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ABSTRACT

Given what is known about cognitive development, how well prepared are 4-year-old children to succeed in school? This paper addresses the question by describing three areas in cognitive development, highlighting major themes in the research, and suggesting implications for teaching practice and social policy. Classical and contemporary views of cognition are contrasted prior to discussions of theory contextualizing and differentiating cognitive development. Qualitative and, preponderantly, quantitative evidence for the "five-to-seven shift" is reviewed. Discussion concludes by contrasting academic versus everyday cognition. It is argued that teaching and assessing 4-year-olds in public school settings will fail, unless special emphasis is placed on embedding cognition in everyday practical terms, so that all classroom communications "make human sense." It is concluded that a considerable amount of information is available concerning the cognitive development of young children which can serve as a guide in teaching practice and social policy. Because young children do have an intrinsic motivation to learn and to understand, they deserve developmentally appropriate educational challenges. The alternative relegates 4-year-olds to understimulation. (RH)

Research and Related Issues: Cognitive Development of the Young Child

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This paper describes three areas in cognitive development during the preschool years and highlights major themes and suggests implications for teaching practice and social policy.

How well prepared are four-year-old children to succeed in school given what is known about cognitive development? Two sections comprise this paper. First, classical and contemporary theories will be surveyed. Second, what has empirical research on early cognitive development added which contributes to our understanding of appropriate expectations for four-year-olds in classroom settings?

Classical Views

A number of theories of cognitive development have been in existence for some time now, which have proven to be very inspirational not only to practitioners but also to modern day researchers and theorists.

Theories of mental development proposed by Piaget (1977), Vygotsky (1962), and Werner (1948) share an overall agreement regarding general developmental progression from early sensorimotor concrete organization of experience to a more autonomous categorical-inferential or abstract mode of organizing experience. Each purports to provide a comprehensive description of the young child's interaction with the environment and the child's conceptualizations of the environment. According to these classical theories, the early years are marked by a dramatic liberation from perceptual- or stimulus-boundedness as the child's symbolic capacities blossom and as language develops. Sensorimotor intelligence involves conquering the object (object permanence), while pre-conceptual and intuitive intelligence involves conquering the symbol (logical operations). Cognitive development during the preschool years entails internalization--objects-to-symbols or representations and actions-to-operations or thought processes whereby actions-on-objects become symbolic thought or represent nationally-bound operational thinking.

In sum, the classical theorists, while differing on specific emphases, all agreed on the general direction of cognitive growth. Four- and five-year-olds, by these accounts, are not viewed as systematic, logical thinkers. They are seen to be in the midst of change, transitional on the road from sensorimotor to operational intelligence.

Contemporary Views

The classical theories had two other features in common as well -- features that modern thinkers consider to be limitations. One was the relative lack of concern for the role of the specific environmental factors that impinge on mental development and influence its course; the second was a notable prescription to an omnibus position concerning the development of intelligence, or to the existence of a general symbolic capacity.

Contextualizing Cognitive Development

Recent theorizing on cognitive development during the pre-school years has attempted to flesh out situational determinants that influence its course. The early theorists did not totally neglect or forget this topic, they merely were placing their emphases elsewhere. For example, Piaget's construct of discrepancy resolution inherent in disequilibriation as a mechanism of developmental change influenced J. McV Hunt's (1961), who, in turn, coined the term "the problem of the match" to refer to developmentally appropriate stimulation needed to stretch the child forward. Vygotsky's "zone of proximal development" shares as another influential link to Hunt's formulation, just as Piaget, Vygotsky, and Hunt all influenced Bruner's (1973) thinking concerning "scaffolding," which refers to how an adult can accommodate to the limited abilities of the child in order to help the child participate meaningfully in mutual interaction and thus reap all

the benefits from this important kind of social commerce during the early years. It should be noted, however, that with the exception of Piaget, who saw particular value in child-child interaction to reduce the child's egocentric tendencies, which, when interlocked with adult constraint impede cognitive development, the theorists were referring primarily to adult-child interactions.

Building on the work of Piaget, Vygotsky, Werner, and Bruner, Sigel and his associates have been working on the task of improving our understanding of the ontogenesis of representational thought (Sigel, McGillicudy-Delisi & Johnson, 1980). In particular, we are interested in specifying the kinds of experiences that contribute significantly to the development of representational thought and to the ease with which children can conserve meaning among various representation of objects and events. Sigel (1970) has coined the term "distancing behavior" to refer to those behaviors by significant others that serve to "force" the child cognitively to separate self from the here and now. Distancing events energize or activate and channelize the child's representational thinking and thus promote its use and development. These events can be verbal (e.g., teachers comments or inquiries) or nonverbal (e.g., new room arrangement, placement of a novel object). In either case, distancing is a fundamental social process that enhances the development of representational thought (Sigel, 1987).

Differentiating Cognitive Development

Another preoccupation of contemporary theorists of early cognitive development is differentiating cognitive development. As noted previously, the classical theorists adhered to an omnibus or general conception of intelligence or to viewing the developing symbol system as an unfolding unitary capacity. More recently, a number of psychologists and educators, influenced by theorists such as Piaget, have come to the conclusion that this way of conceptualizing intelligence may be too narrow, and so these researchers have begun garnering evidence supporting a more pluralistic view of cognition (Feldman, 1980; Gardner, 1983; Keil, 1984).

Gardner (1983) has been most outspoken that the mind is organized into relatively separate realms of functioning. His sources of information have been from a kind of subjective factor analysis of different sets of data from diverse disciplines including brain injury research, psychometric empirical research, cross-cultural anthropological research, special populations (i.e. autism, idiot savants, prodigies) research, and cross-species research suggestive of our evolutionary past. He originally proposed seven relatively independent systems localized in regions of the brain: linguistic, spatial, logico-mathematical, musical, kinesthetic, interpersonal, and intrapersonal. A pure raw, unmediated, intellectual competence resides in one's information processing capacities, but the raw material is used in the different symbolic systems. Gardner and his associates have defined cognitive development as "....the growing capacity to convey and appreciate meanings in the several symbol systems which happen to be featured in a given cultural setting " (Malkus, Feldman & Gardner, in press). Learning, memory, and perception are not the same cognitive process cutting across the different symbolic systems. According to Gardner's Theory of Multiple Intelligences (TMI), they would be different cognitive processes.

A general educational implication from TMI is that each child in early life becomes "at risk" or "at promise" in each symbolic domain, given the sociocultural opportunities, encouragement, stimulation, or lack thereof, for each category of intelligence as found in the environment in which the child is developing. Because one cannot prejudge in which areas a child may have latent talent, assuring a general exposure to all kinds of stimulation relevant to each type of intelligence is more prudent than providing more limited but intensive exposure to only factors selected to affect a particular intelligence such as logico-mathematical reasoning or language.

To conclude this section, classical theories of cognitive development portray the preschool children as having incomplete conceptual frameworks, limited knowledge, and a certain illogic about them -- they are not fully decentered and abstract in their approach to the environment. More recent theories have improved our understanding by looking more closely at the social context of cognitive development and at the nature of cognition itself. Empirical research has yielded some interesting and suggestive findings relevant to theories of cognitive development and to the questions of formal schooling for four-year-olds.

Contributions of Research

Over two decades ago psychologists were in the midst of researching the phenomenon known as the five-to-seven shift (Kendler & Kendler, 1962; White, 1965). A large part of this interest was due to the fact that this age period coincided with the point at which children were making the passage to formal schooling. Theorists have proposed that there is a stage change at this time (Freud, 1938; Piaget, 1960; Vygotsky, 1962).

Qualitative Evidence

Cross-cultural ethnographic data indicate that both Western and non-Western societies change the social place of children at the age when they place them in school, at an age overlapping with when some developmental theorists argue that there are stage changes in cognitive development.

Ethnographies of 50 cultures that had extensive information about childhood were selected from the Human Relations Area File (HRAF) at Harvard University by Rogoff, Sellers, Pirrotta, Fox, and White (1975) to estimate ages at which each culture assumed responsibility or teachability in children or assigned a more mature social, sexual, or cultural role. For 16 of 27 categories inspected, there was a modal shift in the five-to-seven year range in cultural assignment of social responsibility. According to Rogoff et al. (1975), in Western societies the practice of beginning serious schooling between five and seven has been standard for a long time. Western society's changed treatment of children pre-dates stage postulations about latency, concrete operations, or mediation.

The English common law, as codified by Blackstone in 1769, has traditionally held the child of seven years to be first capable of knowing right from wrong, first capable of being guilty and liable to stand trial. Catholic canon law makes similar assumptions about the child's capability of sin. Historically and cross-culturally, then, there has been wide recognition, implied if not formalized, that it is after age four years that a critical turning point occurs in the child's cognitive status. Public school participation extended downward, then, would be bucking the accumulated wisdom of mankind, according to this evidence, if the form it takes is to pursue educational curricular goals appropriate for older children when younger children would appear to only benefit from the use of methods and approaches appropriate to their own age.

Quantitative Evidence

Interest in the question of the kind of change that occurs during the five-to-seven shift has interested developmental researchers from diverse backgrounds (Brown, Bransford, Ferrara, & Campione, 1983). Learning theorists have argued over the proposition that a qualitative shift occurs between non-mediated learning in the preschooler and mediated learning in the older child (Kendler & Kendler, 1962; Zeaman & House, 1963), or whether a change occurs from absolute to relational learning (Brown & Scott, 1972; Reese, 1968). Piagetian-inspired researchers, pro and con, have been also very active examining the qualitative changes that take place in the transition from preoperational to concrete operational thought (Gelman & Baillargeon, 1983). Memory and metamemory researchers also became interested in a five-to-seven shift in use of memory strategies (Wellman, 1977).

Recent empirical evidence from different domains of cognitive functioning has put into question the ubiquitous five-to-seven shift, and suggest that preschool children have more competence than originally thought based on theory. Although a full-blown operational status may not occur prior to the idealized five-to-seven transition, various propensities in younger children exist, supporting theories that their cognitive abilities may have been underestimated by earlier theory and research that employed traditional laboratory tasks or other artificial assessments. To uncover early competence has required that assessment take place under circumstances ideally designed for the preschoolers' interests and abilities. To expose early competence has required that the researcher (and teacher?) strip away all but the most essential feature of the task to reveal its cognitive demands in the simplest possible form and that the assessments be situated in a familiar context.

Examples of research studies that have suggested higher competence in younger children have done so by taking to heart these procedural recommendations; they are many. For instance, Istomina (1975)

investigated the gradual emergence of strategic planning in preschool children. He found that preschool learners and memorizers showed an early propensity to plan, although other researchers reported that full-blown forms of rehearsal, categorization and elaboration are not apparent prior to age five years. To reveal this propensity, however, the situation must be such that the goal of the activity is clear to the child, the setting familiar, and the index of strategy use lenient. Istomina asked preschool children, accordingly, to remember a list of items to be bought at a play store and compared performance to when children were given the same list as part of a formal lesson. Performance was significantly superior in the play condition, with strategies adapted and the way in which they were used more developed comparing children from four to six years. Even the youngest children knew what it meant to remember. However, as Istomina noted, "They must not only know what remembering is by itself, but also be able to see it as an end result, an objective to which activity must be directed, i.e., to grasp it as a goal" (Istomina, 1975, p. 59).

Counting, conservation, and class inclusion success are apparently not beyond the preschooler when specially devised tasks are employed. For instance, Hughes (1986) reported in detail a study involving a box task in which young children displayed significantly superior performance adding and subtracting small numbers compared with when a formal testing situation was imposed. On the box task children are asked how many are in a box after the investigator adds or removes bricks. The problem is real and meaningful for the children in the way some of Piaget's tasks are not.

Others have devised ingenious procedures revealing early competencies in class inclusion and in the conservation of numbers (Gelman & Gallistel, 1978; McGarrigle & Donaldson, 1974; McGarrigle, Grieve, & Hughes, 1978). Gelman and her associates have demonstrated that children as young as three years of age understand the invariance of small numbers -- three or fewer -- using her "magic" game in which after children develop an expectancy that a particular arrangement will contain a certain number of objects, the arrangement is surreptitiously ("magically") rearranged or objects are substituted with others. Likewise, McGarrigle and Donaldson (1974) found that significantly more children conserved numbers when a "Naughty Teddy" messed up an array compared with when the adult experimenter formally rearranged the objects as if to suggest to the young child that something important and deliberate was taking place. McGarrigle, et al. (1978) similarly use Teddy's steps strategies to uncover preschoolers' latent class inclusion understanding. In all of these examples the thinking tasks were translated into something more familiar and meaningful to the young child, or changed to "make human sense," as Donald puts it.

Adler (1984) has noted, in a similar view, that often the wording used in formal assessment violates ordinary conversation rules of being "relevant" and pertinent. The class inclusion probe of Inhelder and Piaget (1964), for instance, "Are there more tulips here or flowers," is an obscure if not downright deceptive inquiry given the perceptual cues present in the task. Children may assume they are being asked a perceptually evident question and, hence, do not compare the subclass with the class. When asked to make more legitimate subclass to total class comparisons, preschool children appear sensitive to the principles of "class inclusion" ("Are there more children or more people?"). Susan Isaacs (1930), over fifty years ago, illustrated many examples of the kind of intellectual performance that even children as young as three to five years are capable under the right conditions.

Tizard and Hughes (1984) reported recently some very interesting findings from their ethnographic study of language behaviors and inquisitiveness of 15 middle-class and 15 working-class girls, comparing behavior at home versus at school. Once again, young children, and in this case particularly working class children, appeared more competent at home or when in the familiar and meaningful setting. These preschoolers were seen to engage in rich verbal exchanges with their mothers and seemed very persistent and logical as they beavered away at tasks that interested them at home. This contrasted sharply with their behavior at school. There they did not ask or answer as many questions and were less verbal and intellectually active in general. Tizard and Hughes reasoned that for these preschoolers all human experience was grist for their intellectual mill. The preschoolers in their study were particularly interested in other people's viewpoints and in social casuality but were much less interested in questions of physical casuality.

Others have reported superior behaviors and skills by young children under naturalistic conditions. Garvey (1977), for instance, reported that the highest levels of linguistic maturity were evident in the language of four-year-olds when they were engaged in spontaneous role play. Moreover, extensive literature exists suggesting that problem-solving behavior in young children is more efficient and combinatorially rich

under play conditions than under observational learning or tutorial conditions (Rubin, Fein, & Vandenberg, 1983).

Academic versus Everyday Cognition

From the theoretical and empirical evidence cited, it is clear that there are pronounced qualitative changes in the cognitive abilities of children during the early childhood years. Classical stage descriptions and their extrapolations by today's revisionists underscore the importance of the preschool years for overall intellectual development. Strong consensus exists across theories concerning the general sequence of cognitive growth. Disagreements occur primarily over exactly when young children possess certain abilities and regarding whether there is any necessary way different cognitive abilities and task performances interrelate. From the work reviewed here (which has excluded an important area of the cognitive literature pertaining to efficacy of training studies), it would appear that the five-to-seven year pivot may be somewhat misleading. It is a gross idealization, dichotomizing the "under-fives" as pre-casual, egocentric, preoperational, passive, nonstrategic, and nonplanful, and the "over-fives" as decentered, logical, planful and strategic. It is absurd to think that one fine sunny morning a child wakes up suddenly nonegocentric! Cognitive development is a gradual, day-to-day process. Cognitive performance of young children is notoriously susceptible to context effects. The rate of cognitive development differs dramatically across children, as individuals and as groups.

Brown et al. (1983) referred to the important distinction between academic and everyday cognition and noted that a disproportionate share of the empirical research literature deals with what is called academic cognition. Academic cognition is effortful, isolated, and cold, while everyday cognition is relatively less effortful, social and affect-laden. Learning is interactive and dynamic. The young child's everyday cognition is scripted knowledge, based on observations of others in social roles and on the observation of physical phenomenon. Vygotsky (1962) referred to the difference between practical knowledge and scientific knowledge; Piaget (1960) referred to practical intelligence on a motoric plane and symbolic intelligence on a symbolic plane. Children appear less cognitively able when in situations that call on academic, scientific, or symbolic abilities, and they are more cognitively able when in situations where everyday, practical knowledge and cognition can prevail.

Formal schools traditionally, and by definition, have been concerned primarily with success in terms of independent competence. The emphasis has always been on deliberate and efficient use and mastery of problem-solving skills and basic skills and on the acquisition of factual and procedural knowledge. Less attention has been placed on emotional factors that may promote or impede efficient learning or thinking. Yet, as we have seen, early cognitive competence is very fragile (i.e., production deficiency hypothesis). Teaching and assessing four-year-olds in public school settings is doomed unless special emphasis is placed on embedding cognition in everyday practical terms so that all classroom communications "make human sense."

Conclusion

Given the limitations of the young child's cognitive capacities, particularly with respect to the information processing capacity or the "effective capacity" of young children (Price, 1982), it is of paramount importance for classroom practice to be modified to take into account the special needs of four-year-olds. These classroom modifications require a shift in thinking concerning the role of the teacher and the definition of instruction.

Price (1982), in a review of cognitive learning in early childhood education, discussed the importance of "de-coupling" teaching and learning. This is difficult for teachers to achieve given that expecting and seeing children learn what is taught is reinforcing to the teacher. However, in his analysis of the role of verbal processes in learning and overlearning and the establishment of automaticity in retrieval in children, Price argued that educators need not be resigned to simply waiting for maturational bottlenecks to be removed. In an ambient manner, lessons can be introduced to young children which are simplified in order to lower the demands on attentional capacities. He stated, "Children can be introduced to concepts that bring manageable parsimony to something previously too complex. Educators can work to foster familiarity with elements that, if unfamiliar, could not be assembled by a child into a manageable whole" (p. 282). The familiarization with letters and numbers which could result, and in a pressure-free way, would prepare the

child for higher-level skills such as those which are involved in reading or in mathematics. This can be done without interfering with the child's motivation to learn. Dissatisfied with both the interventionist's motto of "teach earlier expect learning earlier" or the anti-interventionist's motto, "teach later, expect learning later," Price commented, "Both approaches prevent children from experiencing a prolonged, pressure-free period of familiarization, which would be possible if efforts to teach and expectations for mastery were uncoupled from each other. Familiarity would be maximized and difficulty minimized by following a teach earlier expect later approach" (p. 282).

This approach is antithetical to the drill and practice methods of reinforcing children's imitations of adults, or coaxing young children to give the right answers (e.g., calendar days, letter recognition, flash cards). Implicit in this approach is the recognition of the critical distinction between learning and the disposition to learn. Early childhood education must cherish the latter and never risk stealing it away from the sake of the former. Lillian Katz recently took the stand that the closest thing that comes to a sin for teachers, in her view, was to make young children behave as if they understand when in fact they do not and thus undermine their confidence in their own intelligence. Academics for three-to-five-year-olds must be guided by the realization that exposure or instruction under ambient conditions can be benign but only if there is not too much of it so as to undermine dispositions to learn in young children. As Zigler (1986) quipped, "Our four-year-olds do have a place in school, but not at a school desk" (p. 14).

There are many parts to a developmentally sound educational program for four-year-olds (Day & Drake, 1986). The use of distancing strategies with young children, for example, is consistent with the orientation to classroom practice outlined above. Distancing is child-centered instruction and content-general. In other words, distancing is an effective teaching strategy which is based on cognitive processing considerations and not on a concern with transmitting specific information. Another vital ingredient is providing for and nurturing developmentally appropriate play behavior in preschoolers. Strategies for incorporating play in curricula for young children are diverse and are based on an accumulation of research evidence in support of the hypothesis that play is intrinsically interlinked with the cognitive development (Johnson, Christie, & Yawkey, 1987).

To conclude, a considerable amount of information is available concerning the cognitive development of young children which can serve as a guide in teaching practice and social policy. From this review, the early theoretical descriptions of cognitive changes were seen to refer primarily to what was called academic as opposed to everyday cognition. Important early competencies do exist. Young children do have an intrinsic motivation to learn and to understand. They deserve developmentally appropriate educational challenges. What should be stressed is that the alternative is for four-year-olds to remain understimulated. Preschoolers are a diverse group. Making the wrong kinds of demands for a particular child is all too easy to do particularly for younger children. At this time, the only chance would appear to be for public schools to listen attentively to the then considerable historical and contemporary testimony available from research and theory construction and to tailor the child's outfit accordingly. We want a Sunday best suit, not a Halloween costume.

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