified seven *"primary abilities"*: visualization of figures in space; perceptual speed; quickness in dealing with numerical computations; grasp of ideas and meanings of words; word fluency; rote memory; and the ability through induction to extract a rule common to the materials of a problem or test. **Guilford** (1959) has demonstrated the existence of many relatively independent aspects of intellectual functioning and has reinforced the recognition that outstanding ability in one area of endeavor does not necessarily imply outstanding ability in another. There are, therefore, according to Guilford, many ways of being intelligent. *"There are many individuals who long for the good old days of simplicity when we got along with one unanalyzed intelligence. Simplicity certainly has its appeal. But human nature is exceedingly complex and we may as well face the fact"* (471). He identifies five major groups of intellectual abilities or operations: (1) cognition, (2) memory, (3) convergent thinking, (4) divergent thinking, (5) evaluation. The distinction between convergent

thinking, using information in a way that *"leads to one right answer or to a recognized best or conventional answer"* (475) and divergent thinking, thinking *"in different directions sometimes searching, sometimes seeking variety"* (475) has been a stimulus to research and educational practice. **Piaget's** (1926) theory of the stages or levels of intellectual development, each building upon the previous level, reflects the idea of process as opposed to the factorial theory of categorical and static levels. **Thorndike** and **Hagen** (1961) defined intelligence as *"the ability to see relations in, make generalizations from, and relate and organize ideas represented in symbolic form."*

Mussen (1963) refers to intelligence as *"the ability to think in abstract terms and to reason and the ability to use these functions for adaptive purposes"* (46).

Chein (1945) described intelligence as *"an attribute of behavior, not an attribute of a person. Even though we may observe some constancy in how intelligently a person acts in different situations, we may on this basis, speak of the person's characteristic behaviors and not of a genuine attribute of the person"* (119).

What still remains unknown is the degree of overlap among the various abilities. In a symposium on race and intelligence (Tumin, 1963) IQ was defined as a type of derived score attached to intelligence tests that is generally frowned upon by experts in measurement because the assumptions on which it rests differ from one test to another and from one standardization group to another. With regard to intelligence testing, it was generalized that *"all kinds of human performance whether social, athletic, or intellectual, are built on genetic and environmental elements. The level of all kinds of performance can be increased by improving the environmental situation so that every genetic constitution may be developed to its full capacity"* (55).

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Bloom (1964) studied the stability of achievement and suggests that since in his findings, the absolute scale of vocabulary development and the longitudinal studies of educational achievement indicate that approximately 50 percent of general achievement at grade 12 (age 18) has been reached by the end of grade three (age 9) the great importance of the first few years of school as well as the preschool period in the development of learning patterns and general achievement should be recognized. **Bloom** reviewed and analyzed approximately 1,000 longitudinal studies of early learning and concluded that changes in the development of some human characteristics become more difficult with increasing age. **Bloom's** finding has had an impact upon preschool programs and is responsible for much of the new development in curriculum and instruction for young children.

The controversy over the stability, or instability of the IQ was enlivened by **Jensen's** (1969) argument with the premises on which compensatory education efforts have been based that IQ differences are primarily a result of environmental differences and the cultural bias of IQ tests are subject to question. **Jensen** claims that environment acts as a *"threshold variable"* (2) since, he explains, extreme environmental deprivation can keep the child from performing up to his genetic potential, but an enriched educational program cannot push the child above that potential. He recommends the teaching of specific skills to focus on mental abilities besides IQ which have been identified in studies of associative abilities that are independent of social class.

None of the six psychologists, **Cronbach** (1969), **Elkind** (1969), **Bereiter** (1969), **Kagan** (1969), **Hunt** (1969) and **Deutch** (1969), a geneticist **Crow** (1969) and an environmentalist **Stinchcombe** (1969) who responded to **Jensen's** controversial statements are in accord with his views, citing instead, evidences of factors of

educational goals, measurements, and reported research which refute the **Jensen** emphasis on the genetic potential of intelligence.

It appears then, that the interpretation and use of the obtained measurements of IQ are related to the concept of intelligence which the instrument is designed to evaluate and to the concept of intelligence held by the investigator.

With the changing ideas about the nature of intelligence, the **Pines'** (1968) hypothesis can be considered. She suggests that the innovations in education are likely to raise the intelligence of the nation since the children, advancing at their own pace and in their own way are likely to make gains in early learning which will have progressive influence. The advantages which Pines cites, particularly, are that *"The middle class child will not be held back to some comfortable average, and poor children will no longer be crushed before they can learn to learn"* (231). The innovations which **Pines** describes are linked to language learning in concept, method, or materials.

Research Studies

The review of the literature now focuses on the studies of cognitive development which relate, in some respect, to the various definitions of intelligence. The methodologies usually employed in studying concept development require over-simplification of concepts to be learned in relation to the demands of school and often involve inductive and sensory modes which simply are not characteristic of the typical classroom. Representative studies of this nature include **Stern** (1965) who studied learning and transfer and a concept rehearsal condition, and **Wittrock** and **Keisler** (1965), who studied verbal cues in the transfer of concept.

Freyberg (1966) studied six to nine year old children and reported that concept development is more closely linked to the growth of general intellectual ability than to

chronological age (CA) or general maturational level. **Freyberg** concluded that while the patterns of development of conceptual thinking and of general intellectual ability may be similar, these patterns do not necessarily coincide. *"Moreover, children's school performance seems to be associated with aspects of conceptual thinking which are not adequately assessed by conventional intelligence tests"* (168).

Studies of intellectual growth reveal the influence of language on thought processes and concept development and appears to imply the effect of such influence on the results of standardized evaluative measures of intelligence.

Palmer (1969) hypothesized that a child taught at an earlier age than he/she otherwise might learn them, concepts assumed to be prerequisites to subsequent learning, will be able to interact with home and community environment in a manner more beneficial to schooling. Children from the age of two years to two years and eight months and three years to three years and eight months were followed through their first year in public school. Two treatment conditions, labeled *"concept training"* and *"discovery"* were used. In both groups the child interacted with an instructor on a one-to-one basis, meeting for two one-hour sessions a week over an eight-month period. The children assigned to the concept training group were systematically taught concepts selected to increase their ability to make discriminations. Four steps for teaching each concept were specified: (1) the instructor demonstrated and labeled an instance of the concept; (2) the child performed an action related to the concept while the instructor labeled it for him; (3) the child indicated understanding by responding appropriately to the instructor's request to demonstrate an instance of the concept; (4) the child used the concept label appropriately. In the discovery group, no attempt was made to teach concepts to the children. The materials were employed in a free play

setting. Instructors for each child were rotated each sixth session, or about every three weeks, to balance out instructor differences. The experimental groups were superior on several diverse tasks including language comprehension and use.

The impact of early experience on cognitive growth has been studied in a cross-cultural work by **Bruner** and others (1966). This comparative work on culture and equivalence with Senegalese children from the first, third, and sixth-grade levels used a picture-sorting task for which sorting reasons were solicited and compared. The unschooled child used the perceptible attribute as a basis for his sorting behavior, unlike the schooled child's sorting behavior in which there was a developmental shift from perceptible attributes to conceptual content. **Bruner** concluded that where cognitive accomplishment can be carried out only by symbolic means, with a language composed of several levels of meaning, the linguistic tools or language must be available with, **Bruner** emphasizes, an appropriate tutor.

Wulff and **Kraeling** (1961) trained subjects to note important features of all parts of the mechanism before they received any training in assembling it. It was found that these subjects learned less than those who used a procedure in which the same features were pointed out and labeled while the assembly was demonstrated. This supports the Piagetian theory of language association with direct experience in learning.

Dawe (1942) studied the effect of an educational program upon language development and related mental functions of preschool and kindergarten children in an orphan home. The educational program emphasized training in the understanding and use of language symbols. The program included four types of training: (1) training in the understanding of words and concepts; (2) looking at and discussing pictures; (3) listening to poems and stories; (4) going on short excursions. It was found that the

experimental group gained significantly in IQ. It was observed that the experimental children made changes in the direction of improvement in language ability as measured by mean sentence length and sentence complexity, as well as increasing use of verbal expression and more frequent analytical remarks. The experimenter referred to the linguistic symbols as *"intellectual tools"* which would aid the children in adapting to the conditions they met as *"typical of the functional adaptation the human being is required to make"* (208).

The effect of language on cognitive growth and evaluation has been noted by **Hunt** (1964) in the intellectual inferiority apparent among so many children of parents low educational and socioeconomic status, regardless of race. **Hunt** (1964) describes the children who are apt to have various linguistic liabilities as having perceptual deficiencies in the sense that they recognize fewer objects and situations and have fewer interests than do most middle-class children. **John** (1963), **Deutsch** (1964), **Day** (1968), and **Gratch** (1969), observed that on tasks requiring precise abstract language conceptualization, middle-class children were superior.

Although some psycholinguists accept the thesis that if the mother tongue is rich in lexical option, the child has the opportunity to use the language to categorize and integrate his experience, it has been questioned in a functional sense whether such opportunities are available for the lower-class child to develop these uses of language. It is also questionable whether similar deprivation exists where opportunities are available but not used to advantage. **Hess** and **Shipman** (1965) assessed the teaching styles mothers use which shape the learning style and information-processing strategies their children develop. Four-year old children were observed in structured interaction situations. Verbal output in both children and mothers increased across the four

socioeconomic classes included in the study. Concept-sorting behavior for middle-class children and mothers was superior and perhaps was related to the higher level of verbalization or linguistic encoding associated with the reasons of both the mothers' and children's thoughts. The growth of cognitive processes as indicated in this study appears to be dependent on the cognitive meaning in the mother-child communication system. Impoverishment of meaning in the family communication and control system means fewer available alternatives for consideration and choice. The investigators conclude that, *"Unavailability of behavioral alternatives and the restricting parents-child relationship militate against adequate cognitive growth. Interaction patterns which rely on status rules rather than attention to the characteristics of the specific situation, and where behavior fails to be mediated by verbal clues, tend to produce a child to relate to authority rather than rationale"* (884).

The relationship between intelligence test, language skills, and environment therefore indicates further interdependence. Since middle-class children develop better language skills, they tend to enjoy an advantage in intelligence tests. Since they may be highly motivated to achieve in school and in academic tasks, they are likely to perform better in a testing situation than do the lower-class children with less language and less motivation. Although recognition of language development has had an impact on school programs generally, the literally monumental program of improving and enriching the environment of the lower-class child has placed particular emphasis on communicative and cognitive aspects of language interrelatedly in activities.

Attention has been given to the evaluation of the curriculum from which learning experiences are drawn, and from which intellectual growth emerges in **Piaget's** concept of the interaction of *"nature and nurture"* (543) (Elkind 1967). **Dressel** and **Mayhew**

(1954) concluded that learning objectives are best achieved when the learning experiences are devoted to them. The term *"learning opportunities"* was defined as the situations, activities, objects or presentations which elicit desired responses from the learners not the least of which are linguistic responses. In the **Sandel** (1970) study, the emphasis on activities and situations for children's written expression could be interpreted as *"learning opportunities."* From the curriculum studies of **Glaser** (1967), **Scriven** (1967), **Lortie** (1967), **Goodlad** (1968) and **Wittrock** (1969), **Baker** (1969) has concluded that *"tradition is an unsuitable guide for choosing among competing novelties"* which appears to invite innovation in educational practice. The importance of linguistic representation in the teaching situation has been noted in various contexts by **Hall** (1959), **Carroll** (1964), **Langefeld** (1968), **Leonard** (1969) and **Bruner (1968). Senn** (1969) and **Frost** (1969) emphasized the growth of language power in the concept of educating the *"whole child."* In this view, the new combination of percept and concept produces the highest form of language and thought activity--creativity. Since, according to **Taylor** (1968), creativity is excluded from the concepts of intelligence as defined by IQ tests, he contends that we are fostering mere *"recorders and reproducers"* rather than *"thinkers and producers,"* categorical descriptions which are particularly applicable to aspects of the primary-grade language program.

According to **Sontag** (1958) and **Kagan** (1958), children showing an ascending trend in intelligence rated somewhat higher than others in traits such as independence, aggressiveness, initiative and competitiveness. These traits are similar to those noted for children of verbal competency in the studies of language and behavior (Rosenthal, 1956; Scheidel, Cowell, and Shepherd 1958).

In summary, language can be seen in its relationship to intelligence as a fundamental role in the acquisition of cognitive skills, in the performance of intellectual tasks and in the evaluation of intellectual ability, as well as in its interrelationship and interdependence with intelligence in the development of the *"whole child"* (Senn 1966 (12), Frost 1969 (8) and the creative *adequate person"* (235) (ASCD 1962). It can be expected, therefore, that intelligence as represented by a derived IQ rating will have a determining effect on certain quantitative features of children's oral and written language production.

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