

Introduction

During the past two decades, increasing attention has been given to a life-span orientation within both the fields of developmental psychology and education. While never a dominant approach, the life-span perspective has had its proponents throughout the history of both disciplines (see Baites, 1979, and Riegel, 1977, for historical reviews). It may be of particular interest to educators that Sidney Pressey, known for his pioneering work on teaching machines, co-authored one of the earliest life-span texts in American psychology (Pressey, Janney, & Kuhlén, 1939). Even earlier was E. L. Thorndike's major work on adult learning (Thorndike, Bregman, Tilton, & Woodyard, 1928).

The recent revival of interest in a life-span approach can be linked to a number of contemporaneous events. First, is the growing shift in the age structure of Western industrialized societies, including the United States. As the average life expectancy has increased in this century, the number of persons over 65 in the U. S. has doubled from 1950 to 1980. In contrast, there has been a decline in the proportion of the population in childhood and adolescence. This age shift is projected to continue to increase into the next century. Given the traditional emphasis on youth within both disciplines, such demographic trends have important implications and consequences. One of the most evident changes has been the increasing focus on the adult years within psychology and education. While a life-span perspective should not be equated with the study of adult development and aging, greater attention to this relatively neglected age period (in contrast to the early years) is useful in the development of an integrative life-span orientation. Some of the most recent proponents of the life-span movement have been prominent in the gerontological

K. Warner Schaie
University of Southern California

Sherry L. Willis
The Pennsylvania State University

literature (Baltes & Willis, 1979; Neugarten & Havighurst, 1976; Riegel & Meacham, 1976; Riley, 1979; Schaie, 1979). Particularly important in developmental psychology have been a number of longitudinal studies focusing on adult development. These longitudinal studies included both research specifically on development across the adult years (Neugarten, 1968; Palmore, 1974; Schaie, 1979) and also follow-up studies on aging participants from several child growth studies (Bayley, 1968; Eichorn, 1973; Honzik & Macfarlane, 1973). As longer portions of the life span have begun to be examined, a number of methodological procedures and issues have gained increasing attention. It appears likely that these matters, associated currently with a life-span approach, will gain in importance for future developmental and educational research. Thus, both sociocultural trends with related implications for educational and social policy and a more comprehensive knowledge base regarding human development have contributed to the renewed interest in a life-span approach.

In this article, we will begin by discussing several critical features of a life-span perspective which differentiate it from more traditional youth-oriented approaches to developmental psychology. Secondly, three methodological issues evolving primarily from a life-span orientation to development will be examined. Finally, implications of a life-span perspective for educational research and practice will be considered.

Critical Features of a Life-Span Orientation

Life-span developmental psychology is best characterized as a perspective or an approach to the study of development, rather than as a specific theory or model of development. The life-span perspective is not linked to a specific area of development (e.g., cognition) or age period (e.g., adulthood), nor is it necessarily aligned with one particular theoretical persuasion (e.g., cognitive developmental, behavioral). Rather, it seeks to understand the developing

individual across the entire life course within a changing socio-cultural context. One could, for example, study parent-child (intergenerational) relationships across the life course from a social learning, cognitive developmental, and/or behavioral orientation. Within a life-span approach, consideration would also be given to the impact of cultural change on the developing parent-child relationship. In this section, several features of a life-span orientation will be discussed which distinguish it from more traditional perspectives of developmental psychology.

Age-Segmented vs. Life-Span Focus

A historical review of developmental psychology suggests that the field has evolved largely as a set of distinct, age-segmented specialties: infancy, child development, adolescence, adulthood, and aging. These life stage specialties have developed their own unique theoretical and empirical knowledge bases with relatively little communication or linkage across developmental periods. The age-specific orientation is reflected, for example, in the psychometric approach to intellectual functioning and assessment. Global intelligence measures, such as the Wechsler and Stanford-Binet, have focused on age-graded tests and have assessed knowledge and skills specific to a particular age period, rather than assessing the individual's changing understanding of the same concept across the life course (Baltes & Willis, 1979; Labouvie-Vief, 1977). Such an approach may be useful for the description of interindividual differences at a given age period but is less appropriate for understanding the course of cognitive development and change across the life span.

In contrast to an age-segmented approach, a life-span perspective seeks to define patterns or sequences of developmental change across the life course, to examine the interrelationships among developmental periods, and to identify antecedents and processes associated with change. While chronological age is a very salient index variable within an age-segmented approach, the focus within

a life-span approach in on the pattern of developmental change, which may not be highly associated with chronological age. Particularly in adulthood, chronological age may not be the most useful index of developmental change for psychological processes, such as intellectual functioning. For example, verbal ability throughout much of adulthood appears to be more closely associated with educational level or sociocultural experience than with chronological age per se.

Continuing Developmental Change

A life-span perspective assumes that significant developmental change occurs across the total life course and seeks to examine the nature and sequence of this change (Baltes & Willis, 1979; Brim & Kagan, 1980). This position is in contrast to a view that the most important developmental changes occur primarily during childhood and adolescence, and that adulthood, for the most part, is characterized by stability in the early and middle years with sharp and pervasive decline in old age. Such a traditional view assumes that adult development is largely defined and constrained by events occurring in childhood. For example, within the Piagetian theory of cognitive development, the final stage occurs in adolescence or young adulthood. Likewise, the psychoanalytic approach focuses on stages in childhood and their impact on the rest of the life course. A life-span approach, by broadening the definition of what is considered developmental change, argues that important change can and does occur across the total life course. Early life experiences can interact with and may be transformed by events in adulthood. Also, some behavioral events occurring at early life stages (particularly in infancy) may simply be required to permit the individual to survive until a subsequent life stage is reached and may have no predictive import in themselves for later behaviors (Kagan, 1980).

In the study of life-span development, it is important to consider both quantitative (change in level, rate, degree) and qualitative change (change in

nature, type). For example, change in adult intellectual functioning may involve not only quantitative change in the adult's level of performance but also qualitatively different forms of intelligence unique to adulthood (e.g., wisdom). Intellectual functioning in adulthood may involve primarily knowledge synthesis, integration, and evaluation rather than ^{the} knowledge acquisition more characteristic of childhood (Labouvie-Vief, 1977; Schaie, 1977-78).

Developmental change across the life course is also multidirectional. In childhood and adolescence, the dominant pattern is unidirectional and incremental. That is, children increase in height, motor complexity, and abstractness of thought processes. In adulthood, however, multidirectional developmental patterns may be observed for different areas of development. Speed of responding may decrease; size of vocabulary may increase; and certain personality dimensions, such as extroversion, may remain stable.

An important consequence of a focus on continuing change is the recognition that behavioral plasticity continues across the life span. Thus, there is the potential for the modifiability of personal characteristics across the life span. Positive growth and change usually have been expected and encouraged in childhood and adolescence. As a society, we have expended considerable resources for intervention programs to modify and facilitate development in childhood. Through these efforts, knowledge has been gained on the range of developmental plasticity in physical, cognitive, or social development during the early years. In contrast to the emphasis on positive change in childhood, the study of change in adulthood has focused frequently on decrement, particularly physical and mental decline. This emphasis on negative change in adulthood has often led to assumptions regarding the irreversibility of behavioral decrement. A life-span focus on developmental change requires that the range of plasticity or modifiability of functioning be examined in adulthood as well as in childhood.

Increasing Individual Differences

A life-span perspective emphasizes the importance of examining both intraindividual (change within the individual) and interindividual (interindividual variability) across the life course. Study of a number of developmental phenomena (e.g., intellectual functioning, sensory acuity) indicates that the range of individual differences increases across the life span. That is, the range of variability or differences between individuals of the same chronological age increases from childhood to adulthood.

While most normal children achieve developmental milestones, such as walking or entering school, within a relatively restricted age range, adults vary considerably in the chronological age associated with developmental milestones such as marriage, birth of first child, graying of hair, or menopause. It is likely that the more narrow age band within which individual differences occur in childhood is associated with the greater isomorphy between biological and behavioral development in the early years. The rate and sequence of physiological development imposes a timetable on many aspects of behavioral development in childhood. In addition, age-graded cultural institutions and norms associated with youth (e.g., age guidelines for schooling, driver's license) may promote a close alignment between chronological age and certain developmental events (Riley, 1976). In contrast, the adult has reached biological maturity, and behavioral development is less closely linked to biologically-determined maturational processes until, perhaps, very old age. Nor are there as many culturally imposed age-related restrictions on adult behavior. As age-related biological and cultural moderators diminish in importance in the adult years, environmental and experiential factors come to play a far more pervasive role in adult development. Such environmental factors become not only more influential, but also more diverse in adulthood. This diversity of experiences, in turn, contributes to the increasing individual differences in adulthood. Environmental,

influences may range from specific experiences unique to a given individual (e.g., great wealth) to broad-scale, historically significant events, such as war or depression, affecting an entire generation. Given the importance of differential experiences in adulthood, some authors have questioned whether there are truly universal, normative events or stages in adulthood comparable to those in childhood (Flavell, 1970; Hultsch & Plemons, 1979). The greater variability in both developmental patterns and in the environmental factors affecting life course change has important implications for designing educational efforts in the adult years, as we will discuss in a later section. The focus on environmental influences leads, then, to consideration of a fourth critical feature.

Sociocultural Change and Development

Over the past few decades, the child development literature has shown increasing sensitivity to the importance of environmental influences (cf. Bronfenbrenner, 1977). However, less consideration has been given to sociocultural change as it impacts development. An exception is Roche's (1979) recent monograph on secular trends in physical development. For the most part, recent discussions of development as a function of person-environment interactions have involved a static conception of the cultural context. However, it is well documented that current generations are experiencing dramatic cultural change across the life span and that this change is impacting development. While the cumulative impact of cultural change becomes most evident in adulthood, it may affect development at any period in the life span. For example, changing medical trends in the use of anesthesia during childbirth have been shown to affect basic forms of learning in the newborn (Poroges, 1975).

Since generations will differ in the nature and rate of cultural change experienced over their life spans, it becomes important within developmental psychology to examine between-cohort (generational) differences in individual

development. It is necessary to study a developmental phenomenon over the same chronological age range in several cohorts to differentiate cohort-specific from more universal patterns of development. In much of our research, the study of developmental (or educational) change has been confounded with possible generational effects. A striking example of the impact of generational change is found in the literature on adult intelligence. Typically, changes in intellectual functioning during adulthood have been studied by comparing the performance of persons of differing ages (20, 30, 40 . . .); and lower levels of performance in the older years have been reported for abilities such as spatial orientation or abstract reasoning. However, Schaie's (1979) longitudinal study of several cohorts over the same chronological age period suggests that prior findings of lower performance associated with age are partially a function of generational confounds. That is, earlier cohorts performed at a lower level on intellectual tests than did later cohorts when assessed at the same chronological age. Thus, lower performance levels in the aged are more a function of generational effects than drastic age-related decline. Methodological procedures for differentiating change associated with generational (cohort) vs. developmental effects will be considered in the second section.

Influences on Developmental Change

Within a traditional child-oriented approach, explanatory models of development have focused on maturational/biological and environmental (physical and social) factors and their interaction. A life-span perspective suggests a somewhat different conceptualization of these sources or antecedents of developmental change. Three major systems of influence have been proposed by Baltes (1979): age-graded, history-graded, and non-normative. Age-graded influences have been examined most extensively within traditional child-oriented developmental approaches. These include both biological/maturational and environmental (socialization) determinants which are highly correlated with chronological age. Age-graded biolog-

ical-based influences include both neurophysiological processes moderating development in the early years and possible physical decline factors affecting behavior in very old age. Age-related environmental factors include the age-graded tasks and socialization experiences defined by a particular culture. For example, schooling in the first part of the life span has been a major age-graded socialization experience, with not only instruction itself age-graded, but also there being age-segmented consequences moderating the timing of youth's entry into the labor force and assumption of responsibilities and privileges associated with adulthood.

A life-span perspective suggests that human development occurs within a changing sociocultural context and that particularly in adulthood, unique non-normative life events may be important sources of change. History-graded influences reflect such sociocultural change and are highly correlated with historical time, rather than chronological age. For example, history-graded influences such as inflation (or depression) and changing perception of women's roles interact with age-graded events such as child rearing to produce cohort effects. Likewise, politically-motivated events such as the social programs associated with the war on poverty can produce cohort effects with regard to early education. Such history-graded effects apply to most individuals within a given culture during a particular historical period.

A third source of influence, non-normative life events, involves those incidents that are not universal and that do not occur for most individuals. Non-normative events specific to the individual may include serious illness, death of a significant other, or particular opportunities. The occurrence of such events may be particularly stressful, because they are not associated with a normative developmental pattern. The individual, of course, has received little or no socialization for non-normative events and may, therefore, require special educational or interventive efforts to cope with them. At the same

time, what are considered non-normative events in one particular historical period may become increasingly more common (quasi-normative) events in succeeding time periods. For example, post-secondary education (college or vocational) has become an increasingly normative event during the past few decades.

The above sources of influence, of course, interact in producing developmental change across the life course. While all three sources may occur at any period of development, age-graded influences have been associated most frequently with childhood, and the likelihood of non-normative events becomes cumulative in adulthood. As we will discuss in the third section, such categories of developmental influences may have important useful implications for conceptions of life-long learning and education.

Methodological Issues

The study of developmental processes across the life span is fraught with all the methodological problems faced by developmental scientists working at any particular stage of life. However, what may be minor confounds and caveats raised by perfectionist researchers at a single life stage become major threats to the validity of inferences when long periods of time or age spans are covered. In this section, we will consider three major methodological issues: the problems caused by the indiscriminate inference of age changes from data based on age differences; the question of construct equivalence across the life span; and the role of descriptive and experimental approaches in research on life-span development.

Age Changes vs. Age Differences vs. Sociocultural Change

Although this article cannot cover in detail the problems involved in the correct interpretation of developmental data obtained from cross-sectional, longitudinal, or sequential methods, we would be remiss if we did not call attention to the assumptions required for use of the more commonly encountered

research designs (for more detailed technical discussions, see Baltes, Reese, & Nesselroade, 1977; Nesselroade & Baltes, 1979; Schaie, 1973, 1977; Schaie & Hertzog, 1982).

Many studies of age effects, comparing the behavior of persons at widely differing ages, employ the cross-sectional method. In this approach, individuals from two or more age groups are compared at one point in time. By definition, members of different groups must belong to different birth cohorts which may have had differential prior experience. For example, if we compare a 20-year-old and a 70-year-old group, we cannot assume that the oldsters had similar experiences during their first 20 years of life as did the current 20-year olds. Cross-sectional data, therefore, will always confound ontogenetic (individual) change with generational differences. When widely different age groups are compared, generational differences may well be far greater than the magnitude of change within the same individual. Although information on age differences may be useful for concurrent policy decisions (e.g., cohort differences in life expectancy), they are inappropriate for predicting age changes within a given individual and tell us nothing about individual patterns of aging.

To investigate ontogenetic or "true" age change, it is necessary to conduct longitudinal studies in which the same individuals are followed over the course of their development and are measured at two or more points in time. However, longitudinal studies have methodological hazards as well, because change within individuals may be confounded with the effects of sociocultural change occurring during the particular historical period of the longitudinal study. Generational differences and sociocultural change are likely to impact many behavioral variables. For example, sociocultural change in educational practices may impact certain aspects of intellectual functioning, career patterns, cross-racial relations, etc. It is therefore unlikely that findings

of cross-sectional age differences can agree with those obtained from the study of longitudinal age changes. Nevertheless, it is the longitudinal study which permits assessment patterns of age changes, their interrelation over time, and the explication of individual age functions.

A third approach has often been employed by investigators who wish to compare the behaviors of different cohorts at one specific age. For example, one might like to know whether a certain level of reading skill remains characteristic for several generations of sixth graders. The comparison of different cohorts of individuals at the same age is called the time-lag method. Its users must recognize that comparisons of two groups (cohorts) by the time-lag method will confound generational differences with specific sociocultural events occurring at a particular assessment point. The issues associated with time-lag methodology are relevant to recent concerns over performance decline in college entrance exams and in the application of achievement norms established for one cohort to succeeding generations.

A number of alternate strategies, known as sequential methods, have been suggested to deal with problems of cross-sectional, longitudinal, and time-lag designs. Researchers interested in age-related, ontogenetic change across the life course must show that such change does not simply describe the impact of quite specific historical events (say, like the great depression) upon a single birth cohort. To deal with this problem, a research design is needed which involves the longitudinal study of two or more successive cohorts (e.g., born in 1950 and 1960) over the same age range (say ages 6 to 12). This is known as a cohort-sequential design. To the extent that similar longitudinal changes are observed over several cohorts, it is then possible to speak of ontogenetic change as distinct from change which may be cohort-specific. For example, to examine the ontogenetic nature of Piagetian stages, it is important to examine their development in several cohorts.

A second type of sequential methodology is of importance to researchers who are concerned with whether age differences in the young and old at one point in time are a function of generational differences. In this case, it is necessary to determine whether such generational differences are replicable across several young-old cohort pairs or are an artifact of the selection of particular age-cohort samples experiencing a specific form of sociocultural change. This involves a time-sequential design in which several independent samples of young and old are examined over the same age range but, of necessity, at different points in time. For example, it would be of interest to examine generational differences in attitudes toward higher education expressed by middle-aged parents and young adult children in 1960 vs. 1970.

However, for most of the adult years (from maturity to early old age), there are fewer ontogenetic changes. Researchers interested in mid-life issues therefore may want to use the cross-sequential design. Two or more successive cohorts are examined over the same two or more measurement points. This design permits separate estimation of effects attributable to generational differences and those due to time-specific sociocultural change. For example, consider two cohorts of women born in 1930 and 1940 and assessed in 1970 (ages 30 and 40), and 1980 (ages 40 and 50) regarding their attitudes toward female career aspirations. Generational differences in attitudes of middle-aged women can be assessed in 1970 and 1980. These differences can be compared with similarity of the two cohorts' attitudes at each measurement point as a function of time-specific cultural change. In some instances, the cross-sequential design is also useful for the simultaneous collection of data on age changes and age differences.

Before leaving this topic, it should be stressed that choice of any of the above strategies requires certain prior assumptions about the nature of the variables to be investigated. Thus, use of the longitudinal or cohort-

sequential designs makes sense only if the investigator is willing to postulate trivial time-specific sociocultural change affecting the dependent variables over the age range to be studied. Likewise, the cross-sectional and time-sequential designs imply the assumption of trivial cohort-specific effects (if they are to be used to estimate age effects), and the cross-sequential design postulates trivial ontogenetic change over the age range investigated.

Equivalence of Constructs Across the Life Span

It was noted earlier that development from one life stage to another may involve both quantitative and qualitative change. For example, an individual's score on the Binet intelligence test may change quantitatively. In addition, there are qualitative changes as reflected by different types of items to measure general intelligence at different age levels. Factor analytic studies of tests such as the WAIS have shown that the same measures may assess qualitatively different constructs across the adult age span (e.g., arithmetic tests becoming memory tests). Psychologists distinguish between directly observable behaviors (phenotypes or surface traits) and constructs (genotypes or latent traits). The former would be represented by a specific item on an intelligence test or personality questionnaire, the latter by ability factors such as "inductive reasoning," "recognition memory," or "introversion," requiring several measures of the construct. It is critical to examine changes across the life span in the relation of genotypic observable behaviors to a given construct they are assumed to represent.

The specific technique traditionally used to obtain quantifiable estimates of the phenotype-genotype relationship is, of course, factor analysis. Use of comparative factor analysis has become of major importance for students of life-span development in examining quantitative and qualitative developmental change. Its application permits specific inferences regarding developmental differences between groups at different life stages, or of changes within

groups at different ages. While there may be age-related shifts in specific observable behaviors, true quantitative change of a developmental nature can be substantiated only if there is a mean difference between factor scores estimated for the construct.

Qualitative change at different ages or qualitative differences between age-cohort groups can be said to occur if there are significant changes or differences in factor structure. Given comparable sets of observable behavior, changes in factor structure can take the form of: a lesser or a greater number of factors (i.e., the observables no longer measure a construct, or a new construct is now measured by the observables) a change in the correlation (factor loadings) of the observables with the construct (i.e., a given observable becomes a more or less efficient measure of the construct); or the factor angles (correlation among constructs) change (i.e., shifts occur in the interaction of different constructs).

In the realm of intellectual abilities, for example, the following quantitative and qualitative changes have been noted: (1) factor scores increase through middle adulthood and decrease in advanced age, suggesting quantitative change; (2) the number of factors required for an adequate description of intelligence increases from early childhood to adulthood, suggesting a qualitatively greater differentiation of intellectual abilities; (3) factor loadings on the same factors change across much of the adult age range, suggesting changes in the relation of observables to the construct represented; (4) in old age, factor intercorrelations increase, suggesting a progressive reintegration of intellectual abilities (cf., Reinert, 1970; Schaie, 1982).

Furthermore, because of age- and generation-related differences among subjects in life-span studies, attention must be given to the appropriateness of the test format. That is, personality questionnaires for children require

different language levels than those for adults. Social stereotypes and slang terms are quite different for adults born several decades apart. In addition, age-specific respondent characteristics must be considered, such as the incompletely developed motor-coordination of young children or the typically mild visual impairment of the elderly. All of these variables may pose threats to the construct validity of measures used with subjects at widely varying ages in the life span.

Descriptive vs. Experimental Approaches to Research in Life-Span Development

When long-term predictions are to be made regarding future developmental trends, or when the later life consequences or developmental antecedents are to be identified, developmental scientists are somewhat handicapped by the fact that they cannot conduct true experiments. That is, the age variable or any other index of developmental status cannot be assigned at random. It is not possible to assign subjects to a specific age or in some nice symmetric fashion measure some persons in a longitudinal study at an older age before assessing them at a younger age. Developmental studies must therefore always be quasi-experiments and subject to all of the validity threats characteristic of that class of investigation (cf., Campbell & Stanley, 1963; Cook & Campbell, 1975; Schaie, 1977). Nevertheless, we can readily distinguish between two types of developmental studies--descriptive studies where maturation or life experiences are the only treatment, and those experimental studies in which a treatment is used to examine a variable thought to account for the initial developmental or performance differences between two groups.

Descriptive developmental studies. These studies are typically of a pretest-treatment-posttest design with maturation as the only treatment. Such studies are plagued with the possibility of erroneously inferring effects due to maturation which can be attributed more parsimoniously to other design confounds. The confounds of most serious concern to the life-span developmentalist

involve history, testing effects, experimental mortality, statistical regression, and selection.

History refers to the problem that, in a longitudinal study extending over a lengthy period of time, environmental impacts may occur which are specific to the historical period during which a sample is being followed and which may not be found during a subsequent period. Replication of the study would be a suitable control for this problem. Testing effects refer to practice effects accruing when there are multiple assessment periods. Use of additional control samples from the same cohort at each succeeding measurement point to assess for testing effects is one procedure for examining this concern. Ideally, these additional controls should be randomly drawn at the beginning of the study. Experimental mortality is the dropping out of some subjects due to death, disappearance, loss of interest, or experimenter ineptness. Unfortunately, drop-out is rarely random with respect to the variables under investigation. It is necessary, therefore, to study differences in performance at the first assessment point between study survivors and dropouts to estimate the extent to which the attrited sample is still representative of the population originally sampled. Statistical regression refers to the tendencies that extreme scores observed on one test occasion are likely to err in the extreme direction and, consequently, will tend to revert towards the population mean in subsequent measurements. This effect could spuriously suggest developmental changes and is more serious the less reliable the measure used. Control here is needed by attending to measurement reliability issues and investigating developmental trends for subsamples at different levels of the range of talent for the variable studied. Finally, selection refers to the problem that a developmental phenomenon may be of low incidence or may be exaggerated in a particular sample, particularly if the sample is either quite homogeneous or

heterogeneous in characteristics related to the phenomenon of interest. Although these confounds have been studied primarily in descriptive studies, problems such as testing effects and experimental mortality also apply to control groups in experimental studies. Typically, such control groups receive only pre- and posttest assessments with maturation as the only treatment.

Although it has been argued that descriptive studies can merely suggest the presence of relationships but make no contribution to scientific explanation, this conclusion is not entirely warranted for developmental data. The reason for this statement is that the flow of time in developmental studies will furnish a formidable causal aid. That is, in longitudinal studies, antecedents and consequents can be demarcated clearly by time. It is possible, therefore, to use powerful techniques such as cross-lagged correlations (in the univariate case) or path analysis and linear structural analysis (in the multivariate case) to engage in causal modeling and to test competing deductions from theory by means of descriptive data. The interested reader is referred to more detailed discussions of recently developed methodological advances by Jöreskog (1979), Rogosa (1979), and by Schaie and Hertzog (1982).

Experimental developmental studies. Two different approaches to experimental developmental studies are found in the literature. The first is a between-age-groups design in which it is sought to determine whether an experimentally controlled variable would explain behavioral differences between two or more different age groups. The second design is usually employed within a single-age group to assess the degree of plasticity or modifiability for a given variable.

In the first type of study, two samples of differing age are selected that show performance differences on some variable, say problem solving ability. A training paradigm is then employed, and the hypothesis is tested that the lower

performing (younger age) group benefits more from training than does the initially (older) performing group. What is of major concern here is the interaction and not the main effects. A significant interaction would support the hypothesis that the training paradigm indeed models the maturational process. A prominent example of this approach is the Piagetian training studies that attempt acceleration of the attainment of more advanced stages with younger

children. It should be noted that a possibly even more powerful paradigm, rarely found in the literature, would be to show, say for children, that a given skill could be advanced for younger but reduced in older children.

In the second type of study, individuals in a single-age group are divided randomly into experimental and control groups, the experimental group being trained on a skill which should be demonstrated at that age. For example, compensatory educational studies with disadvantaged children have been used to examine the range of remediation (behavioral plasticity) with training. Such single-age training studies in later adulthood are aimed at examining the range of improvement relative to normative patterns of performance at this age.

Adult studies of this type, ideally, ought to be done with persons with known developmental histories. That is, we need to know whether a given individual has actually experienced a loss on the variable to be trained or whether we are trying to build a new skill not previously exercised by our trainee.

Experimental investigations of the first type are important obviously for the development of life-span developmental theory. The latter are crucial both to our understanding of the range of modifiability of behavior at different ages, and to the generation of an applied developmental psychology which seeks to provide techniques and knowledge for the remediation of developmental defects and optimization of developmental attainments.

Implications for Lifelong Learning Critical Features of Lifelong Learning

Just as a life-span perspective suggests a qualitatively different approach to developmental psychology, lifelong learning entails a unique approach to education (Dave, 1976; Schaie & Willis, 1978). In this section, we will reexamine some of the critical features of a life-span perspective as they may apply to lifelong learning. Foremost, is the implication that a focus on continuing development and change across the life span calls for a redistribution of educational efforts across the total life course. This perspective is significantly different than that taken by traditional approaches to development and education. Such traditional views assume that most of the critical life events (initial job entry, first marriage, childrearing) occur early in development and are largely age-related; thus, the greatest educational "need" occurs during the first quarter of the life span. Implicit in such a perspective is the assumption that development in later life stages is primarily rooted in early developmental periods, and thus educational efforts during the early years can "prepare" the individual for later life events. However, a life-span perspective suggests that critical life events occur at all life stages and require educational efforts appropriate to that developmental event and period. In addition, the impact of sociocultural change on development and the increasing occurrence and salience of non-normative life events in the adult years argues for the need for continuing educational intervention across the life span. Thus, a lifelong learning perspective requires the reallocation of educational resources across the life span, paralleling continuing developmental change at all life stages.

Secondly, an integrative rather than age-segmented approach to life-span education is critical. That is, lifelong learning does not necessarily imply a

succession of unrelated, age-segmented educational efforts across the life course. More is implied than the addition of adult education to the currently existing educational efforts at earlier ages. Just as a life-span perspective of development emphasizes the linkages and relationships among developmental periods and events, an integrative approach to lifelong learning would focus on the sequence and relationships among educational efforts across various life stages. For example, whereas early education may focus on knowledge and skill acquisition, later educational efforts may focus on knowledge and skill synthesis, application, and evaluation. In addition, it would be important to provide remedial educational opportunities at various points in the life course to offset prior educational deficiencies as well as potential obsolescence associated with rapid technological change. Specification of the interrelationships among educational efforts at various developmental periods will be a critical task in designing comprehensive lifelong learning models.

Third, the increase in the range of interindividual differences for various developmental phenomena across the life span has important implications for lifelong learning. There has been increasing recognition of individual differences as a critical factor in educational programming in the early years. This is reflected in recent consideration of issues such as cultural pluralism and individualized instruction. Individual differences will become an even more salient issue within a lifelong learning perspective. In order to accommodate the lifelong learner, educational efforts will need to become increasingly adaptive and differentiated. Such educational adaptiveness and differentiation is represented in issues such as formal/informal education, full-time/part-time learning, and direct/distance instruction, etc.

Fourth, consideration of multiple, interacting sources of developmental change should be of relevance within a life-span approach (Bailes, Reese, & Lipsitt, 1980). Traditional educational efforts have focused primarily on what

has been defined in this article as age-graded, biological and environmental influences on development. Education has been concerned with the child's acquisition of knowledge and skills considered age-appropriate within our culture. In this vein, education has served as a powerful age-graded socialization agent in development (Parelius, 1975). However, as a life-span approach to education is considered, the importance of history-graded and non-normative life events as foci and moderators of educational efforts becomes increasingly salient. Education has, of necessity, been somewhat responsive to sociocultural change or history-graded factors. In periods of rapid and pervasive change, it becomes even more critical that both preventive and remedial educational efforts be systematically implemented to facilitate human development within a changing world. History-graded influences have important implications both for early life education and for educational efforts in the adult years focusing on "updating" and obsolescence remediation. In addition, educational intervention associated within non-normative life events will be important. Because such events are unique and thus not part of normative socialization experiences, special educational programs to enable the individual to adapt and profit from these events will be particularly useful.

The Educational Context

As the role of education broadens conceptually and lengthens temporally, the context for education must also expand. With lifelong learning, only a small portion of the individual's education would actually be acquired within a classroom. Except for the years of formal schooling, most of the individual's education is experiential and active, rather than receptive, and occurs in the context of daily living. Thus, the home, workplace, and public facilities are all contexts for education (Cross, 1981). Education can extend geographically across the individual's total life space as well as temporally across the life span.

Moreover, lifelong learning suggests changes in the teacher-learner role. The role of the teacher across the life span appears to change from director of learning to that of a facilitator or resource person. Whereas society and the educator direct the education of the young, the content and method of learning in adulthood are largely determined by the learner. Developmental changes in the learner across the life span suggest the need for qualitatively different types of teacher training for educators working with different age groups. The techniques of the high school or even college instructor may be inappropriate in teaching middle-aged or older persons. Teacher training institutions must be involved in translating the information concerning adult learning into a delineation of skills required of the adult educator. Much has been said about changing characteristics as the learner ages, but we should not forget that career teachers age as well. Thus, principles applying to the adult learner may equally apply to the teacher's own continued updating and learning endeavors.

Summary

In this article, some of the conceptual and methodological issues associated with a life-span perspective of human development have been discussed. It has been suggested that a life-span approach involves more than the chronicling of major developmental events associated with each age/life stage. Critical to a life-span approach is the identification of developmental patterns, processes, and relationships defining the total life course. Four such features of a life-span perspective were discussed. First, there is continuing development and change across the life span. Critical developmental changes and life events occur in adulthood, as well as in childhood. Such developmental events in later life cannot be totally predicted or dealt with in terms of earlier life stages. This focus on continuing developmental change suggests considerable

plasticity in functioning across the life course with the potential and need for educational intervention at all life stages.

Second, it is suggested that chronological age may not be the most salient index of many types of developmental change. The isomorphy between biological and behavioral change characteristics of early life stages becomes less evident across much of adulthood. Developmental change, particularly in adulthood, is often not directly age-related. Thus, an age-graded approach to development is not particularly useful in describing or intervening into many developmental phenomena.

Third, many developmental events are characterized by increasing inter-individual variability across the life course. Such increased variability is associated with the greater impact of environmental sources of influence during the adult years. As the diversity of environmental influences increases, the range of individual differences expands. Fourth, life-span development involves multiple, interacting change influences. These include age-graded, history-graded, and non-normative life events.

As longer spans of the life course are examined, several methodological issues become increasingly salient. Three of these are discussed. First, there is the need to differentiate behavioral change associated with ontogenetic development, cohort differences, and time-specific cultural events. A series of sequential methodological strategies are described to differentiate such effects. Second, equivalence of developmental constructs and instruments used to assess such constructs becomes important in assessing life-span change. Both quantitative and qualitative change associated with such constructs must be examined and appropriate methodological procedures are discussed. Third, there is the issue of descriptive versus experimental approaches to the study of developmental change.

In the third section of the paper, several critical features of a life-span approach are reexamined as they apply to lifelong learning. It is suggested that a life-span focus would involve a qualitatively different perspective of the educational enterprise, requiring the reallocation of educational efforts and resources across the total life span.

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