

PROMOTING COGNITIVE DEVELOPMENT THROUGH ADULT EDUCATION

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Cognitive development has been a neglected goal of adult education. This paper describes a model of adult education that is derived from recent research regarding cognitive development during adulthood. The model is designed to promote postformal thought—solving problems that involve interdependent variables and integrating contradictory positions arising from competing systems of thought. The model represents a synthesis of self-directed and teacher-directed learning activities. The paper ends with a proposed research agenda for adult educators interested in promoting adult cognitive development.

Research concerned with the cognitive development of adults progressed significantly during the 1980's. Such volumes as *Adult Cognition and Aging* (Rybash, Hoyer, and Roodin, 1986), *Adult Development* (Commons, Sinnott, Richards, and Armon, 1989) and *Wisdom* (Sternberg, 1990) not only attest to the progress, but encourage adult educators to consider new ways of addressing the needs of adult learners. The purpose of this paper is to advance a model for promoting cognitive development in adult learners. The paper has four sections. The first briefly reviews the literature explaining why development is a legitimate goal of adult education. The second summarizes the literature regarding adult cognitive development. The third derives from that literature a model of adult education for cognitive development. The fourth sets out research suggestions for adult educators wishing to evaluate the model in applied settings and/

or contribute to a theory of adult cognitive development.

Development as the Aim of Adult Education

Lawrence Kohlberg was among the most persuasive advocates for adopting development as the aim of education. He noted that he was in the constructivist tradition of Plato, Hegel, Dewey, and Piaget in emphasizing the role of the individual in progressively reorganizing knowledge on the basis of personal experience. According to this position there are ethical and cognitive universals that humans achieve not through didactic instruction but as the result of internal construction (DeVries and Kohlberg, 1987). These universals are stages of thinking that are qualitatively different from one another, that have broad application in problem solving situations, and that are hierarchical so that each stage a person reaches is more efficient, effective and comprehensive than lower stages. Development occurs when an individual becomes dissatisfied with a mode of thought and strives to attain a more effective mode. Development is considered irreversible in the sense that a person does not

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retreat to lower levels of thinking. It is thought to be more beneficial for a student to spend time interacting with the physical and social world in ways that promote progress toward higher stages of thinking than it is to spend time acquiring factual knowledge that the student will continue to consider at the same lower stage of thought. Kohlberg and his coworkers focused on preschool and public school children, and, at this point, it is probably fair to say that cognitive development has been accepted as one of several important goals of public education.

Cognitive development as a goal of adult education has received somewhat less attention. One reason is that there does not exist a comprehensive account of adult cognitive development the equal of Piaget's account of development in children. It even appears that some developmental psychologists and adult educators have inferred from Piaget's writing that most people reach the last stage of cognitive development in their teenage years. The impression has been that cognitive development is complete at the start of adulthood and adult education should focus on the acquisition of skills and knowledge, self-actualization, and on personal growth in the sense of overcoming personality flaws that impair performance.

On the other hand, writers such as Knowles and Mezirow (Merriam, 1987) have expressed ideas that seem consistent with the idea of cognitive development as a goal of adult education. Knowles has called for learning activities that address the developmental tasks of adulthood and encourage learners to become independent thinkers in their areas of expertise. The assumption implicit in this view is that adults ought to be encouraged to learn and think in ways that are qualitatively different from the ways children and youth do. Similarly, Mezirow states that asking questions, discovering problems and noting contradictions become the bases of learning for adults. In his writing, these activities are

apparently thought to constitute distinctly adult ways of thinking which should be promoted by the educational process. In other words, although theorists in adult learning have not explicitly used the language of developmental theory (i.e. promoting transition from lower to higher stages of thinking), they have accepted cognitive development as a goal of adult education.

Cognitive Development in Adulthood

Within the last ten years, there has been a modification of theory regarding the stages of cognitive development and particularly the stages of adult thought. It is beyond the scope of this paper to provide a comprehensive review of the literature on adult cognition. (The interested reader is referred to Rybash, Hoyer, and Roodin (1986) and Commons, Sinnott, Richards, and Armon (1989) for such reviews.) Instead, brief summaries of selected aspects of the literature such as the following review of Piaget's four stages are included in order to derive the model of education for cognitive development.

It is generally agreed among researchers of the Piagetian position that the sensorimotor, preoperational and concrete operations stages are reached and mastered by children before reaching puberty. Whereas Piaget indicated that adolescents have generally achieved the fourth stage, formal operations, by the age of fifteen, contemporary writers have concluded that a significant minority if not a majority of adults never fully consolidate formal thought. Among others, Arlin (1984) and Kramer and Woodruff (1986) have suggested that a style of postformal thought develops among some of the adults who have consolidated formal thought. As yet there is no consensus about the proportion of adults reaching formal or postformal thought.

Rybash, Hoyer, and Roodin (1986) have provided a review of formal thought. They mention as its three most prominent fea-

tures: hypothetico-deductive thinking, reversing the relationship between reality and possibility, and thinking about thinking. The following example is provided in order to illustrate the difference in the performance of children at the stage of concrete operations and young adolescents who have reached the stage of formal operations. In the game of 20 questions, children seem to rush to guess the correct solution. They characteristically ask questions in such an unsystematic fashion that they find themselves in a muddle of repeated questions. On the other hand, adolescents are often able to describe and conduct the procedure of asking questions that continually eliminate approximately half of the possible solutions at any point in time. This ability to use generalized strategies to generate and test a series of hypotheses in an orderly fashion is at the essence of formal thought (Morán, 1976).

Rybash, Hoyer, and Roodin (1986) also indicate that formal thought has significant limitations: It is confined to pure logic to produce one correct answer to a problem. It overemphasizes physical reality to the exclusion of emotional considerations. It is suitable for closed systems but not for open systems. It emphasizes problem solving over problem finding. It underemphasizes relationships among multiple systems of reference.

As indicated above, there has been in the 1980's a growing consensus that a style if not a stage of thought more sophisticated than formal thought characterizes adult cognition. In postformal thought, the nature of knowledge is relative, and nonabsolute. The variables in a given system are often interdependent. Contradiction is a basic aspect of knowing so emphasis is put on the ability to synthesize contradictory positions as they arise in competing systems of thought. (In Hinduism cows are sacred. In Judaism they are not. [Basseches 1989.]) Likewise, emotions and experiences may conflict with each

other or with thoughts and all need synthesis. And finally, problem finding is often more significant than problem solving.

Rybash, Hoyer, and Roodin (1986) illuminate the difference between formal and postformal thought by contrasting the view of marriage problems from the standpoints of a formal and a postformal thinker. The formal thinker sees the problems as the product of stable characteristics of the individual spouses. However, the postformal thinker considers the characteristics of the spouses to be influenced by their relationship to each other and in turn to be contributing to the nature of the relationship.

Of course, thought at any stage only occurs in relation to some content. The encapsulation model of cognitive development in adulthood described by Rybash, Hoyer, and Roodin (1986) seems especially helpful in describing the relationship between content and thought during adulthood. A brief summary of the model follows: First, the acquisition, utilization, and representation of knowledge is assumed to become encapsulated within particular content domains as one grows older. On an everyday level, this seems to be a description of the specialization we observe among workers at all levels. University professors don't teach history and mathematics. They specialize in fields such as military history or calculus. The individual who actually achieves mastery of multiple domains is sufficiently unusual as to be honored with the title Renaissance Person. Second, certain so-called fluid abilities and control processes such as short term memory, and concentration appear to decline with age when assessed as general abilities, but they may show less age-related decline when they are assessed within encapsulated domains such as one's area of specialization. Third, the products of adult cognitive development are the growth of expert knowledge and the emergence of postformal styles of thought.

The research of Charness (1986) regard-

ing expert chess players provides some excellent examples of the apparent results of the encapsulation process. With expert and novice chess players matched for general memory and problem solving tasks, and compared for memory and problem solving under game-like conditions the experts were superior. When comparisons were made between older and younger chess experts, the older experts were inferior on speed and power measures of memory for chess, but they were superior in choosing the best moves. It appears that their superiority in choosing moves is an example of the wisdom people are said to acquire as they mature. It also illustrates the tenet of the encapsulation model that dedicating processes to knowledge domains compensates for the age related declines in general intellectual processing.

Developmental Theory and Adult Learning Theory

As yet little is known about the specific factors that promote cognitive development in adults. The remarks of Neimark (1987) seem to summarize much of the current theoretical thinking regarding adult development and adult learning. She has concluded that distinctly adult levels of thought develop with the assistance of educational and cultural factors among those adults with some generous but as yet unspecified level of "native endowment." Furthermore, she concludes that the essential quality of mature thought is exercising judgment in dealing with tasks that involve multiple variables, and have no universally accepted solutions. Such problems are found primarily in the social and interpersonal worlds. These tasks call for generating alternative solutions and pursuing the implication of each possible solution. Dilemmas, whether moral dilemmas of the sort Kohlberg popularized or making a chess move from a position of disadvantage, are examples of particularly effective educational opportunities for pro-

moting distinctively adult thought. Whereas Neimark has indicated that education is probably of considerable import in fostering postformal thought, Kramer and Woodruff (1986) have evidence that formal education is by no means the only factor or even a necessary factor in fostering postformal thought. Cavanaugh and Stafford (in Commons, Sinnott, Richards, and Armon, 1989) have stated that there is an emerging consensus that postformal thought occurs on a content domain by content domain basis for each individual, and that individuals achieve postformal thought within a knowledge domain in consequence of education and experience in the domain. However, as yet there is no clear understanding of what constitutes a content domain.

One of the more interesting studies regarding the effect of education on adult reasoning was conducted with graduate students in psychology, chemistry, law and medicine (Lehman, Lempert, and Nisbett, 1988). They found that students improved in their abilities to use statistical and methodological reasoning and to use the logic of the conditional depending upon their field of study, and that the improved abilities were matched to the rule systems taught in their fields of study. For example, during their graduate school careers psychology students improved in solving problems with the logic of the conditional, but chemistry students did not. While leaving a multitude of unanswered questions, the results of the study provide empirical support for the positions of Neimark and Cavanaugh and Stafford described above.

Adult Education for Cognitive Development

Clearly, the research literature describing the relationship between adult development and adult learning is in its early stages with many broad questions unresearched. Nonetheless, it is sufficiently advanced to imply guidelines for a procedure for promoting development through education. A six step

model for promoting adult cognitive development as a goal of education is described next.

Since postformal thought is believed to be achieved independently for individual content domains, the first step is identifying an area for study that is within an appropriate content domain for the learner. Generally, writers have agreed that people develop postformal thought within their areas of expertise, so learners should be dealing with an area with which they are already familiar and intend to pursue in depth. In particular, it would seem that they should have knowledge of the nomenclature and basic facts of the area as well as an introduction to its theoretical positions.

Second, learning activities are selected for their potential to promote development. According to the constructivist view, cognition is not a process of incorporating a body of knowledge; it is a process of constructing a representation of reality and rules of thought. The constructing process is thought to begin after an individual becomes aware of needing a better understanding of some phenomenon. In order to engender such an awareness in the learner, the facilitator would confront the learner with a dilemma and then have the learner gather information and attempt to resolve the dilemma. The facilitator should check that the learner recognizes the nature of the dilemma and does not merely amass information related to the general topic. According to Neimark (1987), the dilemma should involve multiple interdependent variables, and should be open to many possible solutions rather than one widely accepted solution. In the process of struggling with the dilemma, the learner is likely to discover and/or consolidate postformal modes of thought.

Third, in addition to shaping the learner's assignment around a dilemma, the facilitator would provide instruction in formal and postformal modes of thought. Brookfield's

(1987) approach to teaching critical thinking seems to provide a sound basis for such instruction without requiring the learner to acquire a theoretical knowledge of cognitive development. Brookfield indicated that critical thinking involves using logic, distinguishing fact from opinion, bias from reason, thoughts from feelings, examining assumptions, identifying contradictions, exploring alternatives, and integrating ideas. The instructor would conduct direct and indirect instruction in one or more of these aspects of critical thinking depending upon the sophistication of the learners. Direct instruction could be derived from texts such as Brookfield's and supplemented with examples from the learner's area of study. Indirect instruction could take the form of asking learners to use checklists to identify examples of or flaws in critical thinking in drafts of their own written work.

Fourth, after the learner is familiar with the dilemma to be addressed and after the learner has received instruction in modes of thought, he/she operates independently of the facilitator to gather information regarding to the dilemma. The reason for independent activities is that the more teacher control, the more the learner is likely to respond to the teacher's initiatives and the less likely to expend efforts constructing a new mode of thought. The information should be in multiple forms including facts, theories, expert opinions, etc. At the end of the information collection, the learner generates and evaluates possible resolutions to the dilemma in terms of the strengths and weaknesses or advantages and disadvantages of the possible resolutions. Emphasis is placed on generating solutions from independent systems of thought and integrating them into a preferred solution.

The learner does not automatically acquire postformal thought as the result of addressing a dilemma. The learner is expected to acquire postformal thought slowly

and with effort after becoming aware that his/her attempts to resolve dilemmas are inadequate or less adequate than another's. Receiving such feedback in the form of a missive from an instructor is discouraging and also puts the learner in a reactive mode which is antithetical to developing new styles of thought. On the other hand, working cooperatively with individuals who are operating at the postformal level in addressing the same or similar dilemmas presents particularly good opportunities for learners to comprehend the need for and intricacies of postformal modes of thought. Therefore, the fifth step in the model of education for cognitive development is collaborative learning.

Sixth, the learning activities would be managed so that the learners would frequently rethink their efforts. Presumably, each time they rethink their work they synthesize ideas and become more proficient postformal thinkers. As part of the managed process, the learners would solicit formal critiques of their work from peers, outside experts, and/or the facilitator for the purpose of incorporating the critiques into their final products. Incorporating the critiques in their final efforts increases the likelihood that the learners will integrate opposing ideas in the final product. Also the sense of the relative is a distinctly postformal characteristic and incorporating the critiques gives learners the emotional as well as the intellectual experience of seeing that evaluations of work including their own work are relative to a host of criteria. Should a grade or similar evaluation of individual learners be appropriate, the facilitator should be mindful that the learner will perform the learning activities that seem to lead to the most favorable evaluation. Therefore, the facilitator would emphasize learning outcomes that require formal and postformal thought. At the beginning of the learning activities the facilitator could refer learners to Bloom's taxonomy

of the cognitive domain. In order to promote postformal thought, grades should be based on synthesis and evaluation as those terms are defined in the taxonomy. Although it is something of a cookbook approach, the use of Bloom's taxonomy is an effective means of reminding the facilitator and conveying to learners what is meant by the terms analyze, synthesize and evaluate, which are the critical features of postformal thought.

In summary, there are 6 steps in designing learning activities that promote cognitive development: 1) the learners choose a topic, preferably in a content domain where they are knowledgeable, 2) the facilitator shapes the topic so that the learners address dilemmas involving multiple interdependent variables, 3) the facilitator provides information regarding postformal modes of thought, 4) the learner gathers information from which to generate and evaluate multiple potential resolutions to the dilemma, 5) peers, outside experts and/or the facilitator critique the potential resolutions, 6) the learner incorporates the material from the critiques into a final product. Should the setting call for a summative evaluation of the learner, that evaluation would be based upon the number of resolutions suggested and evaluations of each suggested resolution provided by the learner as well as the learner's demonstrated ability to integrate contradictory material into the potential resolutions.

Having the learner select the topic of study, gather information, and suggest a resolution to a problem in his or her area of expertise are quintessential elements of self-directed learning (Knowles 1980). However, the procedures in this model of education are not identical with self-directed learning. Shaping the topic to yield a dilemma, providing instruction in modes of thought, and assigning the learner to generate and evaluate multiple resolutions, constitute distinct additions to self-directed learning which greatly increase the potential of a learning activity to

promote cognitive development in postformal thought. Shaping the assignment, providing instruction in modes of thought, and assigning outcomes for evaluation are aspects of teacher directed learning. It is noteworthy that even though self-directed and teacher-directed learning are often thought to occupy opposite ends of the instructional continuum, they have been integrated here in a serendipitous example of postformal thought.

Research Suggestions

Although the basic research into adult cognitive development is in the early stages, it has suggested the prospects for educational procedures designed to raise the cognitive level of adult learners. Adult education researchers are now in a position to capitalize on the insights, interests and resources of their profession to systematically investigate those procedures and simultaneously contribute to the literature on adult cognitive development.

It would seem that their first step is to assess procedures for fostering adult cognitive development in natural educational settings. There is a need to determine whether or not the model of education for development presented in this paper or another model can produce meaningful changes in cognitive development. However, determinations of this sort are complex and require many intermediate investigations. What follows is a broad outline for initiating investigations of the relationships between adult education and adult cognitive development.

At a purely theoretical level, there is a need for research regarding instruments for measuring cognitive development. To date, researchers have developed instruments to carry out their experimental investigations (Cavanaugh and Stafford, 1989). The reliability of these measures is often computed and reported within an individual investigation. But the construct validity of these measures is a more significant issue that can

not be assessed within the confines of typical experimental investigation of development. Construct validity should be evaluated in terms of correlations among tests and also among test scores and variables such as academic and professional success. (For a brief review of the concept of construct validity the reader is referred to Hogan and Nicholson, 1988 and Kagan, 1988.) Adult educators have an important role to play in the development of such instruments because they can contribute a sense of what makes a measure relevant to life outside a laboratory and therefore what constitutes a valid measure.

Assuming researchers could demonstrate the construct validity of an instrument or set of instruments for measuring postformal thought, there would be a need for determining whether or not measured changes in the cognitive development of adult learners lead to beneficial changes in their lives. Adult educators are also in good position to evaluate possible benefits to learners. They can track performance in academic settings and in the workplace over a period of years and record behavioral measures such as participation in continuing education as well as attitudinal changes in such areas as self-efficacy, or relationships with ethnic groups. Adult educators seem better equipped to perform this type of work than basic researchers. Adult educators have ongoing helping relationships with learners within the naturalistic setting of education. Basic researchers have a more intrusive relationship with subjects that produces demand characteristics on subjects and may distort results and limit the scope of the research.

Designing a means of assessing the effectiveness of education for development involves choosing an appropriate set of control groups. A single control is probably inadequate because the interest is not simply on investigating the statistical significance of the model described here but in creating increasingly effective procedures. Initially, comparisons with self-directed study and

traditional pedagogical models would seem appropriate. As theoretical work in adult education progresses, additional comparisons will be developed.

Comparisons of different types of instruction will probably be complemented by investigations of population variables. At first glance, it might appear that education for development is appropriate only for adults who are: above average in intellectual ability, between the ages of twenty and seventy, dealing with content with which they are somewhat familiar if not expert and studying intensively as they would in a week-long (40 hour) workshop, a graduate seminar, or a task force meeting monthly for a year. Research is needed to determine which if any of these notions is accurate. Therefore, research into population differences will likely lead to research into aptitude treatment interactions. For example, it may be that learners with college degrees could acquire postformal competence with little more than an hour of direct instruction and an hour of practice exercises, whereas learners with significantly less formal education might require the intensive study mentioned above. At this point, there is no knowledge base regarding this or similar matters.

Whereas educators and psychologists have a sense of many different knowledge domains such as humanities or interpersonal relations, as pointed out earlier (Cavanaugh and Stafford, 1989), there is no shared sense for what constitutes domains that require specific reasoning abilities. Powers and Enright (1987) have approached this issue by asking graduate faculty to identify the analytical reasoning skills that are most essential for success in their disciplines. They have found differences among disciplines and their results can be construed as an attempt to identify domains of reasoning skills. Presumably their approach could be extended to other areas of adult education. It may prove possible to identify domains for a given educational program and then provide learning experiences early in the program to elevate

all learners to the levels of developed reasoning skills most important for success in that educational program. Such applied research would be of interest to the basic researchers who are interested in defining the concept of knowledge domain. In addition, it would contribute to a theoretical understanding of the transfer of reasoning skills.

A second line of research regarding knowledge domains could spring from a proposition advanced by Hoyer, Rybash and Roodin (1989). They suggested that individuals organize the number and nature of knowledge domains that they use. This position is consistent with the constructivist position and so raises a number of questions for a model of education for development. Do individuals continue to modify and/or create new domains throughout adulthood? Are adults able to create new domains efficiently in adulthood? Do adult learners of equal intelligence have differential difficulty in learning activities depending upon whether or not they had appropriate preexisting knowledge domains? The answers to such questions have obvious practical applications. What is highlighted here is that the answers obtained in a natural setting such as ongoing adult education programs would be greatly valued by both adult educators and basic researchers.

The model of education for development that is offered here is a general model. Questions of how it can be adapted to various settings and modes of instruction have not been addressed although workshops and postsecondary courses seem to offer promise as settings for promoting postformal thought. Before practitioners can implement and adequately evaluate the effectiveness of the model, they need to identify a set of generalizations for effective implementation within settings and modes of instruction. This will probably be a back and forth process of deriving educational procedures rationally, testing them empirically and adjusting them on the basis of empirical results. It would seem that practitioners rather than

basic researchers are the ones to derive these generalizations.

As noted, Neimark (1987) has mentioned that educational and other cultural factors are thought to contribute to cognitive development. With their access to participants, dropouts, and non-participants in formal adult education, adult educators are well positioned to investigate what are sure to be the complex roles of educational and other cultural factors alluded to by Neimark. One set of questions relates to the non-participation or reluctant participation in continuing education. Are there people who seek out cognitive development? Are they born or made? Would they participate in adult education at higher levels if they perceived participation to foster development? Certainly this prospect of increasing participation among intellectually curious adults is intriguing.

This list of suggestions is offered for those interested in applying the work of basic researchers to adult education. Also, it is meant to illustrate the opportunities that exist for adult educators to contribute to a dialogue with basic researchers. Basic researchers have advanced ideas with definite implications for adult education. Adult educators can reply by assessing the worth of educational programs based on those implications. In the process adult educators will contribute findings which add to the basic knowledge of adult cognitive development. The more contributions to the dialogue from both disciplines the more each will benefit.

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