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20 ABSTRACT (Continue on reverse side if necessary and identify by block number) This is a review of the research literature on minority performance in education and training programs. The report also recommends future directions for research that would contribute to the achievement of Navy manpower goals.		

While total years of schooling completed and major field of study are the most important determinants of occupational attainment (Thomas & Gordon, 1983; Thomas, 1980) students preparing themselves for careers in the natural sciences, business, engineering, computer sciences, physics, and mathematics earn greater economic rewards than do students who pursue careers in non high-technology occupations (Vetters, 1977; Metz, Stafford, & Hammer, 1981; College Placement Council, 1982). Despite recent gains in educational attainment, blacks, Hispanics and women remain disproportionately underrepresented in professional, technical and managerial occupations. This pattern is particularly acute in fields such as engineering, mathematics and the hard sciences. In high-technology professional fields, such as physics and engineering, blacks represent only a small fraction of their current proportional representation. Recent tabulations by the U.S. Census Bureau (1980) show that while blacks hold 7 percent of all professional occupations in the civilian labor force, the diversity of their representation among detailed occupations within this broad group is significant. For example, although blacks comprise 10 percent of the elementary-secondary school teachers and 14 percent of the social workers they account for only 2 percent of the engineers and just 3 percent of the natural, mathematical and computer scientists.

Explanations for the maldistribution of minorities across professional and technical occupational categories have usually focused on such individual differences as educational attainment and intelligence. Still despite voluminous research by psychologist studying "individual differences", sociologist researching "status attainment", and among economists looking at "human capital" our understanding of race, ethnic and gender differences in occupational attainment remains limited. Consequently, researchers are beginning to recognize the need to consider the operation of systemic structural processes such as employer recruitment practices training selection criteria, training norms, and instructional techniques which may confront different population subgroups with different opportunity structures.

High-technology jobs require advanced specialized training and education, and minorities often find themselves placed at a competitive disadvantage by an elementary and secondary education which did not prepare them for college science and math courses (Thomas, 1983). Or in many cases the appropriate college training is gender-typed as masculine and requires women to assertively step out of traditional female fields of study to prepare themselves. For example, recent tabulations based on the Higher Education General Information Surveys of Degrees Conferred for 1980-81 indicate that there continues to be a supply problem in regard to the availability of minorities and women with college training in scientific and technical fields. Black males and women of all race and ethnic background are underrepresented among recent college graduates earning degrees in science, mathematics, engineering and computer specialties (Trent, 1983). Interestingly, despite their relatively small absolute numbers, the pattern of scientific and technical majors among both Hispanic males and females more closely resembles the pattern for whites than the pattern among blacks, especially males.

Hispanic and white college graduates who earned degrees in scientific and technical fields are considerably more likely than similarly trained blacks to find employment in high-technology professions (56% v. 40% v. 28% and 71% v.

37% v. 11%, for Hispanic, white and black males and females, respectively). Apparently, even those few blacks who earn degrees in scientific and technical fields may be confronted with access barriers or discrimination when seeking employment in high-technology Occupations.

Research on occupational inequality falls into two broad categories: (1) studies which describe the distribution of blacks and women across types or categories of occupations; and (2) studies which explain the representation of minorities at different levels of the occupational stratification system.

With few exceptions, empirical studies of adult social status differences have concentrated only on individual resource factors. When individual and structural factors are included in the same model, the structural measures used have in most cases been based on crude classifications of census industry and occupation codes and provided only indirect indicators of differential labor market opportunities.

This paper will conduct a review of newer trends of research on minority performance in education and training programs, provide recommended alternatives (1) for future research in this area, and (2) as to how the ONR Organizational Effectiveness Program should be involved in the future with respect to the research topics that would contribute most to the achievement of Navy manpower goals.

A primary factor in determining whether students choose math-based or natural science majors in college is adequate high school math training (Sells, 1980; Sherman & Gennema, 1977; Thomas, 1981, 1983). Liking for math seems to be the single most important predictor of taking advanced high school math courses (Thomas, 1983). Additional factors responsible for successful minority high-technology educational and career patterns and those upon which this paper will concentrate include:

1. Social integration into an organization,
2. Commitment to organizational goals and to the organization itself,
3. High motivation to achieve,
4. High achievement with high level analytical reasoning strategies, and
5. Ability to utilize successful social networks.

SOCIAL INTERACTION

A major factor determining the educational and career success of minorities is the quality and intimacy of their integration into an organizational social system (Durkheim, 1961; Tinto, 1975; Lantz, 1982). Peer group associations appear to be most directly related to individual social integration (Tinto, 1975), while other potential sources of social integration (e.g., extracurricular activities and faculty interactions) appear to be of approximately equal secondary importance.

A number of studies have demonstrated that social integration via friendship support is directly related to persistence in college (Tinto, 1975). Academically successful students who withdraw from college score significantly lower on measures of social relationships than do either persisters or academic dismissals. It appears that the greatest success in

education and training programs occurs when academic and social systems coalesce and students have opportunities for both social interaction and mutual assistance. This is a difficult problem since it must remember that both minorities and organizations have cultures which are often inconsistent thus, making recruitment and training difficult. While selection strategies may be used to maximize the probability that those recruited have a maximum chance at achieving success, the greater the discrepancy between the culture of a minority group and the culture of the organization the higher the probability that the minority member will not be successful.

There are many ways to think of culture. One definition (Herskovits, 1955) is that culture is the human-made part of the environment. Thus, culture has both objective (tools, roads, machines) and subjective (norms, roles, values) elements. Other definitions (Goodenough, 1981) include the idea that culture is knowing the "rules of the game". Still another way of thinking about culture is to argue that culture represents a complex schedule of reinforcements (Skinner, 1953). It is indeed the case that what gets rewarded in some environments does not in others. By using this way of thinking one can identify attributes of the ecology (geography, resources) which make some behaviors more or less likely to get reinforced. For example, in cultures where survival requires much individual initiative (e.g., hunting professional, research laboratories) people are socialized with emphasis on self-reliance, independence, and exploration of the environment. In those where survival requires much interdependence, cooperation, and acceptance of orders from authorities (e.g., agriculture, the military, and workmen in mass production industries) people are socialized with emphasis on obedience, interdependence, and reliability. This phenomenon has been extensively demonstrated with respect to child-rearing and social class/occupational category by Barry et al. (1959, 1979) and Kohn (1969).

Still another way of thinking about culture is that it is a system of symbols (Geertz, 1973) which are recognized by some category of individuals. Such symbols are linked with values (Kluckhohn & Strodtbeck, 1961) so that one of the best ways to capture the key dimensions of culture is to analyze its values. While there is much to be said for such a view it has been criticized (Triandis, 1983) as being too limited since additional dimensions have to be considered. These include that elements of any culture are unique (emic) while other elements are common across more than one culture (etic) and that persons react to an environment in rather similar ways (etics), but there are some aspects of their reactions that are unique to particular cultural groups (emics) (Berry, 1980).

Scholars subscribing to this line of thought contend that minority members have cultures that are a combination of their original culture and their contacts with the U.S. mainstream culture. It then follows that the relative importance of past and the present cultures depends on the amount and the intensity of group and individual contact.

Acculturation occurs when minority members acquire some of the attributes of the mainstream culture. Acculturation is conceptualized as involving three dimensions: that which is emic to the minority culture, that which is emic to the majority culture and that which is etic to both cultures. As acculturation proceeds over time, many of the emic elements of the majority

culture are acquired, some of the emic elements of the minority culture are dropped, and there is some movement on the etic dimensions.

When an element of the subjective culture of a minority group is far removed from behavior, the mainstream group can not perceive it; when it is close to behavior the mainstream group can perceive it. Behavioral intentions are directly linked to behavior, while stereotypes are linked to behavior only indirectly through their influence on behavioral intentions (Triandis, 1984). This process has led some to contend that minority individuals have to practice biculturalism in order to function successfully within educational and career organizations (West, 1983); and that they suffer from cultural displacement on first arrival at an educational or career organization and, therefore, social integration becomes of immediate importance. Minority students require a sense of belonging within an education or training community as soon as possible. Relationships with white as well as minority peers and instructors are, therefore, of the highest importance for educational and career success.

When minority individuals enter math and natural science related training programs leading to a high-technology career, they are often in immediate proximity with white colleagues for the first time. Whether the proximity between minority individuals and other students or employees leads to positive or negative relationships depends on the structure in which they experience interaction.

Deutsch (1949, 1962) conceptualized three types of goal interdependence: cooperative, competitive, and individualistic. A cooperative social situation exists when the goals of the separate individuals are so linked together that there is a positive correlation among their goal attainments. A competitive social situation exists when goals of separate individuals are so linked that there is a negative correlation among their goal attainments. Finally, an individualistic social situation exists when there is no correlation among the goal attainments of the participants. Whether an individual accomplishes his or her goal has no influence in whether individuals achieve their goals.

From this theoretical base a number of studies including a recently completed metaanalysis (D. Johnson, Johnson, & Maruyama, 1983), have indicated that that cooperative learning experiences, compared with those which are competitive or individualistic, promote more interpersonal attraction among students; is positively related to liking other students; and promote more positive attitudes toward heterogeneous peers (D. Johnson & Johnson, & Scott, 1978). Still, other studies found that cooperative learning experiences promoted greater interpersonal attraction between ethnic minority and majority students (Cooper et al. , 1980; D. Warring, Johnson, Maruyama & Johnson, 1984) and among handicapped and nonhandicapped students (Armstrong, Johnson, & Balow, 1981).

A number of partial explanations have been offered for the positive relationship between cooperative learning experiences and interpersonal attraction. From these explanations researchers have hypothesized that positive cooperative experiences result in the following:

1. Greater perceptions of encouragement, support, and acceptance which lead to greater interpersonal attraction.
2. Greater empathy and understanding for others leading to greater interpersonal attraction.
3. More realistic, dynamic, and differentiated perceptions of others leading to greater liking and identification.
4. Higher self-esteem leading to less prejudices against and higher acceptance for others.
5. Greater academic and psychological success leading to greater liking for those who have contributed to that success.
6. More positive expectations about future interaction among students.

Cooperative learning experiences also affect relationships with superiors. The more favorable students' attitudes toward cooperation, the more they believe that teacher, teacher aides, counselors, and principals are important and positive; that teachers care about and want to increase students' learning; that teachers like and accept students as individuals, and that teachers and principals want to be friends with students (Gunderson & Johnson, 1980). These findings hold in elementary, junior high, and senior high schools in rural, suburban, and urban school districts. In suburban junior and senior high schools, student competitiveness becomes positively related to perceptions of being liked and supported personally and academically by teachers. Individualistic attitudes are consistently unrelated to attitudes toward school personnel. There are also several field experiments that demonstrate that students participating in cooperative learning experiences, compared with competitive and individualistic ones, like the teacher better and perceive the teacher as being more academically and personally supportive and accepting (D. Johnson & Johnson, 1983; Bjorkland, & Krotee, 1982).

COMMITMENT TO ORGANIZATIONAL GOALS

Educational, training, and high-technology career success for minorities is dependent upon their commitment to organizational goals and to the organization itself (Durkheim, 1961; Tinto, 1975). Within educational organizations minority students must be committed to such goals as degree completion and feel a personal identification with the institution. Mowday, Porter, and Steers (1982) have identified organizational commitment as being a prime determinant of turnover. Organizational commitment is defined as a syndrome of variables such as belief in the organization's goals, willingness to work on the organization's behalf, and intention to maintain membership in the organization. The greater minority individuals' organizational commitment, the more likely they are to complete training programs and develop a successful career progression pattern. There is a relationship between social integration into the organization and organizational commitment. If minority individuals' organizational commitment is low, then continuation of membership in the organization is based on the extent to which they are

socially integrated. A basic level of performance is necessary, however, to maintain membership. If minority individuals' organizational commitment is high, then their membership may be maintained despite a lack of social integration. Lack of social integration, however, may result in failure to succeed no matter how high commitment may be. A basic level of collaborative skills and social integration is necessary to maintain membership in a career organization.

Attitudes of employers about organizational commitment is demonstrated by their reliance on external vrs. internal markets. Different employers depend upon different sources to locate and to train members of their work force in different job categories. Some firms will hire most of their workers from outside the establishment for both entry level positions and supervisory or senior level positions. These firms, representing external labor markets, depend primarily upon the training and experience obtained by new employees from outside sources, rather than a previous demonstration of loyalty, as the basis for the major skills needed to fill the job. Internal labor markets, on the other hand, exist in firms and occupational groups (such as unionized crafts) where workers tend to be promoted within the employing unit according to a routinized job ladder and without competition from outside the unit. These firms will promote from within to fill most of their needs above entry level positions, and depend largely on the training and experience received on the job within the establishment to produce the major competencies needed in their work force (Braddock, 1984).

At the individual level, systemic social processes shape attitudes, aspirations and behaviors. At the organizational level, they shape goals and policies and procedures. And, at the societal level, they reflect broad social values. Processes operating at each of the various levels may also be interrelated. For example, segregation or discrimination at the societal or contextual level may not only affect minority access to high-technology organizations directly, but may do so indirectly as well through their impact on minority access to networks of job information and sponsorship. In general, systemic social processes may include but are not limited to what others have termed institutional discrimination.

Four systemic social processes have been hypothesized to affect the chances for blacks experiencing success in education and training as they relate to high-technology occupations. First, the occupational socialization process creates large differences in types of occupations, career lines, and labor markets entered by blacks and whites. Second, the job seeking processes differs especially in regard to the availability of informal networks of job information and employment contacts used by blacks and whites. Third, segregation in various spheres and institutions of society acts as a social constraint on minority life chances. And fourth, bureaucratization affects the level of minority participation in particular types of firms (Braddock, 1984).

One outcome of these processes is that minorities do not have as much information as majority members, about the intentions in the majority society. Thus, minorities are less likely to understand how bureaucracies work, what one has to do to achieve particular goals in the majority culture, or who is likely to be helpful to them in achieving their goals. Rojas (1982), working

with Hispanics, found that they had less clear cognitive maps than Anglos, about careers, preparation for careers, and how a bureaucracy works. Yet, he found that prestige and judgments of leadership reflect the extent to which a person "knows the ropes". Those who appear confused, who do not know where to turn for help, have little prestige. Similar observations (Triandis, 1976) have been made about ghetto, unemployed blacks, who often do not see the links between particular events (e.g., going to college) and their antecedents (e.g., graduating from high school).

Variation in cultural, psychological, and sociological aspects of the individualism-collectivism dimension is central to understanding commitment and acceptance of others. The major parameters that determine collectivism (in Triandis' 1985, forthcoming analysis) are (a) the range of behaviors that are determined by the ingroup(s), (b) the number of independent (disagreeing) ingroups, and (c) the degree of influence each ingroup exerts on commitment to the group. In simple cultures there is only one ingroup, and few independent ingroups which determine a very broad range of behaviors and do so to an extreme degree. In individualistic cultures there are many independent ingroups, each determines very few behaviors, and the degree of ingroup influence on behavior is minimal.

Consistent with this conceptualization are the results of a large scale ONR study which found that Hispanics are more collectivist than are mainstream Americans (Triandis, 1984). This research concluded that Hispanics expressed more concern about their ability to meet family obligations than comparable samples of Mainstream young adults (Triandis, 1981; Rojas, 1981; Triandis, et al. 1982a) and that the more acculturated Hispanics showed less familism (Triandis, et al. 1982b). Consistent also is Shweder and Bourne's (1982) argument that in collectivist cultures people perceive the self as a bundle of roles rather than as a bundle of personal attributes and the finding (Rojas, 1982) that Hispanics have difficulties distinguishing the person from the role. One implication of collectivism for work behavior is that collectivists will perform better when the assignments are made to a group, and the whole group receives the same rewards, while individualists will prefer individual assignments and individual schedules of reinforcement.

Bureaucracies can be conceived as consisting of numerous groups, and if one is skilled in working in bureaucracies one can obtain allies from different parts of the bureaucracy. These factors will allow individualists, who are skilled in entering and leaving ingroups, and choosing allies, to be more comfortable when operating in bureaucracies, than will be the case for collectivists, who will find bureaucracies forbiddingly complex and intractable. Consistent with this prediction Rojas (1982) reported that Hispanics find bureaucracies to be extremely difficult to understand, while mainstream workers seemed less at a loss in dealing with them.

Finally, organizational commitment is based, in part, on the attitudes minority individuals develop toward such high-technology subjects areas as math and science. Positive attitudes toward math and science need to be developed in order for minority individuals to take advanced math and science courses in high school, enter math- and science-related careers, and enjoy their work in high-technology fields.

MOTIVATION TO ACHIEVE

Of major importance is the question of how individuals and groups develop the motivation to achieve. Building on Deutsch's previously discussed interdependence theory (1949; 1962) David and Roger Johnson have hypothesized that cooperative, competitive, and individualistic social interactions create different motivational systems which, in turn, produce differential achievement. This theoretical model hypothesizes that there are a number of variables that explain the relationship between learning experiences and achievement motivation. They hypothesize that positive goal interdependence produces promotive interaction among individuals, while negative goal interdependence tends to result in oppositional interaction and no goal interdependence will result in an absence of interpersonal interaction. They go on to contend that promotive interaction results in intrinsic motivation, high expectations for success, incentives for achievement based on mutual benefit, epistemic curiosity and continuing interest in learning, positive attitudes toward the subject being studied, and task persistence. The Johnsons then characterize oppositional interaction as discouraging and obstructing others' efforts to achieve resulting in extrinsic motivation with expectations of success or failure based on a monopolistic comparison of own and others' academic ability. No interaction among individuals not only results in extrinsic motivation with expectations for success or failure based on a monopolistic view of one's academic ability, but also produces a lack of epistemic curiosity, it discourages a continuing interest in learning and finally produces a lack of persistence in completing assigned tasks. Both competitive and individualistic training behaviors, therefore, have negative results for all marginal groups and especially for blacks and Hispanics.

The Johnsons conclude by asserting that one will find higher achievement in cooperative structures than in competitive or individualistic learning situations and that high achievement and attributions ascribing success to joint competencies and the joint efforts of self and collaborators will result in different motivational systems involving: intrinsic and extrinsic motivation, subjective probability of success, incentive for achievement, epistemic curiosity, continuing motivation, task persistence, and finally the expectation of success in future cooperative achievement situations. In contrast competitive and individualistic learning situations results in lowered motivational systems and lowered expectation for future success for all but the most academically intelligent individuals. Further, within competitive learning situations, there is frequently a normative climate discouraging efforts to achieve academically. There is evidence that in the generally competitive climate of most schools, success at academic tasks has little value for many students and may even be a deterrent to popularity with peers (Bronfrenbrenner, 1970; Coleman, 1961; DeVries, Muse, & Wells, 1971; Slavin, 1974; Spilerman, 1971). Large-scale surveys, furthermore, have found that competitive attitudes are unrelated to indices of peer encouragement to achieve (D. Johnson & Ahlgren, 1976; D. Johnson, Johnson, & Anderson, 1978).

That a promotive interaction results from a cooperative goal structure tends to result in intrinsic motivation has been demonstrated by research which has found that students in cooperative situations see themselves as being intrinsically motivated, believe that their own efforts determine their school success, want to be good students and get good grades, and believe that

learning new ideas is important and enjoyable (D. Johnson, Johnson, & Anderson, 1978). There is also some experimental evidence that cooperative learning experiences, compared with non-cooperative experiences will result in greater motivation to do schoolwork (Garibaldi, 1976; D. Johnson, Johnson, Johnson, & Anderson, 1976).

In addition to contributing academic ability directly relevant to goal achievement, the efforts of group members in cooperative situations have to be organized and coordinated, relationships among members have to be effectively managed, ideas have to be formulated and exchanged, higher level learning strategies have to be discovered and adopted, conflicts have to be resolved, and mutual influence has to be constructively managed. This complexity results in a multi-dimensional view of one's own and others' competencies and low ability students can promote the learning of more academically able collaborators and contribute to the effectiveness of the learning group. Students in cooperative learning situations tend to view themselves and their collaborators as having many relevant abilities to contribute (D. Johnson & Johnson, 1983s). Even when their academic performances are markedly discrepant, members view themselves and their collaborators as being similar in overall ability and deservingness of reward (Ames & Felker, 1979; Ames & McKelvie, 1982). Low-performing students feel as satisfied as high performers with their level of performance (Ames, 1981). Low-achieving students view themselves (and are viewed by their collaborators) as competent group members who have contributed to the accomplishment of the group's learning goals (Ames, 1981; D. Johnson & Johnson, 1983a).

Members of unsuccessful cooperative groups tend to attribute their failure to task difficulty and bad luck (Bird, Foster, & Maruyams, 1980; Bukowski & Moore, 1980) and to a lack of effort by group members (Bird & Brame, 1978; Gill, 1980; Iso-Ahola, 1975, 1977a; Roberts, 1975; Scanlan, 1977). Because insufficient effort is perceived to be controllable, it is an adaptive attribution in the face of failure and leads to greater future persistence and performance on the task (Anderson & Jennings, 1980; Andrews & Debus, 1978). Students who attribute failure to insufficient effort on the part of one's collaborators, furthermore, can be optimistic about future success since collaborators can be induced to try harder (Crombag, 1966; Raven & Eschus, 1963). There is also some evidence that cooperators feel less responsible for their outcome when the group fails (Iso-Ahola, 1977a; Stephan, Brunam, & Aronson, 1979; Stephan, Presser, Kennedy, & Aronson, 1978), thus, decreasing the possibility of demoralization.

In competitive learning situations there tends to be a monopolistic view of own and others' competence, where academic ability is the most salient characteristic on which to base expectations for success (Ames & Ames, 1981; Ames, *et al.*, 1977; D. Johnson & Johnson, 1983b). When students perceive their academic ability to be greater than their classmates', they will have a high subjective probability of success. When students perceive their academic ability as less than their classmates, they will have a low subjective probability of success and this creates feelings of discouragement and hopelessness (Ames *et al.*, 1977; Covington & Omelich, 1979a, 1979b). Since only a few students can win, this monopolistic focus on academic ability tends to demoralize most students who will, therefore, avoid engaging in future

learning tasks in order to avoid reawakening the embarrassment of failure (Rosenzweig, 1943).

When the effort of other students has no effect on students' success or failure and only one's own effort has impact on expectations for success. Students have to believe that they can achieve their learning goals if they try hard enough. Although much of the research indicates that ability is of primary importance in determining subjective probability of success, there is recent evidence that when the learning goal is to improve on one's previous performance that effort becomes the dominant influence on expectations for success (Ames, in press; Covington, 1984; Heckhausen & Krug, 1982). Beach (1974) found that small discussion groups working cooperatively consulted more books in writing papers for a college psychology course than did students in a traditional lecture-competition format. Hovey, Gruber, and Terrell (1963) found that students who participated in cooperative discussion groups during a college psychology course engaged in more serious reading to increase their knowledge and demonstrated more curiosity about the subject matter following a course experience than did students in a traditional lecture-competition course format.

How long individuals persist in working on a task depends largely on their intrinsic motivation to do so, their expectations that they will be successful, the nature of the incentives involved, their epistemic curiosity in and continuing motivation to learn more about the topic, and their attitudes toward the subject. Failure may be the largest deterrent to task persistence, especially if individuals believe that there are no responses in their repertoire to alter the course of failure. The more committed students are to achieving academic goals, however, the greater their task persistence. Goal commitment implies a determination to try and keep trying to achieve the goal. This leads to high intrinsic motivation, for all members of the learning group.

Competitive learning situations also provide intrinsic motivation, but only for winners while losers often tend to stop working on the assigned tasks. Motivation under competitive environments tends to be extrinsic, with differential expectation for success based, in part, on social category. The incentive system is based on demonstrating superiority and oppositional interaction patterns decrease the likelihood of persistence on academic tasks if classmates discourage one's efforts to achieve or are resentful of one's successes. Minority students, because of their marginal status are particularly vulnerable to this problem.

HIGH ACHIEVEMENT

Although there may be some disagreement, most researchers now accept the idea that the appropriate measures of school effectiveness are outcomes obtained in student behaviors. Previously used criteria such as school inputs and teacher qualifications are now realized to be only measures of the means of obtaining student achievement.

No such agreement has emerged regarding what students are supposed to learn. The wide range of goals and objectives in American society make it difficult to place priorities on essential outcomes. Recently, a committee of

the Association for Supervision and Curriculum development spent considerable time to identify ten sets of educational goals which are commonly accepted in American education (Brookover, 1984). Although each of the ten goals were considered important, this committee concluded that the mastery and use of basic communication and computational skills was of primary concern. It was felt that these basic skills facilitate the achievement of essentially all other outcomes and do not interfere with the achievement of any of the others. Other behavioral goals (e.g., understanding others, self conceptualization, the use of accumulated knowledge, continuous learning behavior, effective participation in the economic world, and creativity) were deemed of secondary importance and that a reliable means of measuring and identifying them has not yet been developed.

One major problem when studying student achievement is the nature of American education. During the past half century American educators have focused much of their attention on identifying students who have a "limited ability" to learn. After students with such "deficits" are identified they are classified and school personnel adapt their level of expectations and instructional programs to fit the students perceived limited abilities. As it has turned out most students with presumed "deficits" in learning ability are from low socio-economic status families and are often members of minority groups. The typical American school does a reasonable job of teaching children from more affluent, educated, white families, but how important the school is in obtaining this outcome has been seriously questioned. Many researchers (Brookover, 1984; Coleman, 1964) contend that these students come with characteristics which so positively influence their education that one cannot credit their schools as being unusually effective. An effective school, instead, is one in which children from all social backgrounds achieve at high levels.

Researchers have, in recent years, come to use the concept of school learning climate as the combination of those school social system characteristics that significantly relate to student learning outcomes. This is a somewhat different usage of the term climate than others have identified. For convenience in discussing the characteristics of effective schools they can be classified into three clusters: the ideology of the school, the organization of the school, and the instructional practices of the school. These are all interacting aspects of the total school social system.

The ideology of effective schools is characterized by a set of beliefs, expectations, norms, and feelings that students can learn whatever the school identifies as a desirable behavioral outcome. This is in contrast to the belief in most American schools that large proportions of students cannot learn what other students learn. Effective schools are also characterized by high expectations that all students will achieve and by the belief that teachers can teach all types of students. This is in contrast to the belief that certain students cannot learn and/or only certain types of teachers have the ability to teach the gifted or the slow and even such social categories as blacks or Hispanics.

Effective schools are organized into social systems which are characterized by the definition of role behaviors where students are rewarded for high achievement behaviors and not for low levels of achievement; where

teachers status role and rewards are based upon their ability to teach all students and not just a selected few to high levels of performance. In addition, while there is a notable absence of specific research on principal behavior it has been hypothesized that to be effective they must be identified as a strong instructional leader.

The instructional practice includes specific identified objectives which are held for all students. In an effective school one will not find unstructured free-wheeling instructional programs in which outcomes are not clear and students are allowed to determine their own activities. There are several specific instructional tasks that have shown to be effective methods of organization. These effective instruction methods include greater time on task with non-confused and appropriate reinforcement practices and the practice which is currently considered to have the greatest potential, cooperative team learning.

Within colleges a major factor in whether minority students drop out is their level of achievement reflected in the mastery of theories, facts, information, and the application of that knowledge in completing assigned projects. (Armstrong, Johnson, & Balow, 1981; Humphreys, Johnson, & Johnson, 1982; Skon, et al., 1981; 1982). Since the 1920's there has been a great deal of research on the relative effects of educational organizational structure on achievement and productivity. Despite the large number of studies conducted, social scientists are still in disagreement about the conclusions that may be drawn. Michaels (1978), for example, selected ten studies to include in his review and concluded that competition promoted higher achievement. Slavin (1977) selected 27 studies and concluded that cooperation promotes higher achievement than does competition, but only if intergroup competition was included. Johnson et al. (1981) conducted a large meta-analysis (N = 122) of studies conducted between 1924 and 1981 employing three methods of meta-analysis: voting, effect-size, and z-scores. The results of this research indicate that cooperative learning experiences tend to promote higher achievement than do competitive and individualistic learning experiences and that the average person working within a cooperative situation achieves at about the 80th percentile of the students working within a competitive or individualistic situation. These results hold for all age levels, for all subject areas, and for tasks involving concept attainment, verbal problem-solving, categorizing, spatial problem-solving, retention and memory, motor performance, and guessing-judging-predicting. For rote-decoding and correcting tasks, cooperation seems to be equally effective as competitive and individualistic learning procedures.

Despite the large number of studies comparing the relative impact of cooperative, competitive, and individualistic learning situations on achievement, the processes that mediate or moderate the relationship between cooperation and productivity has been relatively ignored. There are several possible modifying reasons why cooperative team activity contributes to achievement. These possibilities need to be researched.

A potential modifying variable for the high achievement value of cooperation is that students in cooperative situations employ superior reasoning strategies. These strategies included the use of category search and retrieval techniques, intersectional classification, formulating equations

from story problems, and formulating strategies for avoiding repetitions and errors in a spatial reasoning task. (D. Johnson, Skon, & Johnson, 1980; Skon, Johnson, & Johnson, 1981).

A second potential mediator of cooperative achievement is that participation in cooperative learning groups produces conflicts among the ideas, opinions, conclusions, theories, and information of members. These may be dealt with constructively or destructively, depending on how they are structured by the teacher and the level of social skills of the students. D. Johnson, Johnson, Pierson, & Lyons, 1983; D. Johnson, Johnson, & Tiffany, 1984; Lowry & Johnson, 1981). When managed constructively, controversy promotes epistemic curiosity or uncertainty about the correctness of one's views, an active search for more information, and consequently, higher achievement and retention of the material being learned. Individuals working alone in competitive and individualistic situations do not have the opportunity for such a process.

A third mediating variable is that in cooperative learning groups the interaction among students from diverse ability levels. There may be an important advantage to having high-, medium-, and low-ability students work together on completing assignments and learning material (Brookover, et al., 1973).

A final mediating variable is that in high technology education individuals "who can sort sense from nonsense," or who have the analytical thinking abilities of grasping information, examining it, evaluating it for soundness, and applying it appropriately are rewarded. Cooperation may be more effective at promoting achievement on problem-solving and reasoning tasks (D. Johnson, Maruyama, et al., 1981) which indicates that cooperation may promote more analytical thinking.

While career advancement is severely restricted for adults who are deficient in technical and basic skills. The careers of minority individuals in educational and career organizations is mediated by competence in collaborating with others. In 1982 the Center for Public Resources published Basic Skills in the U.S. Workforce: The Contrasting Perceptions of Business, Labor, and Public Education. This study was a nationwide survey of businesses and industries that had annual 1980 sales of greater than \$100 million and that employed at least 500 employees, of major labor unions, and of public educational institutions in all parts of the country. Businesses, labor unions, and schools were in agreement that collaborative skills were important in employment retention. Terminations due to lack of basic and technical skills were not frequently reported, but terminations due to poor job attitudes, interpersonal relationships, behavior, or dress accounted for 90 percent of terminations.

A basic requirement for employability, and career progression, is the ability to work effectively with others to perform a task and solve problems. Engineers and other high technology personnel must now, more than ever, work with other scientists and technicians as well as economists, government officials, etc., to reach satisfactory and mutually acceptable designs for future technology. All engineers, for example, must be capable of communicating with and working with people of other professions to solve

interdisciplinary problems. A number of studies have documented that collaborative competencies are essential for successful engineering careers (Smith, Johnson, & Johnson, 1981b).

Technical and scientific knowledge are of no use if a student cannot supply them in cooperative interaction with other people. It does no good to train an engineer if the person cannot work effectively with other people and contribute what they know to joint efforts and maintain a job as an engineer or secretary after they have finished school. The industrial strategy of Japan is a good illustration of this principle. Japanese management has been quoted as stating that the superiority of the Japanese industrial system is not based on the fact that their workers are more intelligent than are the workers of other countries, but that their workers are better able to work in harmony and cooperation with each other. Obviously, the studies noted above in the section on promotive interaction indicate that students in cooperative learning situations learn more collaborative skills than do students learning competitively or individualistically. These skills, furthermore, have been demonstrated to transfer to new situations (R. Johnson & Johnson, 1982a).

SOCIAL NETWORKS

An important aspect of career progression patterns is the building of coalitions with ambitious and competent individuals to mutually advance each other's careers. The relationships formed within a training program can have important consequences for one's career success. The way in which interaction among employees in high-technology companies is structured will determine the opportunity for social networking.

There is a growing recognition of the need for research on how the lack of useful social networks for obtaining good jobs may contribute to black-white occupational inequalities. Major race and sex differences exist in the way that people hear about, are recruited to, and obtain good jobs. Also, informal mechanisms of job-finding tend to produce the most successful employment opportunities for minorities. There appear to be no adequate studies on either of these elements, but there has been a good deal of speculation that further research on these topics would reveal important minority exclusionary processes.

Labor economists have been interested for some time in job search methods and have developed theoretical models of factors to predict strategies of rational job seekers (Lippman and McCall, 1976). These models, however, have not been tested extensively with data. The major empirical sources of descriptive information on job search behaviors are the January 1973 supplement to the Current Population Survey (CPS) covering about two-thirds of the 16 million persons who spent time looking for jobs and actually found work in 1972 (U.S. Department of Labor, 1975); and the Department of Labor's National Longitudinal Survey (NLS) covering a nine-year period since 1966 for a sample of 5,225 young men. These surveys used a series of questions about job search methods that include direct application to an employer, formal methods such as using employment services or newspaper ads, and informal methods such as asking friends or relatives.

Although the CPS and NLS surveys disagree on the relative importance of informal methods over other approaches for finding work, both surveys indicate that minority workers use information or referrals by friends and relatives somewhat more often than whites to obtain work. The CPS tabulations report that 31.6 per cent of minority workers, compared to 25.7 percent of whites, used informal methods to get their present jobs (U.S. Department of Labor, 1975), and the NLS finds that 52 percent of black employed males 14 - 24 years old used friends or relatives to find their current jobs, compared to 47 percent of comparable whites (U.S. Department of Labor, 1970).

In his very thorough study of professional-technical and managerial workers Grannovetter (1974) indicated that informal interpersonal sources of job-vacancy information often produce better quality employment. The CPS tabulations suggest that blacks and other minorities depend more than whites upon information or sponsorship from friends or relatives to obtain higher level white collar and blue collar jobs, while whites find jobs more often than blacks through direct application. The racial differences in the proportion who used informal means to obtain jobs were greater for higher level white collar jobs (31 percent of blacks compared to 19 percent of whites the professional and technical level) than for lower level white collar jobs (26 percent of blacks compared to 22 percent of whites at the clerical level). Similarly, among blue collar occupations, racial differences in the percent who used informal networks to obtain employment were more important for higher level positions (42 percent of blacks compared to 27 percent of whites at the craftsmen level) than for lower level positions (26 percent of blacks compared to 29 percent of whites at the operative level and 35 percent of blacks compared to 36 percent of whites among laborers). Among all service workers except private households, blacks also relied somewhat more than whites on informal networks to obtain work -- 35 percent versus 28 percent (U.S. Department of Labor, 1975). The NLS survey of young men out-of-school and obtaining their early jobs in 1966 shows the same pattern of racial differences for white collar occupations: informal methods were used by 52 percent of blacks and 24 percent of whites for professional and technical jobs, but by 32 percent of blacks and 44 percent of whites for clerical jobs). In addition, blacks report using informal means more than whites in obtaining service jobs (55 percent versus 33 percent). But among blue collar occupations, NLS reports only small differences in the greater use by blacks of informal methods to land jobs, with no noticeable trend across the levels of blue collar work (U.S. Department of Labor, 1970).

If minorities rely more on informal methods to obtain higher level positions, as these data imply, additional research is required to understand the nature of the process. Do the formal methods not work as well for minorities because employers require additional sponsorship before they hire minorities; because minority workers look for informal reassurance about the working conditions before seeking employment in firms at higher levels; or because of other factors in the use of formal and informal networks or job opportunities? Moreover, the inconsistencies and serious limitations of existing data sources need to be first addressed to obtain more reliable estimates of the actual differences between racial groups in the use and value of different methods of job-seeking behavior (Becker, 1979). Consequently, it remains a largely untested hypothesis that, besides reasons of overt employer discrimination and differences in job training, blacks are underrepresented in

the best jobs because they are not tied into important networks of opportunity.

Of primary importance in understanding why minorities are at a networking disadvantage related to whites one must understand the effect of segregation on occupational attainment. Segregation in schools, neighborhoods and the labor force may circumscribe the occupational goals of high aspiring minority students to a restricted range of "traditional" professions such as teaching and social work where access has been both more open and more visible to members of their groups. Also, minority students in segregated schools may be less likely to have access to contacts and sponsorship networks which could lead to nontraditional and better paying jobs. Thus, segregation may serve to channel minorities away from preparation and access to careers in high-tech organizations. It would seem only reasonable that the legacy of job discrimination and segregation which has existed through out the history of the United States would contribute to the narrow range of black occupational aspirations and employment patterns (Spilerman, 1977). Current racial job distributions correspond to historical stereotypes and locations of black workers before segregation and discrimination were declared unconstitutional. Historically, most black professionals and high level social service workers supplied the segregated and institutions or worked in government jobs where racial exclusion was somewhat less intense. Blacks, therefore, continue to be overrepresented in "traditional" professions and in government employment, perhaps because anticipated discrimination remains high in other nontraditional scientific and technical fields or because segregation of schools and neighborhoods continues to present black students with professional role models who have been restricted to the traditional occupational types.

Research is needed to directly examine the effects of segregation and anticipated discrimination on black occupational aspirations. This would include studies of the type of occupational expectations of youngsters in segregated and desegregated schools and neighborhoods, studies of the effects of special minority educational orientation and recruitment experiments to address students' anticipation of exclusion in fields where blacks have been traditionally underrepresented (such as engineering and business), and studies of the underlying values and attitudes of blacks and whites about working in certain fields and relating to members of the other race in supervisory or subordinate positions.

There is very little evidence on the effects of segregation in limiting minority access to important informal networks of opportunity. Although the idea was offered several years ago (Crain, 1970) that school or residential segregation and discrimination may cut off blacks from valuable job information and contacts, there are no direct studies of the effects of segregation on job search behaviors. Some indirect evidence, however, suggests that this is a promising area for future research. This indirect evidence includes Rossi's (1974) study of 434 personnel managers of the largest employers in 15 major cities in which he found that that the proportion black of a firm's current work force is an important predictor both of the likelihood that blacks had recently applied to the firm for work and that black applicants were recently hired by the firm, even after all other measured characteristics of the firm and the city (including racial

composition of the city) were taken into account. The result was particularly strong for professional and white collar applicants and hiring, where current percent black in the work force accounted uniquely for much more variance than any other measured characteristic of the firm or city. Yet without time series data on rates of black employment, applications, and hiring in different firms, it is difficult to view the reported correlations as direct evidence that social network mechanisms are actually operating to affect employment access of minorities.

Although the Rossi et al. data (1974) from personnel managers included direct measures on the recruitment channels used by the firm and on the concurrent level of school segregation in the local city, results with these measures were not consistent and strong in explaining differences of black application and hiring rates at each occupational level. The reported use of specific recruitment channels did not relate to minority rates of application for employment, but the authors point out the available data do not indicate which channel was actually used by the black applicants or employees. The degree of school segregation in the local city also fails to be significantly related to the black application or hiring rates of firms at any occupational level. However, this is not a test of the long-term effects of school segregation on blacks' occupational opportunities, because the measure was not of the school desegregation experiences of those blacks presently in the work force but of the segregation of students still in school who resided in the same city as the firms whose employment practices were being studied. The first study to link the school desegregation of blacks to their own later life employment success was the retrospective study conducted in 1967 for the U.S. Commission on Civil Rights (1968; Crain, 1970). Although the sample size was small and it covered an earlier historical period, it did show a positive effect of earlier school desegregation on black entry into nontraditional and higher status jobs. This study also suggested that black adults who had attended desegregated schools had developed a more useful social network for job referrals and had a better knowledge of specific job opportunities (Crain and Weisman, 1973).

More recently, researchers have reported a similar positive relationship of desegregation with income and job status for black college graduates (Braddock, 1983; Braddock and McPartland, 1984; Brown and Ford, 1977). These studies suggest that black male bachelors recipients and masters degree recipients of both sexes from predominantly white colleges attain better paying and somewhat higher status jobs than comparable black graduates of predominantly black colleges. In the most comprehensive of this group of studies, Braddock and McPartland (1984) show these relationships to hold net of socioeconomic background, academic achievement test performance, region of residence, college grades or major field and type of job held. This study, a major portion of which is being funded by ONR has attempted to illustrate the importance of social networks for understanding how desegregation may affect black occupational attainments. The authors examined the job-seeking techniques that black college graduates in the NLS survey used to obtain their present jobs. Preliminary analyses revealed that although black males and females were equally likely (39 and 40 percent, respectively) to use friendship networks in obtaining job referrals, black male graduates of predominantly white institutions were somewhat more likely (37 percent) than black male graduates of predominantly black institutions (32 percent) to have

obtained their present job through friendship networks. In contrast, black female graduates of predominantly white institutions (27 percent) were considerably less likely than black female graduates of predominantly black institutions (47 percent) to have obtained their present jobs through friendship networks. Further, among the respondents who reported that they did obtain their present job through friendship networks, the income and occupational prestige advantages associated with college race appear to favor black male graduates of predominantly white institutions (\$1592 annual income and nine occupational prestige points) considerably more than black female graduates of predominantly white institutions (\$663 annual income and one occupational prestige point). Although their data did not permit identification of the race of friends used in the job-seeking process, previous research findings on interracial contacts and simple random probabilities suggest that black student friendship networks in predominantly white institutions are more likely to be racially-mixed than are black student friendship networks in predominantly black institutions. Thus, these preliminary results -- showing consistency in both occupational payoffs and uses/advantages of friendships in job-seeking behavior favoring males to a greater extent than females -- provide important indirect support of the social networking advantage available to black students in white colleges.

The research requirements for advancing knowledge about networks of opportunity is very difficult to conduct because there is no existing data using precise model specification and measurement. Collecting of better data about social networking is a first-order requirement.

CONCLUSIONS

From this review of existing literature several research directions have become evident. First, the greatest success in education and training programs occurs when academic and social systems coalesce and students have opportunities for both social interaction and mutual assistance. Minorities and organizations, however, both have cultures which are often mutually inconsistent, making the training of minorities for high-technology employment a difficult task. The greater the discrepancy between the culture of a minority group and the culture of the organization the higher the probability of their failure. While, future research should continue to study selection strategies which may maximize the probability of success we should concurrently invest greater research effort studying those elements of any culture which are unique (emic) and those elements which are common across more than one culture (etic). The purpose of this investment is to gain predictive power on how individuals react to environments in similar ways (etics), but with aspects of their reactions that are unique to particular cultural groups (emics). We should then undertake experiments on the manipulation of etic and emic elements which can increase individual and organizational achievement.

Second, educational, training, and high-technology career success for minorities is dependent upon their commitment to organizational goals and to the organization itself. The success of minority students in high-technology education and careers depends on their being integrated into constructive and supportive relationships with peers and superiors, developing commitment to organizational goals and to the organization itself, having high achievement

motivation, performing at a high level, developing high level analytical reasoning skill, acquiring collaborative competencies, forming coalitions with other ambitious and competent peers, and developing a basic psychological stability. Within educational organizations minority students must be committed to such goals as degree completion and they must feel a personal identification with the institution. The greater minority individuals' organizational commitment, the more likely they are to complete training programs and develop a successful career progression pattern. There is a relationship between social integration into the organization and organizational commitment. If minority individuals' organizational commitment is low, then continuation of membership in the organization is based on the extent to which they are socially integrated. Lack of social integration, however, may result in failure to succeed no matter how high their commitment. At the individual level, systemic social processes shape attitudes, aspirations and behaviors. At the organizational level, they shape goals and policies and procedures. And, at the societal level, they reflect broad social values. Processes operating at each of the various levels may also be interrelated. Consequently, much greater research is necessary on four systemic social processes as these relate to minorities acceptance of organizational goals related to training and preparation for high-technology organizations. These include: occupational socialization, job seeking behaviors, the effects of segregation, and how prospective minority and majority employees develop an understanding of how bureaucracies work. In addition, new research should be undertaken on perceptions of what one has to do to achieve particular goals, and who is likely to be helpful in achieving goals.

Third, while the process of effective schooling has been defined, it has many aspects which are not well understood and about which more research is necessary. We must learn much more about the ideology of effective schools. This includes knowledge about the beliefs, expectations, norms, and feelings about students which are exhibited in these organizations. Research must be done on how this contrasts the the ideology found in the "normal" American school. Further research must be done on the organizational patterns which are found in effective schools related to the social systems, role behaviors, and the reward patterns surrounding achievement behaviors. We must also begin research the effect of group size on function and develop further understandings of how the perception that one's efforts are or are not needed as the size of the group increases and as collaborators' efforts make one's own efforts unnecessary. Further research is also needed on status, role behaviors, and of teacher rewards related to the ability to teach all students and not just selected high achievers. In addition, there is a notable absence of specific research on principal behavior it this relates to leadership and effective schooling.

Fourth, despite the large number of studies comparing the relative impact of cooperative, competitive, and individualistic learning situations on achievement, the processes that mediate or moderate the relationship between cooperation and productivity has been relatively ignored. There are several possible modifying reasons which should be explored. These possibilities include: research to determine if students in cooperative situations employ superior reasoning strategies; if participation in cooperative learning groups produces conflicts among the ideas, opinions, conclusions, theories, and

information of members and if these are dealt with constructively or destructively; if in cooperative learning groups the interaction among students from diverse ability levels has important advantage to high-, medium-, and low-ability students; and finally, if the cooperative treatment may be more effective at promoting achievement on problem-solving and reasoning tasks promoting more analytical thinking.

Finally, much more research must be done to understand why minorities are at a networking disadvantage related to whites and the effect of segregation on occupational attainment. We need know if segregation in schools, neighborhoods and the labor force circumscribe the occupational goals of high aspiring minority students to a restricted range of "traditional" professions and how to overcome the social-psychological and educational problems that are the vestiges of segregated schools and neighborhoods.

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