SOME POSSIBLE DERIVATIONS FROM EXPERIMENTAL PHILOSOPHY FOR THE TEACHING OF NATURAL SCIENCE IN COLLEGE GENERAL EDUCATION PROGRAMS

By

John Newton Moore

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John Newton Moore

candidate for the degree of

Doctor of Education

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Thesis: Some Possible Derivations from Experimental Philosophy for the Teaching of Natural Science in College General Education Programs.

Outline of Studies:

Major subject -- Higher Education

Cognate field -- Biological Sciences

Biographical Items:

Born, April 2, 1920.

Undergraduate Studies, Denison University, 1937-1941; University of Arkansas, Summer Session, 1939 and 1940.

Graduate Studies, Michigan State College, 1941-1943, Master of Science in Botany and Plant Pathology; Michigan State College, 1947-1952.

Experience: Graduate Assistant, Botany, 1941-1943, Michigan State College; Instructor, Michigan State College, 1943-1944; U. S. Navy, Radar Officer, 1944-1946; Instructor, Michigan State College, 1946-.

Member of: American Association for the Advancement of Science, Foundation for Integrated Studies, International Society for General Semantics, Omicron Delta Kappa.

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CHAPTER I

INTRODUCTION

The purpose of this chapter is to provide some indication of the structure of this investigation. The discussion presented herewith is intended as an overview of the ideas developed in six related areas. Each of the following chapters is an attempt to elucidate a major area. Therefore, only an outline of the arguments in these chapters is included here. Substantiation and documentation are provided in the more extensive discussion which comprises the body of the study.

Many writers have attempted to interpret the complex patchwork that is American education.[1] They have drawn attention to the numerous and diverse forms of formal education. Today, certain educators claim that education for youth should be strict and disciplinary like the education which was so common in early years of this country. Then, there are claims that formal education should be more liberal and should place greater freedom of choice and decision in the hands of youth.

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1 Among these are:
John Franklin Bobbitt, The Curriculum of Modern Education. (New York: McGraw-Hill Book Co., 1941).
John S. Brubacher, Modern Philosophies of Education. (New York: McGraw-Hill Book Co., 1939).
R. Freeman Butts, The College Charts Its Course. (New York: McGraw-Hill Book Co., 1939).
Isaac L. Kandel, History of Secondary Education. (Boston: Houghton Mifflin Company, 1930).
Harold Spears, The Emerging High School Curriculum. (New York: American Book Company, 1948).

Some people claim that education should train youth to be "gentlemen" as in the times when education was an expected privilege of the few. Others claim that education should prepare youth for specific vocations which will allow each and every one to make his or her own way in life.

There are those who claim that educational pursuits should perpetuate "culture". They hold that education should be liberal and should concentrate on the finer things of life which can be found in art, literature, poetry, and the like. Still other claimants say that modern education should be generally introductory to all areas of man's knowledge, and should foster free and intelligent interchange of ideas and views by all students.

Therefore, there are many diverse interpretations pertaining to the purpose of education, the content of education, and the value of formal educative efforts. The existence of these various interpretations is reflected in studies of education in this country.[2] These studies have examined the goals and aims of American people. Questions have arisen

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2 Among these are:
Educational Policies Commission, The Purposes of Education in American Democracy. (Washington: National Education Association, 1938).
Educational Policies Commission, Learning the Ways of Democracy. (Washington: National Education Association, 1940).
Educational Policies Commission, The Education of Free Men in American Democracy. (Washington: National Education Association, 1941).
John Dewey Society, Intercultural Attitudes in the Making. Ninth Yearbook. (New York: Harper and Brothers, 1947).
Benjamin F. Pittenger, Indoctrination for American Democracy. (New York: The Macmillan Company, 1941).

concerning the nature of a liberal and a vocational education. Examination of today's culture revealed that much of it has been inherited from the past.

Also, these studies have led to experiments with interlacing and overlapping forms of specialized and liberal education. The most successful efforts have been developed, most generally, in the high school years and other pre-college years of the educative process in formalized educational institutions.[3] However, these "grass roots" efforts for revised treatment of man's socially inherited information are complemented today by a general education movement at the college level in many large institutions.

Actually, these attempts have the *prima facie* intent of working toward maximum utilization of intelligence in social situations as well as in academic cloisters. This premise keynotes the problem of this investigation. The problem investigated in the following chapters may be derived from these attempts to foster greater social intelligence.

The problem of this investigation involves the question: What are some derivations from experimental philosophy for the teaching of natural science in a college general education program? The scope of the study is arbitrarily limited to the areas of science as they might be taught in a formal educational program attempting to enhance maximum utilization of

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3 See Committee on Function of Science in General Education, *Science in General Education*. (New York: D. Appleton-Century Company, 1938) and National Commission on Cooperative Curriculum Planning, *The Subject Fields in General Education*. (New York: D. Appleton-Century Company, 1941).

intelligence in social situations. On first consideration, the problem could be subdivided into discussions of derivations for method and subject matter. Instead, in keeping with general scientific methodology, the primary problem of this investigation is broken down into still more definitive or corollary questions. Then, on the basis of interpretations identified in connection with these corollary questions, logical derivatives are stated for the sub-problems of teaching natural science, namely, method and subject matter.

The corollary questions handled in this manner are: What are some of the existent conditions in the educational scene? What is the task of education and the function of science in American culture? How reach decisions on curriculum and method? What are the methods for teaching a natural science course? What are the subject matter areas of a natural science course?

An approach to the problem of teaching natural science in general education logically entails a study of certain background conditions of the modern educational scene. This is accomplished in detail in Chapter II. Generally, from what has been said already, it should be clear that a diversity of educational forms comprise American education. One aspect leading to this diversity is the task of developing an educational program which will be appropriate for all groups of people. Today, mass education no longer follows the ancient and more classical mold of liberal education. Ideas about industry and the advancement of science have been added to the original seven liberal arts and the classical studies of Greek, Roman, Medieval, and Renaissance times. Another aspect is the separation of the

state from the church. Whereas the church was responsible once for education, the state now has taken over direction of the educational activities to a large degree.

Therefore, in recent decades, attempts have been made to change the inherited European systems and philosophies of education. These attempts at re-liberalization of liberal education are called, collectively, general education. General education is a modern institutionalized means for developing student understandings, abilities, loyalties, and devotions.

Subsequent to this interpretation of education, many of these courses are organized to emphasize method and not subject matter coverage. Thus, much student participation is proposed as a basis for personal action in present day life activities of the student. Such participation encourages use of intelligence in social situations. This outlook brings about the application of information and scientific procedures to human affairs. Such an experimental mode of teaching reduces cultural lags of method and subject matter.

Though a description of general education is necessary, a survey and assessment of the present state of affairs would be remiss without reference to the task of education and the function of science in American culture. This second corollary question of the study is answered in Chapter III. To get at the educational task, it is profitable to compare the function of education in a primitive society with that function in modern society. In a primitive society, youth take on desired learnings by living in the society and participating in the culture. There are no formal educational institutions. However, in modern society, a much more

complex, institutionalized social structure prevails. Modern society is fragmented by division of labor, race, socioeconomic status, and the like. This division results in a varied social matrix in which formal educational institutions must function. Specifically, the major general function of the school is that of induction of youth into accepted ways of society. Yet, this is not adequately accomplished since the school is withdrawn from the realities of the community. All too often, the method employed in schools tends to isolate these institutions from society.

Starting from a general induction function of education, it follows that science is a special area of mediation in formal education. Some fundamental notions on the function of science in modern society are gained from inspecting social implications of science and considering interactions of science and society. As science and scientists have arisen to a position of authority in the past few hundred years, scientific materialism has become a dogma. This dogma has led to specialism. The operation of scientific mentality in the service of specialism has resulted in neglect of the social role of many scientists. They have considered all things merely as the interplay of masses in motion; they have idolized matter. Only recently have some scientists emphasized their social dependency and social responsibility for their creative formations.

The delayed development of a social theory of nature was conditioned by the social origin of men's ideas. Competition was given much emphasis in the theory of organic evolution because of the competitive nature of man's society in the nineteenth century. Only as man became more complete in his interpretation of the socially important concept of organic

evolution did observers emerge who studied the cooperative tendencies of living things. The idea of cooperation is well exemplified by the group creativity of scientists.

Nevertheless, the scientists' emphasis on specialization in teaching has contributed to isolation of school learnings. The graduate training attitude directs college and secondary school activity as if all students were apprentice graduate students. Therefore, science teachers in their devotion to scientific materialism neglect their social function as mediating agents. They impose professional requirements on all students. This makes it necessary to study the authority of science specialists who set up courses that emphasize specialism.

Such a study of how decisions are reached on curriculum and method is incorporated into Chapter IV. In the traditional educational situation, the teacher is the expert, the student is the subject of authority, and the subject is the field of expertness represented by the teacher. The science teacher usually reflects the factual-mechanical aspects of science rather than the social or moral aspects. Consequently, the knowledge extended to the student fails to be socially centered. Generally, the teacher functions as if the student is an apprentice for induction into a scientific association. This is very similar to a medical student who expects to become a doctor by working with a medical expert. These conditions result in learning situations which are chosen to satisfy certain criteria of a scientific association and are usually isolated from society.

Apparently, then, in the traditional authority relationship, the mind of the student is interpretated as the sum total of impressions

acquired during a lifetime. Mind is a content of ideas or impressions. Therefore, mind is developed by mechanically applying a method whereby ideas are impressed on the mind from the outside. However, this viewpoint is based on a restricted concept of interest. Also, it is more suitable to conservative or authoritarian institutions than for democratic societies. From this it follows that an alternative viewpoint must be considered. Learning is more than the linearity of the content concept of mind. Learning also involves higher mental processes of comparing, inferring, and abstracting. Learning is changed behavior. Therefore, some general alternatives to these assessed conditions of the present state of affairs must be formulated.

Some general alternatives to the traditional concepts of mind, subject matter, and method are part of experimental philosophy. These alternatives are derived from experimental philosophy in Chapter V. These concepts contrast directly with conditions surveyed in connection with the third corollary question. Mind is the functional relationship of an individual interacting with an environment. In this sense, mind is related to action and is instrumental to the satisfaction of demands of interested behavior. Mind and consciousness are the climax of organic emergence and are involved in a certain type of creativity. They emerge from situations of social intercourse. Therefore, through the mechanism of language communication, a person controls significant meanings. If this is acceptable, then face to face relationships are most desirable. It follows that these meanings are most significant when acquired through the social process, and are indicated to others in the same medium. Such interaction leads

to self-consciousness. This is a fuller concept of mind than mere content of ideas and impressions.

The alternative from experimental philosophy to the isolation of subject matter suggests that subject matter is the means for developing socially significant meanings. In light of the alternative concept of mind, subject matter must be presented in a social environment. Subject matter should be selected according to a criterion of social worth. This means that experiences in which the widest number of persons share are essential, while professional specialism comes second. Therefore, a curriculum should involve social relationships so that, in a group process, social insight and interest may be developed. Scientific subject matter is a special medium for mediation of that part of the culture which safeguards against practices of premature acceptance and superficial application of knowledge.

The alternative from experimental philosophy to the method of traditional authority relationships emphasizes utilization of acquired knowledge. This means transfer of information. Based on an interpretation of mind as function, enhancement of transfer may hinge on opportunity for discussion. Provision for discussion means student participation and acceptance of responsibilities which modify authoritarian relationships of current practices. In short, the methods of the science classroom should capitalize on similarities between scientific methods and democratic procedures. Cooperative democratic action is joint action which fosters the emergence of mind and self-consciousness. From these general alternatives of experimental philosophy, certain specific alternatives may be derived.

Logical derivations of philosophical and psychological interpretations developed from arguments on the first three corollary questions lead to specific alternatives to the elements of the three-fold authority relationship. These alternatives answer the fourth corollary question about the method of a natural science course. Specific alternatives to (1) the role of the expert, (2) the character and responsibility of the learner, (3) the nature of the learning situation, and (4) the nature of the field are found in Chapter VI. Briefly, the expert will use the interests of students to keep them sensitive to their environment. He will use value orientations to bring students to examine their own ideas; thus, encouraging emergence of understandings and significant meanings. The expert will exercise his authority with the purposes of the student in mind. He will not consider the student an apprentice like the medical student. He will attempt to serve the needs of the student so as to help him gain social homeostasis. He will encourage democratic relationships.

The student as learner will be devoted to the democratic way of life. He will develop a character that is integral, socialized, and objective. In addition, he will recognize his two-fold responsibilities. He is responsible to be integral in outlook and self-objective. Also, the learner is responsible to take part in group activities and to be socialized. Such cooperative action leads to convictions and emergence of self-consciousness.

The learning situation must provide for development of democratic character in the learner. The teaching-learning situations must demand inspection of value orientations, must stimulate personal commitments, and

must demand extension of pertinent factual understandings. Incorporated into these situations will be procedures for evaluation of behavior and validation of objectives.

In general terms, the field is the vehicle by which the expert, the learner, and the methods of the teaching-learning situations function. The science field is a means whereby the learner is inducted into part of the present social matrix. However, the learner would not be inducted into the field of expertness to the same degree as a medical student who is an apprentice to the field of medicine. This would not be feasible for the general education student for whom the social fundamentals of science are essential. Specifically, an alternative to the customary fact-finding emphasis in science would involve greater use of social-ethical-moral generalizations. Such a curriculum would emphasize social relationships. It would provide for development of social insight and interest in social-scientific problems.

The last corollary question was, What are the subject matter areas of a natural science course in college general education programs? The answer to this question logically would be an extension of derivations for method from experimental philosophy. The unstructured nature of the methods presented in answer to the fourth question makes it impossible to prescribe an intensified subject matter treatment.

However, to provide some extension to subject matter of the deductions for method, an outline of major topic units is presented in Chapter VII. Objectives for general education and science courses in such a program tend to be quite broad. Therefore, a functional and operational method for

denoting relationships of broad objectives to specific subject matter areas is discussed. Objectives are related to tendencies or behavioral patterns of all societal men. In turn, these tendencies are related to specific subject matter areas. In this way, demands for study of certain information are made evident. This information is alternative to the isolated subject matter of traditional educational situations. The appropriate natural science subject matter is outlined under four large unit headings, namely, mental activity, socio-scientific laws, maintenance of life, and scientific philosophy. They are derived from relationships of man's tendencies or behavioral patterns and broad objectives of general education.

In conclusion, the following chapter organization of this study has been arranged around a problem-solving approach: clarification of purposes and goals of general education along with background assumptions, Chapter II; survey and assessment of the present state of affairs, Chapters III and IV; attempts to formulate alternatives or hypotheses to fit the demand of the entire situation, Chapter V; and fusion of ideal and the identified existent conditions into a program of action which is more than a compromise, but a real synthesis intended as a means of forging the ideal into reality, Chapters VI and VII.

CHAPTER II

CHAPTER II

BACKGROUND OF THE PROBLEM

In Chapter I, attention was drawn to numerous studies of American education. These studies pertained primarily to the purpose of education, the content of education, and the value of formal education. One problem of implementing American education stands out in the reports of these studies because it reflects long standing perplexities of Western formal education. That problem involves the definition of a "liberal education". In American democracy, any solution of the problem must be predicated upon the assumption that present day non-specialist education ought to be appropriate for all groups of people. However, a glance through historical accounts of education reveals that such a basis for education did not prevail always.

The ancient Greeks looked upon a liberal education as that training which would develop the character of a free man. In Greece, liberal education was aristocratic, primarily, because "liberal studies" were confined to those fields of knowledge which involved the political and intellectual life of the free citizen and did not include those areas of activity which involved making a living through manual work or subservience to others. Therefore, this interpretation tended to disregard "liberal" education for the man in servitude. The insistence of the Greeks upon this interpretation was in keeping with the aristocratic cleavage of their culture. So it is that modern conservatives can claim historical bases

for their insistence upon return to such an aristocratic cleavage between the intellectual and the practical. Yet, the question as to whether this historical conception is appropriate to contemporary America seems, in some cases, to be ignored.

It seems apparent that the dominant interests in Roman times and in the medieval Christian Church determined what should be considered a "liberal education". When an education was aimed at the practical affairs of life, it was freer and wider than when it was aimed at intellectual and literary "culture", or at religious and other worldly affairs. When truth was considered to be in a state of flux, a considerable amount of freedom was allowed to teachers and students. When truth was considered, for various reasons, to be fixed, eternal, and authoritarian, education became circumscribed and prescribed. This was included in the theory of Plato and the practice of the medieval church. These opposing conceptions of truth and their corresponding conceptions of a liberal education have long struggled for domination of higher education.

Even in the uniquely free environment and attitudes which prevailed in the political organization of the early American colonies and the new United States, it is possible to find traces and combinations of three ideals, or theories, of higher education. One was the medieval idea that the study of seven liberal arts[1] alone comprised a liberal education and

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1 The seven liberal arts, which were appropriated by the early Christians as the core of the theological course in cathedral and monastic schools, were: the lower studies--grammar, rhetoric, and dialectic or logic--and the higher studies--arithmetic, geometry, music, and astronomy.

a preparation for later professional study. A second was the Renaissance ideal that the study of the classics was the best means of arriving at a liberal education whether in church or in state. This included a thorough study of Greek and Latin and classical literature. The third was the Reformation ideal that there should be religious control of higher education for protection of sectarianism and for preparation of ministers who would defend and propagate particular religious doctrine. Concerning these ideals Butts says,

> Our most common notions of the ideal liberal education were formulated in the times of ancient Greece and Rome; and then during the intervening centuries the medieval church, the Renaissance, and the Reformation accepted and modified these notions to suit their own purposes.[2]

Also, it is possible to show that the curricula of early American colleges, which showed combinations of these three ideals, were only slightly affected by the enlightenment of the late seventeenth and early eighteenth centuries. Early curricula in America were strongly classical and contained little scientific and commercially useful subjects. Expansion in scientific knowledge, the refinement of skills needed in trade and commerce, and the prevalence of individualistic ideals of economic gain were responsible for the changes that occurred, but the conception still held sway that a liberal education ought to be a complete round of prescribed studies heavily weighted on the linguistic and mathematical side. It was not until the forces of a highly industrialized society were at

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2 R. Freeman Butts, The College Charts Its Course. (New York: McGraw-Hill Book Company, Inc., 1939), p. 19. A similar discussion of the roots of liberal education may be found in Chapter II.

work in the early half of the twentieth century that the traditional notion of a liberal education was really put on the defensive. Changes in traditional liberal education are represented in the liberal arts colleges and schools of liberal arts and sciences in larger universities of today.

Intimately interwoven with the problem of defining a liberal education is the problem of secularization of American education. This problem stems from the separation of church and state in this country. The separation of church and state is based upon

> ... the doctrine that the state shall not appropriate money to religious institutions and shall not prefer one religious outlook as such to another; and that the state will protect its citizens in the equal free exercise of thought and choice in matters religious and will require of its schools that they not teach or act in any way to contravene these principles.[3]

The state has replaced the church as the social institution which directs the education of youth. Today, the various levels of government, i.e., national, provincial, and local, have control of teaching situations. This situation has its roots in the Reformation. It can be demonstrated from historical records that the Reformation created the need for a new educational authority. Attempts to meet this need in France, Prussia, and England led to different formalized educational institutions. In colonial America and the early period of United States history, education was characterized by a prevading religious emphasis.

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3 John S. Brubacher, editor, The Public Schools and Spiritual Values. (New York: Harper and Brothers, 1944), p. 9.

> Everywhere in the colonies the common people were seriously concerned that children should be taught reading and the principles of religion; but frequently their interest in education did not go much further. Everywhere, education was still accepted as one of the functions of the church although it was felt that other agencies, such as private bodies or the state, might properly support or at least supplement the church in the performance of this duty.[4]

In Virginia, the churches established parish schools and a few maintained charity schools. In the middle colonies, the parochial school became the prevailing type. There was no established church and each sect taught its people to read the Holy word. In New England, there was less religious diversity. The Puritan and Calvinistic interest in education, the close cooperation between state and church, and other factors helped develop a public school more easily and sooner than in the other colonies. Massachusetts led the country in formulating general education laws.

However, as the United States government was developed in the eighteenth and nineteenth century, educational theory reflected a separation of religion and citizenship. In discussing the emergence of the secular school in the United States, Mason[5] enumerates several phases of legal enactment that established the American public school as separate from the church. He includes the first amendment to the Constitution, the Declaration of Rights of the Pennsylvania Constitution of 1776, the growing equalitarian political

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4 H. G. Good, A History of Western Education. (New York: The Macmillan Company, 1947), p. 376.

5 Robert E. Mason, Moral Values and Secular Education. (New York: Columbia University Press, 1950). See also S. W. Brown, The Secularization of American Education. (New York: Teachers College, Columbia University, 1912).

thought, and the state constitutions and education laws enacted between 1860 and 1900 in that list of legal steps. Without a doubt, the immediate cause for secularism in the public schools has been sectarianism. Each sect sought protection from the domination of every other sect. Also, there were three basic and related trends which helped produce the secular school, i.e., "the development of modern science, the rise of democracy and the belief in the integral relation of mind and body".[6] Yet the exclusion of sectarianism from the schools was not due to any apathy toward religion.

> As has been emphasized by many historians, these changes in the aims, program, and control of public education were not made by the American people because they were indifferent or hostile to the interests of spiritual religion. On the contrary, they were moved to secularize public education because of their loyalty to some of the deepest spiritual meanings of American life. In addition to their loyalty to the pattern of experimental science, they regarded democracy, both as a form of government and as a personal and social way of life, as the very core of our ethical and spiritual heritage.[7]

Therefore, teachers in public schools respect religious rights. The schools are friendly toward religion.

However, as a form of government, democracy has its secular connotations. It is a government in which

> ... no institution, authority, or leadership, ecclesiastical or otherwise, could be given a preferred status. In so far as any social order were thus granted a privileged position in the processes of government, the doctrine of equal rights and the sovereignty of the people would to that extent be impaired.

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6 Ward Madden, Religious Values in Education. (New York: Harper and Brothers, 1951), p. 7.

7 Brubacher, op. cit., p. 73.

> Political democracy with its presupposition of a government which rests on the free consent of all of the governed very definitely implies a society in which the 'lay' principle has become universalized. The leaders of the church are citizens with all the rights of citizenship, but their ideas and proposals can become influential only as they win their way in free and open competition with those advanced by other groups of citizens. In other words, in a political democracy clergymen are also laymen along with the rest of the population. In this political sense, the pattern of democracy is essentially and necessarily a secular one. It is therefore a confused and misleading form of thinking which holds that in order to conserve our democratic heritage we must abandon this secular principle.[8]

In the past three hundred years, then, Protestants in this country have been transferring from church to state the task of shaping the thinking and character of youth. However, if the state is to replace the church in teaching youth, then responsible leaders of the state must have the ideas, the appreciations, and the wisdom upon which teaching depends. The motives of secular teaching must be concerned, today, with guardianship of the "ways of life" which formerly had been the social function of the church. This conclusion leads to a consideration of certain educational values. Mason says,

> The problem of educational values becomes most perplexing in a free society in which public education is a secular function. For existence of a plurality of values and value-systems is a factor in freedom.[9]

Therefore, pursuant to the development of a democratic way of life, it would seem necessary for a secular educational system to be concerned with moral and spiritual values. It is no doubt true that diversities of

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8 Ibid., pp. 74-75.

9 Mason, op. cit., p. 13.

interpretations exist concerning these values. However, many values that direct the conduct of people are given political expression in the Constitution and the Bill of Rights. Thus, there must be some agreement on some aspects of values. In the seventh yearbook of the John Dewey Society, the authors hold

> ... that there is a large measure of agreement in American communities on what these spiritual values mean by way of actual personal conduct. Our differences, our lack of community, on them concerns rather the philosophical rationalization and verbalization of these values.[10]

In 1951, the Educational Policies Commission[11] developed an analysis of the moral and spiritual values which the American people as a whole have used to manage their lives. The commission lists the following values as being agreed upon by the American people:

1. Human Personality
2. Moral Responsibility
3. Institutions as the Servants of Men
4. Common Consent
5. Devotion to Truth
6. Respect for Excellence
7. Moral Equality
8. Brotherhood
9. The Pursuit of Happiness
10. Spiritual Enrichment.

It seems logical to conclude that, if the state is to provide guardianship for the "ways of life", then these common values must become active and forceful parts of secularized education.

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10 Brubacher, op. cit., p. 12.

11 Educational Policies Commission, Moral and Spiritual Values in the Public Schools. (Washington: National Education Association of the United States and the American Association of School Administrators, 1951), pp. 18-31.

Thus far, two important aspects of the turmoil which exists in modern American educational institutions have been identified. The problem of determining a suitable liberal education for today's youth was seen as an important aspect of the present situation. An attempt was made to show that the present educational system contains expression of various inherited ideals of higher education which may or may not be appropriate for educating youth in American democracy. The second problem mentioned was the fundamental separation of the state from the church and the subsequent secularization of education. The significance of the state's responsibility for guarding the beliefs and values which give concrete guidance and control to human behavior was pointed out. From this brief examination of some historical antecedents of present day conditions, it should be apparent that current conditions are of long standing and the result of a number of cumulative causes. Therefore, attention will now be turned to consideration of recent attempts at the college level to meet these problems which have been identified.

DEFINITIONS AND BASIC ASSUMPTIONS

Within recent decades, attempts to change the inherited European systems and philosophies of education have appeared in American educational institutions. Many innovations and experiments have been developed even at the college level because, as Ivol Spafford says,

> Educators were beginning to see that though there had been a time when life itself educated for living and the school had a minor place in such preparation, this was no longer true. Life was more

> complex. Change was rapid. ... The standards of conduct set by home and church were to many people no longer acceptable. Society with its more complex organization demanded a kind of participation for which people were unprepared.[12]

Spafford goes on to say that even though the various experiments promulgated do differ in certain ways, they show certain similarities. She quotes Eurich as writing,

> Fundamentally there is a common concern that underlies all efforts to stress general education in the upper secondary and higher levels regardless of the different emphasis. It is a concern that grows out of (1) a dissatisfaction with higher education as now organized, (2) a reaction against an overemphasis upon specialization in the colleges, (3) a new body of information regarding the college and the characteristics of the student body, (4) the current youth problem in society, and (5) a deepened desire to do something that will make education more effective than it has been in the past, largely, perhaps, in the hope that future generations will be able to solve better such problems as those that baffle present-day society.[13]

In other words these changes are leading into a new period in college education where there is a return to general education with an emphasis upon the adjustment of work to the individual, and where there is the intent to substitute a "field of concentration" for the "major" subject. These changes have as a common purpose the redefinition of liberal education for the present age. Collectively, these changes are called general education. The President's Commission on Higher Education supplies this definition:

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12 Ivol Spafford and others, Building a Curriculum for General Education. (Minneapolis: The University of Minnesota Press, 1943), pp. 16-17.

13 A. C. Eurich, "General Education in the American College," Thirty-Eighth Yearbook of the National Society for the Study of Education, Part II, 1939, pp. 6-7.

> 'General education' is the term that has come to be accepted for those phases of non specialized and non vocationalized learning which should be the common experience of all educated men and women.[14]

The philosophy back of general education calls for an effort to frame the educative process in terms of life's problems as men face them; that is, to aim the curriculum at human orientation and social direction.[15]

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14 President's Commission on Higher Education, Higher Education for American Democracy. (New York: Harper and Brothers, 1947), Vol. I, p. 49.

15 Ibid., Vol. I, pp. 50-58. The report of the President's Commission provides the following list of culture guided objectives of general education:

"1. To develop for the regulation of one's personal and civic life a code of behavior based on ethical principles consistent with democratic ideals."

"2. To participate actively as an informed and responsible citizen in solving the social, economic, and political problems of one's community, State and Nation."

"3. To recognize the interdependence of the different peoples of the world and one's personal responsibility for fostering international understanding and peace."

"4. To understand the common phenomena in one's physical environment, to apply habits of scientific thought to both personal and civic problems, and to appreciate the implications of scientific discoveries for human welfare."

"5. To understand the ideas of others and to express one's own effectively."

"6. To attain a satisfactory emotional and social adjustment."

"7. To maintain and improve his own health and to cooperate actively and intelligently in solving community health problems."

"8. To understand and enjoy literature, art, music, and other cultural activities as expressions of personal and social experience, and to participate to some extent in some form of creative activity."

"9. To acquire the knowledge and attitudes basic to a satisfying family life."

"10. To choose a socially useful and personally satisfying vocation that will permit one to use to the full his particular interests and abilities."

"11. To acquire and use the skills and habits involved in critical and constructive thinking."

As seen by the members of the President's Commission,

> The crucial task of higher education today, therefore, is to provide a unified general education for American youth. Colleges must find the right relationship between specialized training on the one hand, aiming at a thousand different careers, and the transmission of a common cultural heritage toward a common citizenship on the other.[16]

An attempt to meet this crucial task of education is to be found in the various experiments which are part of the general education movement.[17]

As McGrath has summed up the situation,

> The various efforts at curriculum reform collectively described as the general education movement originate in a desire to introduce some sort of order into our culture. Shocked by the inability of our people to understand and to communicate with one another about the principal issues of the day, a few educators a quarter of a century ago sought a course of study that would correct the intellectual separatism caused by the free elective system. They believed that required courses in the various branches of learning would assure a common intellectual experience for all students regardless of their intellectual interests or their vocational objectives. These scattered early efforts to find some type of unifying or integrating element in the college program have now become ubiquitous, though many remain only in the discussion stage. Many college faculties seem convinced that a common thread of experience must be woven through the education of every student irrespective of its overall design, signalizing the fact that he has come to grips with the main ideas in the Western European intellectual tradition and with the issues of contemporary life.[18]

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16. Ibid., Vol. I, p. 49.

17 Various references would provide evidence of the breadth of these experiments:

W. Hugh Stickler, editor, Organization and Administration of General Education. (Dubuque: Wm. C. Brown Company, 1951).

Earl J. McGrath, Science in General Education, (Dubuque: Wm. C. Brown Company, 1948).

Committee on Function of Science in General Education, Science in General Education. (New York: D. Appleton-Century Company, 1938).

18 W. Hugh Stickler, James Paul Stokes, Louis Shores, General Education: A University Program in Action. (Dubuque: Wm. C. Brown Company, 1950), p. 42.

In other words the proponents of this movement propose to collect those essential parts of man's intellectual heritage that are deemed useful and meaningful for citizenship. These then shall comprise the content of the general education movement. It is believed that by such an approach the educational institutions will be meeting the crucial task referred to above.

These essentials of man's heritage include opportunities for students to acquire certain knowledge, abilities, skills, attitudes, and values which will permit them to live a full life as responsible citizens. Specifically, students in general education would be assisted to attain (1) skill in communication as a basic tool of human thought and action, (2) understanding of the broad principles and useful applications of natural and social sciences, (3) understanding of social institutions and cultural expressions of man, and (4) understanding of and belief in certain values and ideals. These ideals include a genuine concern for the welfare of all men, the dignity of the individual, the responsibility of every individual for decisions and actions in a democratic society, and living by consistent principles instead of by expediency. Actually these ideals appear in the various documents which are part of the American political heritage and have been aptly summarized as follows:

> It is not the provision of food, shelter, and clothing that is the primary aim of democracy in this connection. This may be the sincerely avowed aim of almost any form of social control. The primary concern of democracy is rather with the social method by which the aim is conceived and the need supplied. Democracy seeks to institutionalize, in the field of public economic arrangements, a method of resolving disputed, novel, uncertain situations through the deliberation and participation of all concerned, a method which takes its character from the enduring and inclusive

> ideal of uncoerced and active community of persuasion. The aim, therefore, of democracy is the development of understandings, abilities, loyalities, and devotions formed consistently with this ideal of method and with its institutionalized forms.[19]

Therefore, general education is planned as an institutionalized means for developing these understandings, abilities, loyalties, and devotions.

NEED FOR COMMON CORE

In keeping with the crucial task of general education, there is a recognized need for teaching that emphasizes such a common core of essentials as was identified in the previous section. This need is referred to quite pointedly by the report of the President's Commission,

> The failure to provide any core of unity in the essential diversity of higher education is a cause for grave concern. A society whose members lack a body of common experience and common knowledge is a society without a fundamental culture; it tends to disintegrate into a mere aggregation of individuals. Some community of values, ideas, and attitudes is essential as a cohesive force in this age of minute division of labor and intense conflict of special interests.[20]

McGrath also describes this need,

> Traditional college programs have developed specialized and professional training to a point where ostensibly educated men can no longer communicate with each other on topics other than local news and baseball scores. They have no common understandings, interests, tastes, attitudes, or opinions, no common convictions, no common system of value. They may have developed technical knowledge and skills; they have not developed--unless incidentally--wisdom and human understanding.[21]

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19 R. Bruce Raup, George E. Axtelle, Kenneth D. Benne, and B. Othanel Smith, The Improvement of Practical Intelligence. (New York: Harper and Brothers, 1950), p. 211.

20 President's Commission on Higher Education, op. cit., p. 48.

21 Stickler, op. cit., p. 65.

It is therefore assumed that the role of the new experiments in general education is to combine the set of ideals which comprise the common core with the roots of specialized or professional education. At present, the degree of specialization among members of various professional and vocational groups is so high that possibility of intercommunication is becoming ever more reduced. Recognition of the difficulty of sharing common experiences is what has spurred the attempted establishment of this new and modified phase of the educative process.[22]

Though the enumerated essentials comprise the content of general education along with skills, abilities, and knowledge, a very characteristic aspect of this new and modified phase of education is the pattern of content organization. The courses in general education are not planned as encyclopedic treatments of subject matter content. These new courses are planned to emphasize method. McGrath[23] is quoted as saying that new programs of general education do not emphasize the coverage of subject matter, but rather emphasize the methods of the various disciplines. These courses recognize the results of modern psychologists who have shown that although transfer[24] is not automatic it does occur; that when transfer is made a specific object of instruction the student learns to generalize his experiences.

Scroggs has written on the capture of generalizations or generality. He says that there are two aspects of generality.

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22 President's Commission on Higher Education, op. cit., pp. 47-48.

23 Stickler, op. cit., p. 45.

24 A more detailed discussion of transfer may be found in Chapter V, pp. 96-102.

> First, we think of general education as consisting of that knowledge which every citizen needs. Second, we think of it as knowledge that is comprehensive in scope, which related to broad principles and relationships rather than to facts and skills, and which is well integrated.[25]

Scroggs states that these two notions are somewhat in conflict since what every citizen should know is liable to be construed in terms of simple, factual information, relatively unintegrated, especially with reference to the broad synthesis and generalities that represent the basic conclusions of the field.

He further maintains that one of the principal tests of the validity of the educative process is the extent to which the individual grows from the concrete, simple, unintegrated meanings of the kindergarten to possession of the control over broad syntheses (organizations) of knowledge in college and the university. This seems to suggest that the logical criteria of the general course may be briefly stated: (1) it should possess logical unity, (2) it should be wide in scope, (3) it should be thorough, especially in respect to the adequate development of central generalities, and (4) it should be clear. These criteria seem to be in keeping with earlier statements on general education.

However, Scroggs emphasizes that the general course, in contrast with courses for specialists, must look beyond the narrow province of subject matter to the dynamic integration of meanings. Whereas, in the professional course, the subject matter is an end in itself even though

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25 Schiller Scoggs, "Generality in the General Course", Bulletin of the Association of American Colleges, Vol. 24, no. 4:484 December, 1938.

related to subsequent ends; in the general course, the subject matter is more aptly described as the means of providing practice in method. Students must react organically and participatively to the presentation, and they must apprehend meanings in broad human perspectives. As a result of this reasoning it appears that the unit of organization of the general course should be the generality--if generality is defined as a notion held, on the basis of restricted observation and experience, to be true enough to constitute a basis for action in the present.

BASIC ORIENTATION OF THE STUDY

This statement about the use of generalizations as bases for action in the present gives a clue to the basic orientation of this study. In the present, more intelligence must be used in social situations. Use of intelligence may involve the study of social needs and ills with a view to constructing special social legislation which will approach the problems of the times. Such an outlook fosters experiment in social and political democracy. Such a philosophical outlook sponsors formation of hypotheses which may be tested for significance and workableness. Actually this position attempts to incorporate the methods and evidence of science into a philosophical approach appropriate to the twentieth century. John Dewey has been very effective in formulating this experimental philosophy and he has tried to make it conform closely to the requirements of an age committed to machine technology, democracy, and science.[26] It is this experimental attitude which permeates the general education movement.

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26 Butts, op. cit., a very interesting account of the historical importance of John Dewey and the experimentalists may be found in this volume.

Dewey, in his widely influential book on democracy and education, emphasized science and scientific method as being central in the governing of human affairs. Dewey found principles of procedure, in the scientific method, that gave him a clue to a conception of experience, knowledge, and thinking[27] widely at variance with the notion of a separate faculty of intellect as held by earlier educators. His theory closely associates knowledge and thinking with action and with the consequences of action; knowledge and action are definitely not separated into two antagonistic spheres.

Now, it may be concluded that both the experimental philosopher and some leaders of the general education movement have been concerned with the dynamic effect of industrialization and the advancements of science upon American society and culture. They have identified the gross effect of dualistic thinking and the limitations of absolutes which have been developed over the centuries, i.e., from the time of Plato through medieval ecclesiastics to present day representatives of that type of thinking.[28] These thinkers and investigators have pointed out also that man's conception of the universe and his place therein is no longer so restricted as that

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27 Dewey arrived at a description of thinking that rests upon the scientific method of problem solving. Thinking as problem solving involves these steps: a sense of disturbance, or problem to be solved; observation of the conditions surrounding the problem; formulation of suggested hypotheses, or plans of action, with their possible consequences if acted upon; actual and active experimental testing to see whether hypotheses when acted upon yield the anticipated consequences.

28 John Dewey, Democracy and Education. (New York: The Macmillan Company, 1916).

held before the turn of the present century.[29] These men have tried to show that no field of man's knowledge has escaped the turmoil between status quo conditions and deviate forces of change. The task of elucidating this idea in detail would be completely beyond the scope and range of this work.

However, certain changes in the teaching of the natural sciences will be the limited interest of this study.[30] This broad field of man's knowledge is usually understood to deal with objects in nature. Quite logically this interpretation calls for recognition of living things and non-living things. Therefore, the traditional dualism of the biological and physical sciences is employed by many in discussing the natural sciences.

It is generally recognized now that the term biological sciences refers to the following specialized subdivisions: namely, morphology, the study of the form and structures of animals and plants; anatomy, the study of gross structures; histology, the study of tissues; cytology, the study of cells; taxonomy, the grouping and naming of organisms; physiology, the study of the working or functioning of organisms; ecology, the study

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29 See Philipp Frank, Relativity: A Richer Truth. (Boston: The Beacon Press, 1950).

30 It might be assumed from the description of general education that such a course of study would not reflect the current practice of departmentalization. If an ideal integration could be possible, then removal of departmentalization would seem a most logical and probably desirable development. If instructors for such an ideal integration were available and had practice in methods which such an ideal integration would seem to demand, then departmentalization would not be necessary. However, since the experiment of general education is occurring within the framework of departmentalized curricula, it seems most realistic to recognize the necessity of conducting a study of curricula within the present departmental structure.

of the environmental relations of organisms; heredity or genetics, the study of the inheritance of organisms; embryology, the study of the development of organisms; animal behavior and psychology, the study of adjustments and reactions of the organism as a whole; paleontology, the study of the fossils of pre-existing plants and animals; and philosophical biology, the study of the origin of life and living forms (evolution).[31]

A similar breakdown may be made of the term physical sciences, the subdivisions of which might be listed thus: physics, the study of natural laws and processes of matter and energy; chemistry, the study of the composition of substances; astronomy, the study of celestial bodies; geology, the study of the earth; geography, the study of the topographical features of the earth surface; mathematics, the study of measurement, properties, and relations of quantities; meteorology, the study of the atmosphere and its phenomena; metallurgy, the study of metals and their alloys; and technology, the study of the industrial arts.

The field of the biological sciences has been considered by many writers and thinkers as a fundamental link in the growing attempts at integration of man's knowledge into a more meaningful whole. These authors see the importance of understanding the biological sciences as next to comprehension of the physical sciences.[32] There is much support for the idea that advances in comprehension of the concepts and principles

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31 Perry D. Strausbaugh and Bernal R. Weiner, Elements of Biology. (New York: John Wiley and Sons, Inc., 1944), p. 3.

32 Howard L. Parsons, "The Social Implications of Science", Main Currents in Modern Thought, Vol. 8, No. 2:52-57, June, 1951, and No. 3: 84-88, September, 1951.

Alex B. Novikoff, "Integrative Levels of Biology", Science, Vol. 101:209-215, March, 1945.

operative in the field of the biological sciences must be greatly increased if man is to control and apply, for the benefit of the greatest number, the results of atomic investigation. For some time, leading thinkers have pointed out that there has been too much lag in applying to society the knowledge of the biological sciences, especially when compared to advances in applying the discoveries of physical scientists. Both fields, however, display a lag in consideration of the social implications of the respective areas.[33]

General education is concerned with such cultural lags in application of scientific information and awareness of social implications of science. For this reason, traditional content and methods in formal educational institutions have been placed under close scrutiny and analysis when considered in relation to general education. Therefore, within the limitations of the natural science field, this study will be concerned with a mode of teaching natural science in general education. The study will be concerned with the development of a course structure. The course will be planned to reduce the cultural lags just mentioned.

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33 Raup, op. cit.
George G. Simpson, The Meaning of Evolution. (New Haven: Yale University Press, 1950).
A. Montagu, On Being Human. (New York: Henry Schuman, Inc., 1950).
Albert Einstein and Leopold Infeld, The Evolution of Physics. (New York: Simon and Schuster, Inc., 1938).

SUMMARY

This chapter provides a background of interpretations, definitions, and limitations for the problem of this study. It has provided an answer to the first corollary question. Two problems of modern American educators are identified. The first problem identified is the problem of satisfactorily interpreting liberal education for modern times. Many accepted educational notions stem from the Greek aristocratic conceptions of liberal education. Many present day practices and procedures are still traceable to the interpretations of the medieval church, the Renaissance, and the Reformation. The second problem is the separation of the state from the church. Much significance is attributed to this fundamental aspect of the social transformation of man from medieval times to the present.

Recent attempts at meeting these problems are to be found in the general education movement. This newer modification of formal educative processes is aimed at a re-liberalization of the more traditional liberal education. The philosophy underlying general education centers around an attempt to combine historical ideals of democracy and skills and abilities into a common core of education which will be useful to all groups of American society. Based on this outlook, the courses in general education are planned to communicate broad generalizations which are of use to students in contemporary society. These courses are organized to foster wide use and application of intelligence in social situations. Such application of intelligence is allied with the experimental spirit and attitude of an age committed to machine technology, democracy, and

science. Yet this study is planned within the limitations of the broad fields of the natural sciences. Therefore, the limited interest of this study is centered around certain changes which would be brought about in teaching the natural sciences if certain aspects of experimental philosophy were fully implemented.

In order to reach a tentative solution to the problem of this study, it will be necessary to study the second corollary question which concerned the role and function of education in society, of science in society, and of course, science teaching as a special aspect of educative processes in the modern societal setting. This is the purpose of the next chapter.

CHAPTER III

CHAPTER III

ROLE OF EDUCATION, SCIENCE, AND SCIENCE TEACHING IN SOCIETY

The second chapter has provided a background for development of the problem of teaching natural science in general education. Some basic definitions and fundamental assumptions have been set down from which a description of present existent conditions may be derived. Also, the second chapter has been devoted, in part, to brief enumeration of some historical antecedents of conditions which comprise the current educational situation. Before a more specific approach to the problem of teaching natural science can be attempted, there is need for more fundamental notions. Identification of these will begin in this chapter and be continued in the next. In this chapter, specific attention will be given to the role of education, the role of science or scientific endeavor, and the role of science teaching in modern industrialized society.

It may be pointed out that in the current educational situation, there are few elements of the educational scene which might be identified as common to the various formalized institutions of learning. One of these elements involves recognition of the fact that youth are to be educated. A second element involves the intent that youth be educated in keeping with the ideas and ideals of democracy. Thirdly, it is recognized that there is a functioning educational system attempting to carry out the

educational task. However, beyond these common elements, there lie many conflicting claims, ideologies, practices, promises, and problems. Or as Muntyan emphasizes,

> There is the hue and cry about 'traditional schools'; the claims of the 'Great Books' proponents; the direct and variant offspring of the experimentalist school; the emphasis on the effects of technology and urbanization; the demand for 'new mind', 'new common sense'; the emphasis on liberal education, vocational education, general education, or what not; the need for reconstruction of society, maintenance of the status quo, reliance on the past, emphasis on the present, development for the future; integration, interaction, and so on and on ad infinitum.[1]

Of course, it is possible to turn to the pages of history and find much substantiation for the point of view that conditions in man's society with respect to education have ever been thus. However, by reference to contemporary primitive tribes, it may indeed be possible to find a situation wherein the educational task is more clearly understood. The educational task in a primitive society may then be compared to that task in modern society.

EDUCATION IN PRIMITIVE AND MODERN SOCIETY COMPARED

Many reports show that in a primitive society the educational task may be summarized in terms of youth taking on desired learnings which will

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1 Milosh Muntyan, "Community School Concepts in Relation to Societal Determinants". Unpublished Doctoral Dissertation, University of Illinois, 1947, p. 9. The ideas presented in this first section on the function of education in society parallel Chapter II of Muntyan's investigation.

allow them to share in the life of the group or community.[2] These learnings are an intimate part of the life of a particular tribe. Therefore, education becomes necessarily and undeniably a function of the culture since such tribes have no extensive, recorded history or literature to which they might turn.

Of course, the social organization into which the primitive youth is born is relatively simple and is characterized principally by face-to-face relationships. The infant grows up in an organization characterized by rigidity of structure and clear division of labor. At a specified stage of development, the individual loses infant status and begins to take on the bearing and learnings expected of him as an adult member of the group.

Primary learnings of primitive youth are those that involve survival, both personal and group survival. Yet, those learnings would not be acquired through any formalized procedures based on the assumption that the individual was learning for some far-removed future or was learning on a listen-and-remember or a major-principle-to-be-generalized basis. On the contrary, those learnings would be taken on in the context of actual situations of living, being actively passed on from older to younger generations. Consequently, those learnings would be taken on in a

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2 Descriptions of particular societies may be found in:
Margaret Mead, From the South Seas. (New York: William Morrow and Company, 1939).
Ruth Benedict, Patterns of Culture. (New York: Houghton Mifflin Company, 1934).
Bronislaw Malinowski, A Scientific Theory of Culture. (Chapel Hill: University of North Carolina, 1944).

meaningful-experience, here-and-now, child-and-social-need activity, meaningful to the individual and necessary to the society.

The formal educational institution of school is plainly excluded from the tribal picture. The educative process is an integral part of the every-day business of living. It would follow, therefore, that the education of youth was accomplished in terms of demonstration and example arising from the common core of the culture which embraced all aspects of living. Any attempts at bringing in variables in the culture would be defeated by the common allegiance to the core. This leads to the conclusion that the function of education in a primitive society consists of nothing more than indoctrinating youth through a method consisting of having youth live and function in the group.

Now, it will be necessary to show that this description does not apply to the present industrialized society. Some insight into present societal-individual relationships may be gained from comments about modern society.

The social structure into which today's youth are born is a complex organization. It is an organization which may be characterized by interdependence and impersonal, institutional, rather than face-to-face relationships.[3] There is considerable contrast between today's society and a

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3 Specific descriptions of today's society may be found in:
W. L. Warner and P. S. Lunt, The Social Life of a Modern Community. (New Haven: Yale University Press, 1941).
Robert C. Angell, Integration of American Society. (New York: McGraw-Hill Book Company, 1941).
Gunnar Myrdal, An American Dilemma. (New York: Harper and Brothers, 2 Vols., 1944).
Karl Mannheim, Diagnosis of Our Time. (New York: Oxford University Press, 1944).

primitive society where the customs, habits, and ways of life are simple, and hence easily transmitted from one generation to another. There are many reasons for the confusion which has come about in the centuries following the period of the Renaissance. As man's culture became more and more complicated, there appeared within the overall society many subdivisions of people. These subdivisions are traceable to the various trades in which people were able to earn their means for livelihood. Also, the separations of society are traceable to religions, race, economics, folkways, and so forth. The end-result of societal differentiation, which for the moment is the present culture, is marked heterogeneity of people and their customs, attitudes, habits, mores, and creeds.

Unlike the society of primitive tribes, today's society has no set criteria, applicable to all youth, by which it clearly marks the transition from the dependent, consumer-like status of childhood to the interdependent status of adulthood, except for the "legal age" concept. Yet this age varies from segment to segment of the society, and also within segments. For example, in the lower and middle socioeconomic segments, transition from childhood takes place, primarily, when the earning power of its younger members is needed. In a somewhat similar manner, in the upper segments of society, the individual takes on full adult status when the family decides that there has been adequate preparation. Serious implications arise out of this situation for both the consciously and unconsciously acquired economic, political, and social learnings of youth. All this means that the laborer does not take on the same learnings with respect to labor, management, labor unions, social welfare, the economic

structure of the society, and so on, as does the doctor, lawyer, corporation executive, the property owner, or the school teacher. Each of these groups tend to react and reason out of the context of the conditions peculiar to its own socioeconomic status. Thus, what may be quite clearly true and desirable for one may be false and despicable for the other. This may lead to perpetuation and extension of cultural disunity.

Such is the social matrix within which education of today must exist. Education as symbolized by the educational institution never arises in the primitive group, because the unity of the culture and the impact of the day-to-day contacts in the group serve as basis for consummation of the educational task. Nevertheless, in today's industrialized society, the formal educative process has been structured in a special institution in an effort to meet this need for engendering common learnings, i.e., common attitudes, ideals, skills, and knowledge. An attempt has been made to have the formal educational institutions meet and serve the needs that were met and served by the community itself in primitive societies. The method employed has made the school a separate, isolated community itself. The position has been taken that activities of daily living are too complex for youth to acquire desirable learnings automatically, so the school has been structured according to what is considered to be the important elements of community. It has been assumed that youth can acquire, in the school building, those common learnings which underlie the community. Muntyan concludes,

> The barrenness and futility, the delusory nature of this 'solution' needs no profound philosophical or psychological argumentation for proof. The evidence is all around us, so unmistakable, so glaring that those who run may, indeed, read. ... the current volumes on

> education, representing claim and counter-claim, incriminations and recrimination, are hardly evidence of any underlying consensus as to the adequacy of educational theory or practice.[4]

Therefore, the succinct conclusion is reached that today's formal educational institutions are not carrying out their major function. That function is the induction of youth into commonly accepted ways of society. Or, in other words, the educational institutions are mediating agents between society and youth. This function would hardly seem to be accomplished adequately by having the school withdraw from the realities of the community situation. This means that schools in modern society are faced with the task of functioning as a community institution while surrounded by a non-communal society. The difficulty of the educational task is further emphasized by the stark contrast between the ease of educative function in the primitive society and that function in an industrialized society.

The discussion thus far presented has provided some sociological aspects of the framework in which general education must operate. By way of these statements a better foundation is formulated upon which to build a tentative solution to the problem of teaching natural science in a general education program at the college level. For, if the mediating role of the schools is accepted, then, the ensuing comments upon the special role of the sciences will be recognized as logical out-growths of the more general position. It would appear to be consistent with what has been presented to assume that science courses are also mediating agents in today's culture. These agents transmit understanding and, of

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4 Muntyan, op. cit., p. 31.

course, knowledge about a restricted, narrowly identified field. The science course attempts to induct youth, who are exposed to the subject and method of science, into that part of the community process which is scientific.

SCIENCE IN MODERN SOCIETY

To understand the role of science in today's society would seem to call for an attempt to build some foundational concepts about the function of science in society, as has been done for the task or function of education in society. This approach involves an inspection of some social implications of science and consideration of interactions of science and society.[5]

During the past few hundred years, science and scientists have risen to a position of authority and dominance in modern culture. As this dominance of science has come about there also has developed a dogma of scientific materialism. This dogma as practiced and utilized by scientists has given impetus to development of most of the so-called comforts of modern living. Yet, as these fruits of scientific endeavor were developed there also developed in science and modern society a particular characteristic, namely, specialism. This specialization has come to dominate the social economy, and has occurred at the expense of the full development

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5 A similar discussion to that presented in this section on the role of science in society may be found in an article by Howard L. Parsons, "The Social Implications of Science", Main Currents in Modern Thought, Vol. 8, No. 2:52-57, June, 1951.

of that economy. This is exemplified in the restrictive affect on society of some patents, corporations, cartels, and monopolistic practices which have appeared along with scientific specialism. Of course, this dogma of materialism has been very much in keeping with the concept of individualism and political franchise.

However, the mentality of scientific specialism has neglected its social role by disassociating itself from general social conditions and giving exclusive attention to its own claims. Some hint as to the orientation of specialism and materialism is reflected in the supposition of scientific mentality that matter, life, and society can be reduced to successive configurations of masses in motion, moving according to clearly defined laws. Therefore, it is possible to observe that while the dogma of scientific materialism has idolized "matter", it really has idolized one way of minding that matter, one theory of matter. This idolizing of specialized mentality has given itself exclusive authority and status in the interdependent scheme of things and may have added to social chaos and mental confusion.

Some thinkers, like David Hume, sensed some conflict in the system of scientific materialism when that system was examined at the level of its basic assumptions.

> But not until the modern period of physics, and the dissemination of the idea of evolution, did the collapse become widely acknowledged. Physics challenged the old notion of mass as fundamental, substituting energy waves, and suggesting that change is basic and permanence derivative; and it yanked the rug of absolute space-time from under the clear, settled, discrete, and exact furniture of the Newtonian salon. Finally, the idea of evolution laid the axe to the root of the tree of fixed permanence.[6]

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6 Ibid., p. 54.

In essence the new biology and the new physics provided what the Newtonians lacked; namely, a basis in nature.

Great minds who have contributed to these immense changes include Bernard, Sherrington, Pavlov, Cannon, Child, Coghill, Lashley, Faraday, Maxwell, Hertz, Einstein; as well as the famous psychologists, commencing with the gestaltists, the Deweyites, the intuitionist, and the social psychologists like Cooley and Mead; and scholars of society like Marx, Veblen, Tawney, and Shaw. The general emergent point of view which has come from these studies has been called organicism and calls particular attention to sociality in all things. It has received marked philosophical emphasis and expression in the writings of Henri Bergson, William James, John Dewey, and A. N. Whitehead. It is this concept of the social theory of nature which is, now, directly affecting the dogma of scientific materialism.

This newer operational orientation for scientific endeavor is based on a certain definition of society. By this definition a society exists when two or more events are sensitive and responsive to each other, and to the "whole" which they constitute.[7]

An atom, therefore, is a society, since the protons and electrons are mutually sensitive and responsive, and since the character of the whole atom is altered as the individual parts are altered (as when a neutron is added to produce an isotope of new characteristics). Similarly,

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7 R. Gerard, "Higher Levels of Integration", R. Redfield, editor, Levels of Integration in Biological and Social Systems. (Lancaster, Pa.: Jaques Cattell Press, 1942), 8:74-75.

a molecule, crystal, colloid, unicellular organism, multicellular organism, ant society, personality, family, university, nation, and the sun, all may be considered societies, with various degrees of reciprocity in the part-part, and part-whole relations. Of course, there must be grades of sociality.

> The constituents of a water molecule are not so sensitive and responsive to one another and to the whole as are the constituents of a protein molecule. Nor is the whole or plan of a colloid so influential over its parts as is the plan of a molecule over its parts. Nor is the sociality in a molecule so complex (in the system of control), so differentiated, or so vivifying as in a human organism.[8]

Nor have the various orders in the universe existed from eternity, as Aristotle imagined. They have evolved. This process of evolution may be observed today in the formation of an atom, a molecule, and on up to a personality or family. In fact this process of social formation may be called creativity. The process of creative formation consists of (1) novel emergent events and (2) novel emergent integrations which bind into relations of mutuality those previously emerged events. Thus, thinking or minding and all manufacturing and synthesis may be interpreted as phases of creative formation.

The appearance of the social theory of nature exemplifies interactions of science and society. Some effects of science upon society have been pointed out already. What about the relation of the conditions and forms of society to the development of these scientific ideational changes? Why have these newer ideas in science been so slow in developing?

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8 Parsons, op. cit., p. 52.

For one reason, the people of today's society are caught in the contradictions between cooperation and competition. Of course, this conflict is not merely one between ideals and practices, for the rising forces of socialism in the real world of economics oppose the forces of competitive capitalism. Again, why has there been such a long way around to this social theory of nature?

The answer might seem to lie in part in the social origins of men's ideas. The nineteenth century was a competitive century, both in thought and action. The theory of evolution which evolved implied the goodness of competition. Darwin derived his theory from the climate of opinions, scientific and popular, wherein he lived. He threw his mass of data, which today's scientists consider to have been highly incomplete, into the ideational pattern dominant in his time.

> The doctrine of sociality awaited the efflorescence of the biological studies for its fullest ripening. ... the earlier theories of evolution reflected the social structure in which they arose; hence Lamarck's theory expressed the interior Napoleonic freedom of the organism, Darwin's the specialization and mechanism and commercial competitiveness of 19th century England, Weismann's the racial autocracy of Germany. The captains of industry, of course, seized upon the evolutionary doctrine to justify their exploitation of natural and human resources. When Marx said that evolution moved toward the triumph of the cooperative over the competitive forces, the apologists of industry accused him of being unscientific. Yet now it appears that Marx's theory was an under statement of the potency and pervasiveness of the cooperative powers in the world. For we possess masses of data from the biological and social sciences in proof of the cooperative principle as fundamental to the evolution of higher forms. The various 'life sciences' now find themselves unified by a common subject matter diversely exemplified. And as they become unified they can see cooperation operating not only under the microscope or in the field but also between those organisms that peer into microscopes and take field trips.[9]

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9 Parsons, op. cit., p. 55.

Consequent to this discussion of the interactions of science and society is the conclusion that the observation of social trends required the evolution of observers looking for such trends. But such observers emerged only under the favorable conditions which would generate in them the idea of cooperation as fundamental. It seems that though the romantic poets inspired men with the conviction that nature if not man is on the side of love, it was left to the biologists to base this conviction in exact fact. Therefore, it is from the biologists that members of modern society have received a possible bridge of the chasm between the stars and the mind; they have provided bodies of factual material from their approach to nature in support of the principle of sociality. From biologists, along with modern physicists, is coming the suggested unity of the sciences and the unity of social orders.

Yet to be mentioned and given definite consideration in this discussion is a very central fact of scientific endeavor. Reference is made to the attitudes and methods of scientific men.[10] These attitude-method procedures are summed up in the one word "openness". The scientist is open to every aspect of his environment and the organisms which are living in that environment. The scientist shows sympathy, sensitivity, responsiveness, alertness, patience, and above all is interested constantly in understanding his universe and those things in the universe which more plainly resemble himself. The open-minded scientist is a specialist who

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10 A similar point of view on the method of science may be found in an article by Howard L. Parsons, "The Social Implications of Science", Main Currents in Modern Thought, Vol. 8, No. 3:84-88, September, 1951.

explores every implication of his specialty. He searches to the foundations of things, making clear to himself how the particulars of his field illustrate universal principles. Openness is, then, receptivity to variation.

> Variation rises to fullest expression in the mentality of man, which is the source of his freedom. Science is that mentality working on the side of abstract structure, though never devoid of some esthetic content. Science is an instrument of survival and of enjoyment. By means of its laws it orients men to those invariant and reliable features of the universe on which men depend for life. And in its method of exploration, experimentation, tentativity, and flexibility, it furnishes a tool for adjustment to change. The scientific will inherit the earth, for they possess the finest devices for cooperating with and recreating that earth. The scientific method is a way in which one organism responds sensitively to another, feeling the novelty of quality and pattern, integrating what is felt with the fund of previous experience, and envisaging new patterns of possibility. The 'lower' animals are fellow scientists with us, though somewhat inferior. In its most concrete operation science is a prime example of that innovating-integrating activity which we have called creativity. There is the emerging into awareness of new perspectives; the integrating of these perspectives into a new hypothesis; the differentiation of this hypothesis into its details of implication; and the integrating of these details in their total pattern with observed fact and established theory. This creative process is not merely symbolic; it is neural-muscular-glandular-etc., in a word, organismic transformation.[11]

One might ask how shall these perspectives of the scientists be used? Is the scientific method an infallible instrument of human survival? These questions are close to what might well be considered a most fundamental question: Is the scientific method used so as to further release creativity? Certainly this question was not answered in a positive manner by the extermination of millions of Jews and Russians. Nevertheless, at least some of the atomic scientists have come to the realization

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11 Parsons, op. cit., p. 85.

that science is not an end in itself, nor an isolated activity. These scientists are coming to realize that science (1) must have freedom from society and yet owe that society an obligation; (2) must perforce be concerned about the roots of life; (3) is the servant of man and carrier of the method of creativity; (4) may escape from dogmatism, irresponsibility, and self-defeating procedure, of which it has been accused, only through service to creativity. Therefore, it is in the service of creativity that science can save the human species for the more abundant life. From this, it seems that all human progress must be mental now; that is, the guiding factor in evolution is mind. Since the fundamental nature of reality is social, and this social character is generated in the method of creativity, it will be through the work of scientists (they being members of a superbly cooperative enterprise) that human social progress will continue by progressive leaps of new insights.[12]

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12 Parsons evaluates the past performance of scientists in society and indicates high hopes for their future role,

"Science is still in its youth. For years the mass of scientists have shown all the earmarks of advanced adolescence, as seen, say, in college youth. They have sought facts indiscriminately, and voraciously. They have demanded the luxuries of living in society, but have resented any responsibilities toward that society. They have proceeded by the adolescent code of live and let live. They have scorned emotion. They have arrived at the callow conclusion that all values are relative. They have vacillated between faith in automatic, linear progress, and an existentialistic self-indulgent cynicism toward mankind.

"But the next stage in science will be that of maturity. During this period we may look for scientists to take an active part as leaders in improving the human world. Science will become more social, in theory and practice, and society more scientific. Scientists will apply the principles they have learned for the enjoyable survival of mankind, and in so doing they must inevitably discover and apply the principle of sociality, of creativity." p. 88.

Along a similar vein might be the words of John Dewey in Democracy and Education. (New York: The Macmillan Company, 1916). He summed up a discussion about science in the course of study by saying, "Science represents the office of intelligence, in projection and control of new experiences, pursued systematically, intentionally, and on a scale due to freedom from the limitations of habit. It is the sole instrumentality of conscious, as distinct from accidental, progress." p. 266.

What has been said here on the role of science in society and its interaction with society suggests that forces of change exist. These forces of change involve the direct action of the newer social theory of nature upon the older, well established orientation in scientific work, i.e., scientific materialism. These two bases for interpretation or orientation of scientific endeavor have been presented in this section as antithetical. Specifically, the role of science is no longer the same as it has been for the past few hundred years. Now, scientists are looking for greater understanding of the cooperative actions of man and all living things as well as searching for deeper understanding of the actions of the individual as an individual.

Intimately tied to the relation of scientific materialism and the social theory of nature is the dualism of cooperation and competition. Only in recent years, as historical time must be measured, observers, investigators, and "creators" in scientific work have been of a mind to explore and imagine relations of lower animals, as well as man, as being other than entirely competitive. As the social climate of civilized man has changed, upon spread of the theory of organic evolution, great masses of fact have been accumulated which belie the competitive orientation as being the only basis of social activity. The openness to variation of scientists has lead thinking individuals to a factual, scientific basis for the spiritual nature of man which the ancient intuitions of Christendom have preached to generation after generation of youth.

However, accompanying these changes, scientists have become established in a position where they are members of society, and yet, in some

respects not responsible members. Their special mentality has neglected its social role. Scientists have encouraged development of an attitude of "exclusive authority" to such an extent that they have attained a status in which they are wont to maintain themselves independent in an interdependent scheme of things. It may be stated that, in the practice of science specialists as teachers, this neglect of their special mentality is quite evident. It might even be stated that the science teacher contributes to the isolated nature of school learnings referred to in the first section of this chapter. The science teacher, as a mediating agent in the formalized educative process, has assumed the responsibility of transmitting already known scientific information to youth of each new generation. Therefore, this function of the science specialist must necessarily be given some attention.

SCIENCE TEACHING IN MODERN SOCIETY

The science teacher of introductory courses in the traditional educational institution may be considered as contributing to the isolation of school learnings when particular attention is given to the effect, in education, of specialization, which has become an outstanding characteristic of scientific mentality. The present educational program in the sciences is splintered in the same way that all areas of man's knowledge have become subdivided. Therefore, the narrow outlook of specialization is common to the majority of courses in undergraduate programs in science and even extends throughout the secondary educational program. The graduate training attitude which emphasizes advanced specialization

suggests the conclusion that science specialists teach under the tacit assumption that students in science courses are apprentices to high-level graduate endeavor.

Concerning the problem of specialization in education, the report of the President's Commission on Higher Education has this to say,

> Specialization is a hallmark of our society, and advantages to mankind have been remarkable. But in the educational program it has become a source both of strength and weakness. Filtering downward from the graduate and professional school levels, it has taken over the undergraduate years, too, and in the more extreme instances it has made of the liberal arts college little more than another vocational school, in which the aim of teaching is almost exclusively preparation for advanced study in one or another specialty.
>
> This tendency has been fostered, if not produced, by the training of college teachers in the graduate school, where they are imbued with the single ideal of an ever-narrowing specialism. ...
>
> The net result of the situation is that the college student is faced with a bewildering array of intensive courses from which to make up his individual program. To secure a reasonably comprehensive grasp of his major field, he must in some cases spend as much as half or more of his time in one department. The other half he scatters among courses in other departments which, designed for future specialists in those fields, are so restricted in scope that the student can gain from them only a fragmentary view of the subject. He, therefore, leaves college unacquainted with some of the fundamental areas of human knowledge and without the integrated view of human experience that is essential both for personal balance and for social wisdom.[13]

From this description, it is quite clear that the beginning student is faced with a situation which involves conflict between deviate and separated specialties, each of which represents the same impetus toward minute, detailed study. This certainly suggests the lack of an orientation

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13 President's Commission on Higher Education, Higher Education for American Democracy. (New York: Harper and Brothers, 1947), Vol. I, p. 48.

of the educative process around a concept of common core or concerted emphasis upon social application of intelligence.

This point is also brought out clearly in the following statement:

> One of the disturbing results from the development of scientific method was that of over-specialization. Perhaps it would be more accurate to say that we have over-worked the idea of specialization and have given it undue emphasis in the educational program of immature students. At any rate, the pattern of specialized or concentrated attention to given fields of learning has been applied in many instances to the detriment of the educational process. Begun too early in the experience of the individual, it has resulted in the development of lop-sided 'specialists' whose total education reveals glaring 'blind spots', and a pitiful lack of synthesis of bodies of knowledge which should characterize any educated person.[14]

Another appropriate comment runs as follows:

> Too much time has been given to the thirty percent who go on for a second course in a given field; too little to the seventy percent who do not. Yet teachers of specialized subject matter have continued complacently for years teaching the same things in the same didactic way with no reservation about either the material or the procedure nor any real concern about the usefulness of the information in the student's life, present or future.[15]

Put quite simply, specialism dominates course content at secondary and college levels of formalized education. It is as if the dogma of scientific materialism, which stresses the explanation of all things as interaction of masses in motion, exerts a so-called pressure of direction upon the content and method of most courses.

There is no intention to argue that there is any organized and conscious professional control. However, the idea of control is involved,

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14 W. Hugh Stickler, James Paul Stokes, Louis Shores, General Education: A University Program in Action. (Dubuque: Wm. C. Brown Company, 1950), pp. 5-6.

15 Ibid., p. 66.

nevertheless, in the action of individual science teachers. Many science teachers neglect their social function as mediating agents between society and youth in their devotion to the orientation of scientific materialism. They fail to contemplate "the usefulness of the information in the student's life, present or future". By continuing to teach through the methods by which they have become specialists, science teachers cause perpetuation of subject matter and method. Therefore, science courses display a marked informational lag (general ignorance of the social theory of nature) as well as a methodological lag (practice of authoritative presentation of scientific information as from an "exclusive authority" position).

To help explain this condition of science teaching, it might be beneficial to mention a specific characteristic of modern human society. Perhaps some pertinent facts and ideational bases for understanding the relation of science and science teaching to the function of education in modern civilized society may be identified.

Today, there seems to be an absolute impossibility of a person's acting individually, due to the great interdependence which is characteristic of the present societal structure, i.e., the individual is dependent upon others for food, clothing, and manufactured goods of all sorts.

> What we actually have, ... is a middle ground on which men meet to further their private interests as best they can within limited group action, i.e., within associations. That is to say, men band together with other men of like interest or interests in order to further those interests in the face of, or because of, the lack of community of feeling in the larger group.[16]

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16 Muntyan, op. cit., p. 54. A similar interpretation of this sociological phenomenon in modern society may be found in Chapter III of Muntyan's investigation.

In this sense, the term association is meant to include psychological groupings of people as well as distinct institutions, i.e., professional, civic, religious, and social societies or organizations. In other words, it is possible to consider all people who have business interests, religious interests, atheletic interests, or scientific interests as belonging to so-called associations or segments of modern complex society. In reference to this study, then, science specialists (including science teachers) show a group acceptance of the attitudes and methods which seem to belong to scientific endeavor. As such, therefore, they represent an association of people with "like interest or interests".

In light of what has been said in the previous section on the attitudes and method of scientists, it seems possible to hypothesize that scientists are working together towards the furtherance of those special interests. In the formal educational institution, this amounts to stipulation of professional requirements. Because of the extension of specialization and the graduate training attitude throughout the secondary and college levels, these professional requirements are imposed upon all students who take any science course.

Essentially, then, it is maintained that science teachers (association members) direct the application and fulfillment of professional requirements while operating on the tacit assumption that all students are apprentices for like membership in an association of scientists. Therefore, science teachers in introductory college courses seem to construct and teach science courses for "their private interests", namely, the preparation of new specialists. Science curricula are conceived,

primarily, as stepping stones to membership in a particular professional association, rather than toward participation in a process of full sensitiveness and responsiveness to others, as Parsons[17] would put it.

Therefore, it seems that the experiences by which members of a new generation are expected to become capable members of the overall society, are not the type which build a community or core of attitudes, beliefs, habits, goals, and mores. On the contrary, the experiences in science curricula, which are presented to students in formal educational institutions, are almost strictly of the type which make for budding apprentices in the particular professional associations which are represented by the subject division displayed in the educational curricula. Actually, the purposes of the educative process have become so aligned with the allegiances and specific objectives of professional associations that the educative process is satisfying those ends, primarily. The student finds himself faced with courses sponsored by associations which are not wholly compatible.

> In so far as the individual finds many of his wants and needs alien to the purposes of any given association, he is thrown back either to individual actions or to other associations. But, in being party to other associations, the individual finds himself at odds not only with other members of the society but also, on occasion, with himself, since the various associations cannot be entirely compatible. If these associations were mutually compatible the society would, of course, be characterized by community. Unfortunately, it is the lack of community which gives rise to the formation of associations in the first place, so that the individual, in pursuing his wants and needs through associations eventually finds that as the lack of community is reflected in his own personal life he becomes the victim of his own conflicting interests.[18]

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17 Cf., pp.45-46, Chapter III.

18 Ibid., p. 54.

To allay any misunderstandings about the role of conflicts in the life of an individual, it should be added that conflict situations, in and of themselves, do not reflect a non-integrated or disintegrating society any more than personal conflicts define the psychotic personality. The aspect of the situation which is definitive in either case is not the conflict itself but rather the lack of any adequate basis on which to resolve the conflict. In the society, then, as in the case of the individual, conflict situations are to be expected, but an integrated society would have an adequate "social core" against which to evaluate, and thus resolve conflicts.

The absence of a common core was mentioned in Chapter II. The moot question which seems to arise out of the discussion in this section is whether the professional requirements, which become embodied in introductory courses, are proper or at all desirable "diets" for general students who quite obviously are not enrolled as candidates for association membership. In partial answer to this question, the operation of many separate associations of professional people in educational institutions (representatives of authoritative disciplines) are distinct reasons for (1) most of the conditions which have been described in this chapter, and (2) instigation of a more integrative phase of the overall mediating process of education, namely, the general education movement.

The entire problem of the isolation of school learnings from the process of modern society makes it necessary to study the question of authority of specialists. It should be possible to demonstrate that their authority does not arise from their narrow "expert" status, achieved in a specialized area of knowledge. These statements direct attention to

another corollary question: How should decisions on the method and curriculum of a science course be reached? This question involves the "exclusive authority" of scientific mentality and the neglect of the scientists' social role. The question also involves the authority of science teachers to formulate courses and experiences of an educative nature which have bias toward or primary benefit to apprentices for scientific association membership.

SUMMARY

This chapter has provided discussion of three important concepts which are part of the second corollary question of this study. First, a comparison of educative activities in a primitive society was made with those in a modern society. It was pointed out that, in the former, youth acquire desired learnings through living within the group. This means that no formal educational institution exists as such. In modern society, characterized by division into many groups with varied attitudes and outlooks, there are distinct educational institutions. These institutions are formal mediating agents between society and youth.

Second, the delimited subject area of this study, science, was considered as a special part of the mediating activity of formal education. This led to a discussion of some social implications of science and some interactions of science and society. It was concluded that the development of specialism has placed the scientist in a position of real authority in modern society. Also emphasized was the interaction of science and society

which has led to development of the social theory of nature. The evolution of scientific observers of social trends was discussed. Lastly, the methods and attitudes of scientists were shown to be devoted to creativity. This creative process involves emerging awareness of new perspectives, integration of new perspectives into hypotheses, and differentiation of hypotheses into integrated and established theories.

Thirdly, the activity of science specialists as teachers was brought under scrutiny. Science teaching in modern splintered curricula was interpreted as a further manifestation of the characteristic specialization of scientific mentality. A certain neglect of the mediating role of science teaching was indicated by the general failure of specialists to consider the social usefulness of information for the present. An explanation for the isolated nature of science teaching from society was sought in the apparent tacit assumption of science teachers that all students are apprentices for advanced graduate training in science. The desirability of formulating non-specialized science instruction along lines of professional requirements was questioned. This led to a questioning of the exclusive authority of science specialists.

Since there has been repeated mention of the science authority, it seems necessary to arrive at a clearer interpretation of the basis for the authority of science specialists who are participants in the mediating activity of formal education. Gaining this understanding seems to demand a specific examination of the authority relationship between (1) the science teacher as a representative of a particular association, (2) the pupil or student who comes to the science teacher for education, and

(3) the field or area of man's knowledge which is distinctly represented by the scientific association member. Therefore, discussion of the third corollary question of this study will be incorporated into the next chapter.

CHAPTER IV

CHAPTER IV

THE AUTHORITY RELATIONSHIP IN SCIENCE TEACHING

This chapter will close the survey and assessment phase of the study. The two preceding chapters have provided general definitions, fundamental assumptions and some historical antecedents plus an examination of the general role or function of education, science, and science teaching in formalized educational institutions in this society. In the previous chapter at the close of the first section on education in society, the induction of youth into accepted ways of society was indicated as the role of education. This means that educational institutions are mediating agents between society and youth. The complex nature of this mediating role is quite real. Significance of the complexity was brought out when educative activity in a primitive society was compared to the institutionalized form of education found in an industrialized society. The lack of community or "common core" was pointed out as another aspect of the complex nature of modern education.

Turning to the function of science and science teaching in society, science teaching was considered as an integral part of the mediating function of the formal educative process. Some expectations, duties, and responsibilities of scientists, as well as their special skills, attitudes and methods were mentioned. From recognition of existent scientific associations and the exclusive authority with which the mentality of

scientists has become characterized, a specific conclusion was reached. It was concluded that a definite problem exists which involves how decisions and solutions are reached concerning selection of subject matter and method consistent with concepts and fundamental assumptions of general education. It was held that the general student must not be considered as a candidate or apprentice for membership in a professional association in each beginning subject which comprises his educational program. Therefore, the practice of directing science education toward the few who take a second, third, or fourth advanced course in a field, instead of toward the many who are interested primarily in a general or liberal foundation in the outstanding areas of man's knowledge, was questioned.

Traditionally, educational institutions have developed a simple solution for the task of inducting youth into society. That solution has been dependent upon formulation of certain selected skills, attitudes, and knowledge from life activities into a school-life pattern. The student experiences these skills, attitudes, and knowledge and, then, is expected to carry them back with him into life. This pattern is theoretically aimed at the proper induction of youth into the ways of the group. Yet, basically, this traditional method functions primarily through withdrawal from the social situation. Therefore, to get at the fundamental problem inherent in this method, it is essential to reach an understanding about the basic authority conflict which underlies the formal educational institution-society relationship. This calls for consideration of certain general aspects out of which understanding of the authority question referred to in the closing sections of the previous chapter may be derived.

ELEMENTS OF THE AUTHORITY RELATIONSHIP

It may be stated that the authority of the expert (doctor, lawyer, scientist, teacher) functions as a three-fold relationship in which the elements are: (1) the expert, (2) the subject on whom the authority is exercised, and (3) the field or area in which the expert is competent, and in which the subject has a need.[1] However, the expert does not command, just because he is an expert, unqualified acceptance of his pronouncements in relation to the field of his expertness. For example, the doctor's diagnoses are not unqualifiedly acceptable because he is a doctor. The doctor is an expert, but his being an expert does not make his judgment in the field of medicine valid. The validity of his pronouncements can be determined only by reference to the facts which they purport to encompass. Benne explains the function of the second element, the field or area, in the three-fold authority relationship as follows:

> To put this same point in terms of our definition of authority, the field in which the validity of the expert's knowledge and skill can be determined is substantially independent of his 'legislation', his fiat, his will, concerning it. His 'legislation' does not constitute the field to which it applies. This statement seems to apply generally where the function of the authority is conceived as supplying the information about an 'independent' body of fact or prescribing or performing procedures based on such information. The ground of the validity of this information lies in the body of fact and not in

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1 A similar argument on the three-fold authority relationship as presented in this chapter may be found in Kenneth D. Benne, A Conception of Authority. Contribution to Education, #895. (New York: Columbia University Press, Teachers College, 1943) and Milosh Muntyan, "Community School Concepts in Relation to Societal Determinants". Unpublished doctoral dissertation, University of Illinois, 1947.

> the expert. It makes no difference, whether, the bearer of such authority be scientist, magician, Pope, the Bible, the Great Tradition, dictator. Insofar as he (or it) claims expert authority, authority based on superior experience and study of a field, the truth or falsity of the knowledge proferred as authoritative can only be determined by reference to that field.[2]

From this it is possible to see the relation of the first two elements in the authority relationship--the expert as the symbol of authority and the field, or knowledge area, as the independent repository of the actual authority.

The third element in the triple authority relationship, the subject upon whom the authority is exercised, complicates the analysis still further. The field and an expert representing the authority of that field may exist without a subject upon whom the authority can be practiced or exercised. Therefore, a person is identified as a subject only when he is willing to recognize the field of expertness and the authority of the expert in the field.

Though the three-fold relationship which is involved in the practice of expert authority is denoted by the above, the purposes of the exercise of authority are still to be considered. It may be stated that the medical expert in treating a patient, establishes the authority relation. The successful consummation of such an authority relation does not, in general, eventuate in an extension of common skills, knowledge, and orientation. If the doctor is successful, the patient ceases to be a patient, but does not become a doctor. Therefore, it should be clear that the subject does not become particularly involved in the field of authority.

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2 Benne, op. cit., pp. 41-42.

The consequents are entirely different in another instance of practice of the same expert when there is exercise of authority in the medical expert-medical student situation. Here, neither the broad field of authority nor the symbol of expertness have been altered, but the consequents of the authority relationship are completely altered. Benne explains the meaning of this further interpretation of the elements of the authority relationship:

> The task of the expert with relation to his student is broadly to enlarge and deepen the common information, common professional commitments, and the common professional interests of the bearer and the subject of authority. The authorized task in this case is to help in making common a field of medical information and the typical role of physician, defined by the code of the medical profession. As the student's proficiency in the field of medical information and skill increases, his dependence on the older expert decreases, and the authority of the latter over him is lessened. But there has been, ideally at least, an attendant induction of the student into a new interdependence, a professional 'community', into the authority of a common group orientation, function, and devotion.[3]

As described, this situation brings about as complete an involvement as possible, on the part of the subject, in the field of authority. Therefore, from the general aspects of the three-fold authority relationship, it may be deduced that there is a basic distinction in the authority relation between an expert and a subject and between an expert and a student. In the latter case, the student is inducted into the field of common codes, rules, and commitments which are identified with the expert who functions as a member of a professional association. This means that the authority of the teacher-expert is rooted in his membership in the

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3 Ibid., p. 43.

professional association. The field or knowledge area related to the association is the field of authority. Thus, in this field of authority the expert and the student develop an increasingly common interest. However, this situation is not to be found, to any degree, in the authority relation of the expert and the subject (or medical patient) of the first case.

AUTHORITY IN TRADITIONAL EDUCATIONAL SITUATION

A similar three-fold authority relationship may be outlined for the traditional educational situation. There is the person of expert authority, the teacher; there is the subject of the authority, the student; and there is the field of authority which the teacher represents. It should be particularly interesting to study some implications surrounding the extent and type of involvement which the subject of authority undergoes when confronted by the field of authority which the educator in the traditional educational situation personifies.

In the area of the sciences, the science teacher is the bearer of authority. His claim for the attention of the student rests on his superior knowledge and skill in the theory and practice of science as a specialized area of knowledge. Inherent in the situation is the supposition that the student, as subject of the authority, needs to gain a mastery of the scientific techniques in order to function as a citizen of society. Due to this need and an admitted lack of skill and information, the student comes to depend upon the authority expert for help in meeting the need.

Now, it must be kept in mind that the stipulated purpose of education is the induction of youth into the ways of society. Also, it must be stated that the field of authority of the traditional science teacher involves an expertness in the factual-mechanical aspects of science rather than in its function from social and moral aspects. Therefore, it should become quite evident that authority depends upon a difference in function and expert ability between the teacher and the student. In actual practice, the functioning of the authority relation fails to result in an extension of common skills, knowledge, and orientation which is socially centered. Though the science teacher is presumably aiming at these elements for their use in society, it does not seem that this aim is to be accomplished through the involvement of the student in the field of authority of the science teacher.

Based on the authority relationship which science teachers of the traditional educational situation have with their students, it may be concluded that the actual consequent of the authority of science educators shows a striking parallel to the case which has been presented about the physician and the medical student. The science teacher personifies the field of the science specialists as such. The purpose of the authority relationship with the student is quite clearly that of inducting or involving the student in the common skills, knowledge, and orientation of the narrow association which the teacher represents, namely, the association of scientists. This means that the authority relationship is that of expert to subject with the expert not representing society, but representing the expert association which constitutes only a narrow area within

the potential societal association. Finally, then, this expert authority relationship is aimed directly at inducting youth into the general association of scientists.

In light of the argument to this point and with each teacher functioning as his own council, and without many conscious coordination efforts, either of an intra-science or inter-science nature, the net result is a guarding of a so-called traditional approach to the treatment of subject matter and method of science courses. Consequently, past practices take on values which are usually far out of line in regard to actual applicability to the current social scene by youth of new generations. Taken collectively, this phenomenon results in the existence of an isolated group of highly specialized individuals who are functioning for the satisfaction of aims and objectives which might be assigned to a huge association of such science individuals.[4] As a consequence, isolated

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4 A very explicit description of the more common attitudes of specialists toward the content and objectives of general education is available in an article by Joseph J. Schwab, "Deriving the Objectives and Content of the College Curriculum: The Natural Sciences", The Proceedings of the Institute for Administrative Officers of Higher Institutions. (Chicago: The University of Chicago Press, 1941), pp. 35-52.

Many research specialists who are teachers are too busy. "Their job is research and the training of more researchers. To them, undergraduate teaching is the unfortunate form of prostitution which exists in order to supplement endowment incomes. ... In actual practice, the objectives of undergraduate education become: (1) to satisfy the professional jealousies of the staff members by including as much of each one's special field as the time allows; (2) to make the course sufficiently technical and detailed as to satisfy other scientists in the university that the course is indeed a 'science' course; (3) to make whatever concessions are necessary to keep repurcussions and complaints from the dean of student's office at a safe minimum.

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"If the narrow point of view and inadequate training chosen and administered by most research scientists have no serious effect upon the trainees in their role as teachers, the narrowness and inadequacy have

course work exists which satisfies the criteria of a science association, and which has little correlation through actual student learning experiences with the antecedent sensory activities which brought about identification of the mass of knowledge now classified in the natural sciences.

It would seem that implicit to the conditions which have just been described (and enlarged upon in the footnote reference to Schwab), are particular conceptualizations of mind and learning. For the development of the argument of this study, it will be necessary to consider the relatedness of such concepts of mind and learning to the three-fold authority relationship.

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4 continued --
only singular, not plural, significance; they stand simply as warnings to administrators that the pronouncements of scientists on problems of general education are to be subjected to the most careful scrutiny. Unfortunately, however, the narrow training given by research scientists to their graduate students is usually highly effective. These graduates, who become the faculties of the liberal arts colleges of America, carry with them ideals on general education which possess the limitations which are the limitations of their teachers. I shall describe their conceptions as falling into four classes, presenting them in evolutionary order.

.....

"The first step in the evolution of a teacher from a research-trained scientist consists in the arrival of the conviction that the materials of science have not been taught by the most effective methods. Thenceforward, comes a preoccupation with means. Dozens of proposed organizations of courses are compared and contrasted in order to find the 'best one'. Lectures are worked and reworked with loving care and great industry in the interest of maximum clarity and ease of understanding. ... At this step or stage a substantial number of teacher-specialists remain until retirement.

"Step two in the evolution of a teacher is, in a sense an emergent phenomenon. Suddenly, the instructor finds himself omitting materials from his course. Some of his knowledge is deliberately and consciously withheld from students. Pressed for reasons for his omission of one thing rather than another, the answer is usually that 'we haven't time to teach everything', or that the omitted material is too difficult for the average student, or best of all (though not good enough), that the material omitted is less important than the material included. Unfortunately, when further

DEVELOPMENT OF MIND IN AUTHORITY RELATIONSHIP

Apparently, in authority relationships, one viewpoint as to the nature of mind seems predominant. Mind is conceived merely as the total of all the ideas or impressions which enter into one's consciousness during a single lifetime. Such a position seems to be based upon associational psychology. Associational psychologists view human behavior as the result of a combination of atomic sensations or simple reflexes.[5]

The various types of associationalism

> ... have tended to base themselves on a realistic and atomistic metaphysics, to insist that knowledge has its origin in experience, and to employ the method of analysis, that is, to reduce behavior to simple elements. In education this philosophy ... has emphasized external control, habit formation, and subject matter.[6]

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4 continued --
pressed for his criteria of greater and less importance, the instructor's judgments turn out to be entirely subject matter standards. ...

"Step three in this process of evolution is the obvious fruit of step two--the use of conscious criteria for elimination of materials. The process remains, however, only one of elimination of materials, and the criteria are bad criteria." Therefore, Schwab deems it necessary that criteria must be reached which will defend the inclusion or exclusion of material whether that material contributes "to the student's concept of himself or of the living world--at that level of organization of life phenomenna with which the students will deal as men and citizens".

.....

Examples of the fourth position in the evolution Schwab describes differ so materially that they do not fit into a category of their own. "They are the positions of teachers proper, not of specialists in the process of becoming." pp. 37-41.

5 Of course, this interpretation negates the older idea of innate or inborn faculties of mind and denies that mind exists as such at birth. Also, associational psychology is different from organismic psychology which stresses the complex adjustive or process behavior of the living organism in maintaining relations with its environment.

6 William Stanley, "The Educational Psychology of Johann Herbart", The Madison Quarterly, Vol. I, No. 2:67, March, 1941.

Therefore, it is easy to realize that associationalism has been an important doctrine to those who have sought a mechanical or a physiological explanation of learning. It is not surprising, then, that the teaching methods of science teachers should reflect this viewpoint toward learning. Basis for this would be the scientist's marked belief in and formation of research projects in science on the rather exclusive basis of scientific materialism. Associationalism considers that learning is the active assimilation of ideas.[7] Ideas or "presentations" are interpreted as grouping themselves into so-called "apperceptive masses", according to similarities between them. Then, new experiences are interpreted in terms of the old. This understanding of the new by means of the old has been called "apperception". Thus knowledge is built up in the mind by way of a series of steps.

> Such a formulation would necessarily influence method.
>
> Based upon his conception of the mind and his theory of apperception was Herbart's view regarding method. For him, there is a method, a general method, applicable to all subjects of instruction, because the mind assimilates all ideas, or experiences, in the same way."[8]

This general method represented one of the early efforts to develop the inductive procedure of the scientist into a teaching formula. Various

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7 Though traceable to Aristotle, the concept of association, as a school of psychology, is principally British (Hartley, Hume, J. S. Mill, Bain, and Spencer). It is manifest in this country through the concept of connectionism by Hall, Thorndike, Sandiford, Gates, and others. However, it was Johann Herbart in Germany who made a forceful educational interpretation. Herbart is considered the founder of modern educational psychology, for his principles indicated a method of mental development.

8 James Mulhern, A History of Education. (New York: The Ronald Press Company, 1946), p. 371.

steps of the method have been presented but included the following, principally: (1) preparation, (2) presentation, (3) comparison and abstraction, (4) generalization, and (5) application. Although these once famous Herbartian formal steps are nearly forgotten per se, they did suggest a problem-solving technique for teaching. This method became particularly appropriate to teaching in situations where books were central and ideas, as ideas, were taught.

However, the method is commonly misused. Often, the burden of effort is carried by the teacher and not shared by the student in the learning situation. Because the method is general and because it is the method of inductive-deductive thinking in its complete form, it often is employed quite rigidly by teachers (among these many science teachers). Mind, characteristically expected to result from use of this method, is formed by the ideas impressed upon it from without, from the teacher and from books Consequently, formalized education customarily has come to emphasize presentation of ideas. This seems to be the philosophical concept of mind and the psychological interpretation of learning which undergirds the three-fold authority relationship in the traditional school situation as it has been described.

John Dewey studied such a concept of mind and formulated some educational implications. He described the following three-fold set of implications of this doctrine which considers the concrete character of mind as being wholly a matter of "contents":

> (1) This or that kind of mind is formed by the use of objects which evoke this or that kind of reaction and which produce this or that arrangement among the reactions called out. The formation of mind is wholly a matter of the presentation of

> the proper educational materials. (2) Since the earlier presentations constitute the 'apperceiving organs' which control the assimilation of new presentations, their character is all important. ... The business of the educator is, first, to select the proper material in order to fix the nature of the original reactions, and, secondly, to arrange the sequence of subsequent presentations on the basis of the store of ideas secured by prior transactions. The control is from behind, from the past, ... (3) Certain formal steps of all method in teaching may be laid down.[9]

Yet, it might be said that this concept of mind and learning is based upon an inadequate concept of interest. There seems to be a failure to realize that vital student interests must grow out of needs of a living person, and that growth and development of interests through the medium of formal education involve a constant reconstruction and broadening of basic concerns of the student. Therefore, the educational psychology of associationalism, and the authority relationship as analyzed, have led to some educational practices which ignore the roots of interest. In one respect, a denial of the real importance of interest has resulted because it has been regarded as something which is external to the student and built up from the outside, namely, through building up "apperceptive masses". Then, in another respect, interest has been identified with the content of consciousness (the mind). Therefore, interest is interpreted primarily as an affair of the intellect. Such an interpretation might be contemplated as the cause for present tendencies to think of interest as involving only student amusement and passing whim.[10]

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9 John Dewey, Democracy and Education. (New York: The Macmillan Company, 1916), p. 82. See Chapter VI on "Education as Constructive and Progressive" for his discussion of the associational psychology of Johann Herbart.

10 Stanley, op. cit., p. 84.

Dewey takes exceptions to this idea of mind and learning, and says,

> The fundamental theoretical defect of this view lies in ignoring the existence in a living being of active and specific functions which are developed in the redirection and combination which occur as they are occupied with their environment. The theory represents the Schoolmaster come into his own. This fact expresses at once its strength and its weakness. The conception that the mind consists of what has been taught, and that the importance of what has been taught consists in its availability for further teaching, reflects the pedagogue's view of life. The philosophy is eloquent about the duty of the teacher in instructing pupils; it is almost silent regarding his privilege of learning. It emphasizes the influence of the intellectual environment upon the mind; it slurs over the fact that the environment involves a personal sharing in common experiences. It exaggerates beyond reason the possibilities of consciously formulated and used methods, and underestimates the role of vital, unconscious attitudes. It insists upon the old, the past, and passes lightly over the operation of the genuinely novel and unforeseeable.[11]

Dewey goes on to conclude that all education forms character, both mental and moral. However, he sees that formation as consisting of selection and coordination of activities of the student so that the subject matter of the social environment may be utilized. "Moreover, the formation is not only a formation <u>of</u> native activities, but it takes place <u>through</u> them. It is a process of reconstruction, reorganization."[12]

In another evaluation of this system of mind-building according to an exact plan and certain cultural patterns, it is noted that the system is

> ... better suited to conservative and authoritarian political and social institutions than to democratic societies, in which individualism is exalted, and change is recognized not only as inevitable but desirable.[13]

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11 Dewey, <u>op. cit.</u>, pp. 83-84.

12 <u>Ibid.</u>, p. 84.

13 Mulhern, <u>op. cit.</u>, p. 375.

This statement appears to support the contention that the three-fold authority relationship in the traditional educational situation has been operating inherently upon a content concept of mind and an impressionistic and associationalistic concept of learning.[14]

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14 Apropos at this point is a statement by William Heard Kilpatrick, Foundations of Method. (New York: The Macmillan Company, 1932), pp. 288, 289. " ... a regime that is content with assignment-and-testing-under-penalty will tend to restrict itself to the things that can be so assigned and tested, which means that there will be small consideration for the attitudes out of which are the issues of life.

.....

"Most obviously such a scheme means mechanical memorizing with lessened attention to thought connections. Where examinations are the principal means of testing we frequently find school work reducing itself to cramming. ..." This is an apt connotation of the affection for scientific materialism and the development of specialists imbued with the research attitude instead of the general approach to the social use and applicability of scientific knowledge.

Another commentary bearing on the content concept of mind is one from T. V. Smith and Eduard C. Lindeman, The Democratic Way of Life. (New York: The New American Library of World Literature, Inc., 1951). On pp. 127 and 128, the latter author says, "Educators must bear a large share of guilt if children have become end-gainers in and through the educational process. It is deplorable that school authorities continue the use of examination in every type of subject and thus lead pupils to believe that the chief aim of education is to pass examinations and receive grades, ... The principal difficulty here, ... is that end-gainers sooner or later lose the capacity to enjoy their means. They become so pre-occupied in attaining ends that they regard the means as a boring compulsion, something to be endured but not enjoyed. In this manner the entire educational process becomes perverted. Ultimately, learning itself comes to be regarded as a necessary 'evil' and on this account the status of scholars tends to deteriorate. .....

"Education is presented as a discipline which may not offer much enjoyment or adventure now but will surely help us solve the problems of our future. ... A person who lives in this manner will sooner or later lose interest in the process and the moment he loses interest in the process he becomes an end-gainer, a person who exerts effort now only because of the prize he anticipates then. In striving for ends he postpones growth. Such a person lives an unhappy life under democratic conditions."

The critical points which are brought out by Dewey and the historian Mulhern raise the question as to whether there is more to mind and learning than mentioned by associationalists. It is assumed on the basis of this brief discussion of associationalism that the three-fold authority relationship of the traditional educational situation is predicated upon concepts which characterize learning as being linear only. The student must be in absolute and irrevocable possession of certain sets of facts before the next successive topic or large area of knowledge can be taken into consideration. In other words, the student will not be able to see any sense to the successive points of discussion unless he is in complete command of the facts and knowledge which inhere in the topic under immediate discussion.

CLUES TO ALTERNATIVES

It is possible that learning is more than linear. The linearity of the immediate classroom learning situation or the isolated reading assignment may be granted. However, research in modern psychology justifies the conclusion that active thinking tends in the direction of synthesis of ideas. The mind does not concentrate on isolated items of experience but combines these terms into integrated systems. So general is the tendency to synthesize ideas that prepositions and conjunctions are drawn upon with a comparatively high frequency in any use of language.[15] This

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15 Charles Hubbard Judd, Education as Cultivation of the Higher Mental Processes. (New York: The Macmillan Company, 1936), p. 30.

seems to suggest that the general or introductory course ought not to concentrate upon the learning of isolated facts.[16] Learning must be interpreted as more than recall of facts. Development of higher mental processes is also involved in learning. A higher mental process is one in which the individual makes a conscious contribution through his own effort. Mere memory must be considered a low level mental process as compared to the degree of individual contribution when a person is comparing, inferring, or abstracting.

In short, emphasis upon recall cannot be taken as a guarantee for the development of the higher mental power of drawing inferences. In order to cultivate the higher mental processes of application of principles and inference, learning conditions appropriate for their cultivation are necessary.[17] It would seem that correction of the isolated nature of

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16 Ibid., p. 6, Ralph W. Tyler in Chapter II reports, "Interviews with college students indicate that more than 60 per cent of the students in college believe that the chief duty of college students is to memorize the information which their instructors consider important."

17 Ibid., p. 17. Judd also says, "One reason why there has been emphasis on mere memorizing of facts and verbal reproduction of statements is undoubtedly to be found in the necessity of devoting time and effort to the development of these simpler processes in the early stages of learning. It would, of course, be futile to demand of learners that they carry on the higher forms of thought if they had no intellectual contents on which to exercise these forms of thought. Teachers become absorbed in laying the foundations of thinking, and they secure such tangible and easily measured results when they deal with the lower mental processes that they fall into the mistake of believing that they have done their duty when they teach facts. Like teachers of mathematics, teachers of the natural sciences often rationalize their failure to cultivate higher mental processes by saying that such processes are of rare occurrance, that the individual learner must develop them independently, that scientific thinking results from imitation of the example set by the teacher, or that psychologically there is no difference between lower and higher mental processes except a purely quantitative difference." p. 108.

formal educational learnings depends upon student participation in such mental activity. Reference should be made at this point to comments on the concept of generality as Scroggs formulated it.[18] He said that students think with abstractions. He pointed out that generalities, such as hypotheses, are the media of the thinking process; that it was through such general mental patterns that transfer of training is effected. It was therefore concluded from Scrogg's reasoning that the unit of course organization should be the generality, since the generality is a notion held to be true enough to constitute a basis for action in the present.

Another conclusion would seem to follow from what has been said about the higher mental processes. If these mental processes are to be attained in the student in the educative process, then methods of evaluation must show increased regard for measurement of the student's ability to employ thought processes in applying information. These methods would in some degree reflect the individual abilities of a person in thinking out new situations. As Spafford reports on evaluation in curriculum planning,

> The way in which a college measures learning sets the goals for students. If it tests for facts and nothing more, it may expect students to focus attention on learning facts. If it tests for growth in reflective thinking, social adjustment, writing ability, or self-confidence, it may expect students to strive to improve in these ways. It becomes extremely important then that plans for appraising learning accompany the setting of objectives. It is important also that instruments of evaluation be as broad as the objectives. That some will be crude is inevitable.[19]

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18 Cf., pp. 27-29 of Chapter II.

19 Ivol Spafford, Building a Curriculum for General Education. (Minneapolis: The University of Minnesota Press, 1943), pp. 31-32.

SUMMARY

It should be understood from this chapter that there is a definite problem of authority involved in the selection of subject matter and method for a course in natural science. Out of an examination of general aspects of the three-fold authority relationship, an attempt has been made to discuss the inherent authority question which was brought up repeatedly in Chapter III.

Then, moving from the general to the more specific, attention was drawn to the direct similarity of the elements of authority in the medical school and that of the usual educational situation. It was stated that this three-fold authority relationship created a problem with regard to degree of involvement. The degree of involvement of the expert and the student for the medical association is very different from the degree of involvement which seems to be keynoted by various statements of educators in general education, quoted in Chapter II and Chapter III.

Next, the concept of mind and the psychology of learning which seemed basic to the methods employed in the authority relationship of science instruction were examined. The procedures of the traditional educative process were shown to be similar to the methods derived from the philosophy and psychology of associationalism. Mention of particular theoretical defects of associationalism raised the question as to whether the processes of education under associationalism were complete or whether there were other aspects besides elements, minutiae, or content which should be considered. The latter position was taken. The concept of learning, which lays such stress upon memorization, is one which appears to ignore, quite

completely, the higher mental processes of comparing, inferring, and abstracting. Yet it is through these means that psychologists are suggesting, today, that development of systems or integration of knowledge are made possible.

Basic facts of man's information are essential. However, as Mather deduces,

> More important is the search for basic concepts and underlying principles that may be valid throughout the entire body of knowledge, that serve as the common roots from which the various branches draw their vitality.[20]

On the basis of the argument to this point, it is now maintained that the exclusive authority relationship of science specialists, who teach general students, and the emphasis on minutiae with little or no regard for interpretation and evaluation via group activity, is a highly unsatisfactory, undesirable, and unnecessary state of affairs. Probably, as a direct result of the analytic and highly descriptive pattern of academic effort by past scientists, there has developed a serious condition of multiple schisms in the general field of the sciences, today. This condition is complicated further as the specialists continue to teach from the position of exclusive authority and remain aloof from the student, in general, and the social implications of their speciality, specifically. Likewise, youth of new generations, experiencing such educative processes, reflect the schisms of the subject matter fields which they are supposed to master during their formal education. Such cleavages, then, as exist in man's

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20 Kirtley F. Mather, "Objectives and Nature of Integrative Studies", Main Currents in Modern Thought, Vol. 8, No. 1:6, March, 1951.

scientific knowledge, have had a contributory role in the emergence of the present confused state of affairs.[21] It is the correction or abatement of further development of non-integrative or disintegrative forces in society that adds momentum to the general education movement and gives credence to Mather's comment,

> Basic to almost every concept of general education is the desire to shift from the centrifugal tendencies that seem to accompany analysis to the centripetal ones that ought to accompany synthesis.[22]

In turning from the two preliminary steps of this study (background discussion and survey and assessment of existent conditions), it is quite logical to ask where the experimental philosophy of a general education program fits into the discussion thus far presented. Also, it would seem that the last section of this chapter indicates the need for an alternative or more comprehensive concept of mind and learning. Therefore, the following chapter will investigate experimental philosophy for alternatives concerning mind and science teaching.

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21 Efforts at adding impetus to integration of man's knowledge may be seen in the work of the Foundation for Integrated Education in Connecticut and the Institute for the Unity of Science at the University of Chicago.

22 Mather, op. cit., p. 4.

CHAPTER V

CHAPTER V

ALTERNATIVE VIEWPOINTS OF MIND, SUBJECT MATTER, AND METHOD

The traditional outlook in education enlarged upon in the previous chapter may be contrasted with experimental philosophy. In the closing section of that chapter, statements were made which gave some clues to this contrast. It was considered that learning might be more than linear; that learning should be interpreted as more than acquisition and recall of isolated facts. This conclusion seemed to allow for more conscious incorporation of inferences and comparisons into the learning process. This incorporation seems necessary if such higher mental processes are going to be utilized by students in synthesyzing ideas. Also, accompanying the inclusion of higher mental processes as a part of learning activity, it seems necessary to include measurement of these more difficult activities as part of evaluation procedures.

Therefore, this chapter will be concerned with three general alternative viewpoints involving concepts of mind, subject matter, and method. They will be discussed in that order. This third phase of the over-all study will be continued in the next chapter wherein specific alternatives to the elements of the traditional three-fold authority relationship will be discussed.

ATTITUDE OF EXPERIMENTAL PHILOSOPHY TOWARD MIND

Fundamental to experimental philosophy are certain formulations relative to interpretations of mind, thinking, and consciousness. Primary importance is given to the use of intelligence in all aspects of living, as well as in the more restricted activities of formal education. Therefore, a discussion of alternatives to some aspects of the traditional authoritarian position may begin logically with considerations about mind.[1]

In Chapter II, reference was made to an emphasis in experimental philosophy upon the use of intelligence in social situations. It was interpreted that such an active utilization of intelligence involved the study of social needs and problems with a view to constructing special solutions which would approach the problems of the times. This viewpoint attempts to incorporate the methods and evidence of science into a philosophical approach appropriate to the twentieth century. Such an attempt aims to conform to conditions of the present, an age of technology and science. These characteristics of experimental philosophy are summarized, thus:

> The pragmatic movement has been characterized by an emphasis upon the place of action in the mental life; representing 'the influence of Darwin on philosophy' it has demanded the reinterpretation

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1 An argument similar to that of the present chapter may be found in Charles W. Morris, Six Theories of Mind. (Chicago: The University of Chicago Press, 1932); John Dewey, Democracy and Education. (New York: The Macmillan Company, 1916); and George H. Mead, Mind, Self, and Society. (Chicago: The University of Chicago Press, 1934).

> of philosophical problems and concepts in terms of the materials uncovered and the viewpoints gained in the biological, psychological, and sociological sciences. The resulting reinterpretation of mind is perhaps most adequately embodied in the concept of function.[2]

In experimental philosophy, then, a vital and inevitable implication of an evolutionary point of view has been the concept that mentality functions in the service of the organism. Such a conceptualization identifies mentality as a function within life-processes. Thus, an explicit functionalism is derived as an interpretation of mind; first, stress is given to the idea that thinking is instrumental to the control of the environment, and secondly, thought and mind are functional characters of a complex interaction of natural events.

In experimental philosophy, the concept of mind is directly or indirectly related to action. Therefore, judgments involve statement of the given facts of a situation so that an indication as to the course of action to pursue is revealed. This notion opposes

> ... the view that the knower is merely a glassy eye angelically beholding a ready-made world. In place of this he (Dewey) insists that knowledge plays its part in life-process, and that both the data and the object finally known are determined by the interaction of the inquiring subject with objects.[3]

This means that, through the activity of the individual, the complex relational structure called "experience" arises. Through the activity of the individual, changes arise in the surrounding world and new features of the world arise which would not have appeared in the absence of the

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2 Morris, op. cit., p. 274.

3 Ibid., pp. 304-305.

individual. Thus, if the ongoing activity of the individual is blocked, there arises a situation which Dewey characterizes as being "doubtful" or "tensional". In such situations, mind and consciousness appear. Mind as function serves the purpose of resolving the doubt or tension so that the situation can be controlled and used by the individual to remove frustrated organic demands or interests. This viewpoint does not make mind and thought merely instrumental to non-directed, random activity. On the contrary, specific interests of the individual are served. The conclusion should be clear that thought is inseparably linked with the demands of interested behavior, and, therefore, is instrumental to the satisfaction of such demands.

In experimental philosophy, the terms mind and consciousness may be used interchangeably. Consideration of consciousness is simply a matter of putting the concept of mind in another way. Mead has the following to say about consciousness:

> Earlier psychologists--and many psychologists of the present time, for that matter--assume that at a certain point in the development of the organism consciousness as such arises. It is supposed to appear first of all in affective states, those of pleasure and pain; and it is assumed that through pleasure and pain the form controls its conduct. It is assumed that later consciousness finds its expression in the sensation of the antecedent stimulus process in the environment itself. But these sensations, from the point of view of our study, involve the statement of the environment itself; that is, we cannot state the environment in any other way than in terms of our sensations, if we accept such a definition of sensation as a consciousness that simply arises. If we try to define environment within which sensation does arise, it is in terms of that which we see and feel and that which our observation assumes to be present. The suggestion I have made is that consciousness, as such, does not represent a separate substance or a separate something that is super-induced upon a

> form, but rather that the term 'consciousness' (in one of its basic usages) represents a certain sort of an environment in its relation to sensitive organisms.[4]

It is possible to see from this statement that consciousness is simply a phase of systems of meanings which at a given time are undergoing redirection or transformation. Consciousness is not some power which modifies events, but is the meaning of events in the course of reconstruction. Consequently, consciousness as such refers to both the individual and his environment and simply cannot be located in either.

> Consciousness arises from the interrelation of the form and the environment, and it involves both of them. Hunger does not create food, nor is an object a food object without relation to hunger. When there is that relation between form and environment, then objects can appear which would not have been there otherwise; but the animal does not create the food in the sense that he makes an object out of nothing. Rather, when the form is put into such relation with the environment, then there emerges such a thing as food. Wheat becomes food; just as water arises in the relation of hydrogen and oxygen. It is not simply cutting something out and holding it by itself (as the term 'selection' seems to suggest), but in this process there appears or emerges something that was not there before.[5]

Therefore, mind and consciousness may be considered as the climax to the processes of organic emergence which were referred to in Chapter III. Mind is the creative formation of new relations of meanings which have been gained through the experience of the individual with things in the environment. This characteristic of human behavior is exemplified in today's society by the creativity of modern scientists. The mentality of the openminded scientist illustrates the concept of mind being described.

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4 Mead, op. cit., p. 329.

5 Ibid., pp. 332-333.

The practicing scientist is constantly looking for relations and putting things in his environment in new relationships. This exceedingly well developed attribute of scientific mentality has put scientists as a group in an advanced position of great control over much of man's environment.

The experimental philosopher has been interested in how the human species has evolved toward getting control over these relationships. He has found that, essentially, the mechanism the human animal has worked out is that of language communication. Language has provided a vehicle for indicating meaning to others and to the individual. This is an ability which gives peculiar power to the individual. The mind of the individual is dependent upon this mechanism of control over meaning. However, the mental processes do not lie in words any more than the intelligence of the individual lies in the elements of the central nervous system. Both are part and parcel of a complex process that is going on between the individual and the environment.

The complexity of this process whereby language assists the individual in controlling meanings about his environment, nevertheless, prevents the concept of mind from being exclusively individual. The conditions in which human beings have used the language mechanism for control over meaning are social conditions. The isolated individual's experiences with his environment are not enough. Meanings arrived at through this limited means would not be as inclusive as the meanings which have been accumulated in man's culture. The individual gains a fuller experience through social acts. In social situations, the

individual becomes aware of the relations of other individuals to the environment through the language mechanism. Therefore, the individual becomes self-conscious when he compares his meanings about the environment with those which others have gained. This self-consciousness leads the individual to make adjustments to the attitudes and the ideas expressed by others in the social situation. This means that an individual's ideas become significant to him as he takes part in the social process through the language mechanism. Others react to him and his ideas. Therefore, the words and meanings which come from social intercourse, ideally, have greater significance to the individual than those obtained in isolated relation with his environment. In this way, thinking is preparatory to social action. Mead offers this conclusion about mind as function:

> It is absurd to look at the mind simply from the standpoint of the individual human organism; for, although it has its focus there, it is essentially a social phenomenon; even its biological functions are primarily social. The subjective experience of the individual must be brought into relation with the natural, socio-biological activities of the brain in order to render an acceptable account of mind possible at all; and this can be done only if the social nature of mind is recognized. The meagerness of individual experience in isolation from the processes of social experience--in isolation from its social environment--should, moreover, be apparent. We must regard mind, then, as arising and developing within the social process, within the empirical matrix of social interactions. We must, that is, get an inner individual experience from the standpoint of social acts which include the experience of separate individuals in a social context wherein those individuals interact. The processes of experience which the human brain makes possible are made possible only for a group of interacting individuals; only for individual organisms which are members of a society; not for the individual organism in isolation from other individual organisms.

> Mind arises in the social process only when that process as a whole enters into, or is present in the experience of any one of the given individuals involved in that process. When this occurs the individual becomes self-conscious and has a mind; he becomes aware of his relations to that process as a whole, and to the other individuals participating in it with him; he becomes aware of that process as modified by the reactions and interactions of the individuals--including himself--who are carrying it on. The evolutionary appearance of mind or intelligence takes place when the whole social process of experience and behavior is brought within the experience of any one of the separate individuals implicated therein, and when the individual's adjustment to the process is modified and refined by the awareness of consciousness which he thus has of it. It is by means of reflexiveness--the turning-back of the experience of the individual upon himself--that the whole social process is thus brought into the experience of the individuals involved in it; it is by such means, which enable the individual to take the attitude of the other toward himself, that the individual is able consciously to adjust himself to that process, and to modify the resultant of that process in any given social act in terms of his adjustment to it. Reflexiveness, then, is the essential condition, within the social process, for the development of mind.[6]

In this statement there is a suggested extension of the social theory of nature discussed in Chapter III. If the social process is essential for the fullest development of mind, then, individuals must of necessity be responsive and sensitive to one another's ideas and meanings if fullest development is to occur. Therefore, at the abstract level of ideas, it is possible to hypothesize a "society" of significant meanings in keeping with the basic definition of society as adopted earlier. By way of the language mechanism, these ideas become a part of the environment of the individual. With mind considered as a function within life processes, it would seem that adequate development of the functional aspects of mind would depend upon extensive participation in social

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6 Ibid., pp. 133-134.

intercourse; this might lead to the greatest possible control of significant meanings by an individual.

To this point, then, it should be clear that mind for the experimental philosopher is a function of the relation of an individual with the natural events of the environment. Because of the language mechanism in the social process, this functional relationship may lead to a high degree of control of significant meanings about the environment.

Mind is not considered as substance and is not to be located in the brain. Mind is the functioning of significant meanings. The development of significant meanings and self-consciousness to the fullest extent depends upon the social process.

> Mind is an emergent character at the level of social or co-operative behavior. The factor of meaning or mentality which language makes possible is then extended to other events, so that the ultimate origin of mentality is social.[7]

This concept of mind is, therefore, an alternative one to that of mind as content only. This section has developed a more inclusive interpretation of mind than that identified with the traditional authority relationship. In the concept of mind presented by the experimental philosopher, two philosophic concepts, namely, one of emergence and one of relativity, are brought together. Water arises out of a combination or functional relationship of hydrogen and oxygen. In much the same sense, then, when sensations which lead to meanings are considered as arising or emerging, no more is demanded than when the character of any organic compound is described.

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7 Morris, op. cit., p. 321.

> Anything that as a whole is more than the mere form of its parts has a nature that belongs to it that is not to be found in the elements out of which it is made.[8]

Fundamentally, from the viewpoint of experimental philosophy, mind and consciousness are emergent functions of the relationship of a thing to an organism. Mind as function leads to control of the environment. Subject matter, then, would seem to be a means for developing significant meanings through a social process.

ATTITUDE OF EXPERIMENTAL PHILOSOPHY TOWARD SUBJECT MATTER

It seems logical now, to consider an alternative to the common isolation of subject matter from the social process. Various stipulations relevant to desirable conditions or circumstances wherein mind might arise have been inherent in the description of the experimental viewpoint toward mind. Overshadowing all other aspects of interaction of individuals with the environment is the importance of the social process and the opportunity for social intercourse. From this conclusion, it would seem that subject matter in formal education would be the means for developing significant meanings. In other words, subject matter is that part of the educative process which furnishes the immediate environment. Subject matter stimulates responses and a course of action. However, to give fullest meaning to habits and ideas formed through the medium of subject matter in educative activities, a social environment is necessary. Of course, subject matter may exist simply as knowledge. Often, it may be

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8 Mead, op. cit., p. 329.

studied for mere mastery of it, irrespective of any social values. These interpretations lead to a remoteness of subject matter from the experience of youth which is quite real.

Therefore, with the wide range of possible material to select from, the experimental philosopher considers it very important that the educational program, especially the program planned for beginning students, should be determined by use of a criterion of social worth. It is true that all information and systematized knowledge has been worked out under the conditions of social life and transmitted by social means. Nevertheless, it is impossible to assume that all material is of equal value. It is necessary that the scheme of the curriculum be adapted to the needs of the existent societal requirements, like those requirements which were discussed at some length in Chapter II. Therefore, with these requirements utilized as a set of criteria,

> ... the curriculum must be planned with reference to placing essentials first, and refinements second. The things which are socially most fundamental, that is, which have to do with the experiences in which the widest groups share, are the essentials. The things which represent the needs of specialized groups and technical pursuits are secondary. There is truth in the saying that education must first be human and only after that professional. But those who utter the saying frequently have in mind in the term human only a specialized class; the class of learned men who preserve the classic traditions of the past. They forget that material is humanized in the degree in which it connects with the common interests of men as men.[9]

Such a curriculum would include social relationships. The curriculum would involve problems relevant to living together. In working on the problems of living, observation and information would be worked out in a group process devised to develop social insight and interest.

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9 Dewey, op. cit., p. 225.

Now, what of science teaching and science courses in particular? Are they to be conceived as media for the development of mind as evaluated in the previous section, and part of a curriculum calculated to result in social insight and concern? The experimental philosopher answers this question in the affirmative. Science is interpreted as representing a safeguard against certain human tendencies. It may be noted that the undisciplined person is adverse to suspense and intellectual hesitation. Ordinarily, people like things undisturbed, settled, and tend to treat them as such. They show a predilection for premature acceptance and assertion and an aversion to suspended judgment. They are satisfied with superficial and immediate shortvisioned applications. Yet, science is the safeguard against these practices.

> It consists of the special appliances and methods which the race has slowly worked out in order to conduct reflection under conditions whereby its procedures and results are tested. It is artificial (an acquired art), not spontaneous; learned, not native. To this fact is due the unique, the invaluable place of science in education, and also dangers which threaten its right use. Without initiation into the scientific spirit one is not in possession of the best tools which humanity has so far devised for effectively directed reflection. One in that case not merely conducts inquiry and learning without the use of instruments, but fails to understand the full meaning of knowledge. For he does not become acquainted with the traits that mark off opinion and assent from authorized conviction.[10]

Therefore, science is given a leading position in the mediation of culture from one generation to another.

Though scientific methods and procedures have much value, there is a grave problem for education of youth if isolation and abstraction should

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10 Ibid., p. 223.

prevail in science instruction. The science courses in a curriculum also must be planned "with reference to placing essentials first, and refinements second". Those parts of science which are socially most fundamental, and involve the experiences in which the widest groups share, are the essentials. Consequently, students should be introduced to scientific subject matter and be initiated into its facts and laws through acquaintance with everyday social applications.[11] In this way the criterion of social worth may be served. Also, the development of significant meanings may be more assured. It is even possible that the instruction of youth in social applications of science will lead the way to measures and policies by means of which a better social order might be brought into existence.

In this section the viewpoint has been supported that the educative process should occur in a social environment. A further interpretation of experimental philosophy suggests that subject matter in formal education should be selected on the basis of social criteria. This applies to the specialized area of man's knowledge called science. The subject matter of science in formal education should be directed toward the social and should meet social responsibilities. All in all, the emphasis of subject matter is upon social relationships and all education, short of that for the most specialized, should be organized along the lines of present social use and potential social utility.

However, in experimental philosophy subject matter is not separated from method. Therefore, the next section is presented, essentially as a continuation of the experimental viewpoint on subject matter-method.

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11 John Dewey, Experience and Education. (New York: The Macmillan Company, 1938). Chapter VII.

ATTITUDE OF EXPERIMENTAL PHILOSOPHY TOWARD METHOD

According to the outlook of experimental philosophy,[12] the worth of school learnings is proved and substantiated by the degree to which those learnings actually merge with the social environment of youth. The social worth of school learnings is of great importance to the experimental philosopher for such a measurement of subject matter is proposed as a corrective factor for the "evil" of isolation of the formal educational institutions. Certainly the inducting function of formal education involves, inherently, utilization of acquired information in the daily activities of youth. Therefore, the method of experimental philosophy emphasizes utilization of information in the form of significant meanings for control of individual behavior and estimation of consequences of behavior in social situations. The experimental director of curriculum revisions plainly recognizes that there are learnings which go on in the life of youth while youth are not actually in the confines of the educational institution. If, then, the matrix in which the experiences of education are set have the greatest degree of similarity to certain out-of-school activities of the learner, it follows that the potential for utilization of significant meanings is at a maximum.

This utilization is what modern psychologists mean when they refer to transfer of information.

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12 Dewey, Democracy and Education, p. 225.

> By transfer is meant the operation (use or misuse) of learning in circumstances that are different to some extent from those under which the learning took place. ... The utilization of that which was learned in one situation in reacting to or in learning to react to another situation is transfer.[13]

Experimental philosophy is concerned with transfer. Dewey observes that the more specialized is the reaction, the less is the skill, acquired in practicing and perfecting it, transferable to other modes of behavior.[14] In other words,[15] he says that whenever an activity is broad in scope (that is, involves the coordinating of a large variety of sub-activities), and is constantly and unexpectedly obliged to change direction in its progressive development, then general education is bound to result. Education will meet these conditions and hence will be general in the degree to which social relationships are taken into account. If the student is concerned principally with technical subject matter, his action and his judgment may be ill-advised and inept outside of his specialty. However, if the student is concerned primarily with technical subject matter which has been deliberately connected with human activities having social breadth, then the range of active responses called into play and flexibly integrated is much wider. Isolation of subject matter from the social context is the chief obstruction in current practice to securing general training.

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13 James B. Stroud, Psychology in Education. (New York: Longmans, Green and Co., 1946), p. 555.

14 Dewey, op. cit., p. 75.

15 Ibid., p. 78.

The findings of modern psychologists support these generalizations. As McConnell[16] has pointed out, transfer depends not only upon the presence of identical components, but upon attitudes and methods which dispose the individual to make an aggressive attempt to discover them. The individual must be guided and trained in systematic methods of getting at the essential features of the situations which life and learning present. These ideas call to mind those presented before in the discussion by Scroggs[17] on generality and by Judd[18] on the development of the higher mental processes.

Thus, by presenting and handling school learnings so as to provide the greatest enhancement[19] of transfer to social situations, the experimental philosopher considers formal educational institutions to be fulfilling the role of mediating agents between youth of new generations and the habits, attitudes, mores, and so forth of the community into which the youth are being inducted. If the argument is logical and

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16 T. R. McConnell, "Reconciliation of Learning Theories," Forty-First Yearbook of the National Society for the Study of Education, Part II, 1942, pp. 276-277.

17 Cf., pp. 27-29 of Chapter II.

18 Cf., pp. 77-79 of Chapter IV.

19 Stroud, op. cit. On p. 563, he writes, "The most practical and the most effective way of implementing the conditions of transfer in education is teaching designed to bring about the greatest amount of general understanding upon the part of pupils." He also comments that the chief justification for the trend in modern education toward increasing emphasis upon meaning, understanding, useful generalizations, and so forth is the fact that it furthers transfer. "A method of instruction that utilizes facts as means to an end--a means of attaining generalizations--is to be defended on the same ground." p. 585.

acceptable, then, one is led to the conclusion that there is a need for close scrutiny of present subject matter organizations and, also, pedagogical techniques employed.

In response to these statements, the proponents of the traditional, authoritarian methods might be expected to charge that they, too, are interested in transfer of school learnings. They no doubt feel that they are developing conditions which contribute to the real transfer of school learnings. In short, the interpretation which they place on the objective of formalized education may appear on the surface to be almost the same as that of the spokesmen for a more experimental educative process.

However, as Humphreys writes in a recent article on transfer of training in general education,

> The expected outcomes of education do not always materialize. Time spent in training seems wasted when students are asked to use their learning in new situations.[20]

He illustrates this in the area of science. In a laboratory course in physical science, the claimed function is the teaching of the scientific method. Yet there seems to be no carry-over by the students to biological science or social science, as the skills and attitudes acquired are more those of the technician than of the scientist. During the last fifty odd years students generally have been required to take one laboratory science in the early years of their undergraduate training. This is done,

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20 Lloyd G. Humphreys, "Transfer of Training in General Education", Journal of General Education, Vol. V, No.3:210-217, April, 1951.

in part, so that students will be trained in the disciplined habits of scientists and gain an understanding and appreciation of the scientific method. This means that claims for considerable transfer are involved.

> There are several reasonable predictions that can be made concerning this procedure. In the first place, the training in the physics laboratory will probably extend only to the subject matter of physics. If greater breadth than that is required, the course must be broadened. Second the techniques taught in the usual laboratory are only in small part the techniques of the scientist. The techniques learned have been characterized in an earlier section as those of the technician, not of the scientist. The major omission from the laboratory of techniques essential to the scientist are his problem-solving activities. If problem-solving is desired, problem-solving must be an essential part of the laboratory procedure.[21]

Humphreys makes it clear that attention to attitudes toward science is omitted from the usual laboratory course. He concludes that desirable changes in the attitudes of students toward science can no more be taken for granted than they can in the area of aesthetic appreciations.[22]

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21 Ibid., p. 216.

22 Humphreys also proposes a series of steps to be followed if transfer is expected to follow from the educative process:

"The first step in analyzing an educational problem in terms of transfer possibilities is to decide on the ends to be accomplished.

"The second step is to select the classroom (or course) content that seems most suitable for the achievement of the objectives. This selection is made primarily in terms of the identical-components basis for transfer, that is, the content of the training situation should correspond as closely as possible to the content of the prospective transfer situation.

"The third step is to decide how this content should be presented or to determine the techniques of instruction that will be most effective. Here the contributions of Judd and the Gestalt psychologists are most appropriate: the teaching must stress general principles, organization of the learning, etc.

"The fourth step, and perhaps more important than either the second or the third, is to attempt to measure the extent to which the predicted transfer takes place." p. 216.

He feels that changes in attitudes can be measured with success and that techniques for changing attitudes in specific courses must be developed.[23]

On the basis of this example, it would appear that the crux of the matter seems to lie in the implementation of the educative process. Emphasis of formal education upon social use of intelligence and the fostering of deviate viewpoints and opinions on the part of the educand suggests that implementation involves reorientation of subject matter and methods of classroom activities. To say reorientation, does not mean that the facts of subject matter and rigor of scholarship are to be forfeited as part of the educative process. There can be no understanding without facts upon which to base understanding. There can be no understanding without knowledge of contrasts and exceptions which may lead to depth of interpretation. Very definitely, the facts of subject matter are not to be ignored. However, a most rigorous and challenging examination must be made of the importance of specific facts and their relative

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23 Certain attitude changes are reported by John M. Mason, "An Experimental Study in the Teaching of Scientific Thinking in Biological Science at the College Level". Unpublished Doctoral Dissertation, Michigan State College, East Lansing, Michigan, 1951. The two different methods compared were designated the scientific thinking method and the descriptive method. The scientific thinking method emphasized scientific methods and scientific attitudes and provided activities in the use of the methods and attitudes of science. Mimeographed lectures were used which provided activities for student participation in solving problems and for the direct teaching of scientific attitudes as habits of thinking. The descriptive method stressed only knowledge and understanding of the facts and principles of biological science. Mason indicates that the ability to think scientifically and scientific attitudes can be concomitant outcomes of science instruction. Also these outcomes can be taught more effectively when students are given direct training and practice in the methods and attitudes of science.

contribution toward wholesome understanding of principles and generalities of subject matter.[24] Such an attitude would become paramount in any reconsideration of educative experiences. Such scrutiny might reveal some shortcomings of current methods and subject matter treatment.

It has already been mentioned that science teachers teach according to patterns through which they have learned to be specialists. It has already been mentioned that the pedagogical methods and techniques which are predominant in science classes are almost strictly authoritarian in degree. It has been maintained that utilization of information is what is desired as a result of experience in education on the part of youth. It is now possible to consider an alternative to the traditional authority relationship.

According to experimental philosophy, it may be argued that if participation and acceptance of responsibilities in a democratic community are desirable outcomes or end-results of education, then the traditional educational practices seem to be in error. Practice of the traditional educational relationship implements, directly, acquisition of facts and masses of information. These points have been brought out before in the discussion on the three-fold authority relationship.

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24 Here, a contrast between general and special educators stands out in stark reality. The general educators perceive that specifics are learned most properly as outgrowths of generalities, more often than the reverse. The special educators, typically, uphold the position that specifics must be learned before generalities may be detected and discussed by the learner.

If the preceding argument is valid, then, the give and take, approximation and correction, errors and repeated experiments, and so forth of actual science work rarely creep into the awareness of youth being inducted into that portion of the community process which is scientific. So cut and dried is the form in which the information of typical science courses is presented that the "adventure" of discussion is left without trial. Nevertheless, this business of discussion is a large and very important part of the activities of scientists when in their laboratories. There, in the discussion phase of generating new hypotheses, the creative aspects of the scientists' work come to attention. Yet, what can be said for the creativity potential or the emergence of mind, if opportunity for discussion is lost and student exchange of ideas and expressions is held to a minimum? According to experimental philosophy, subject matter and method should be cast in a social environment. However, the current practices of the traditional science courses can hardly be interpreted as being conducive to such an environment when subject matter is taught as isolated from the community. This is so when classroom procedure isolates students from one another and from the teacher, who stands as an expert authority before the youth.

If transfer of information (ideas learned in one situation employed in a different yet related situation) is to be guaranteed as an end-product of the educative process as presented in formalized educational institutions, then methods of the classroom must of necessity be brought into coincidence with certain desired methods practiced in the ways of life in the community. If there is to be a transfer of scientific

information it would seem quite logical that the information, in part at least, should be acquired through methods which would be utilized outside the isolation of the classroom. This seems possible when the alternative interpretation is made that the scientific method is quite similar to the political democracy which is so revered in the present culture.

> There has been a persistent and at times ably developed tendency during the past half-century or more to identify the method of science with the democratic way of life. Where this has not been expressly attempted, there has often, nevertheless, been an implicit assumption of belief in the identity of the two. The way the scholars, schools, and universities of America have devoted themselves to the discipline of the knowledge of facts is evidence that, at least, there was felt to be nothing essentially out of place about the devotion almost exclusively of democracy's disciplined minds to the pursuit of fact and informative theory.[25]

The authors go on to emphasize that the "eggs of intelligence" have been put in one "basket" with very little regard given to thought that shapes moral and political policies. They deplore the devotion of intelligence to scientific fact-gathering and identification of this use of intelligence with devotion to democratic procedure. They answer with an affirmative the question, "Has not the ethic of science been prevailingly identified with the ethic of democracy, especially in the circles of careful and advanced students?"[26] This parallelism between these two areas of procedure is highly important to the experimental philosopher who is attempting to implement the problem of transfer of school learnings to social situations.

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25 R. Bruce Raup, George E. Axtelle, Kenneth D. Benne, B. Othanel Smith, The Improvement of Practical Intelligence. (New York: Harper and Brothers, Inc., 1943), p. 216.

26 Ibid., p. 216.

This democratic method, which includes student participation, involvement, and concern, is a very important part of a concept of effectiveness of learning experiences in experimental philosophy. Both extensive student suggestions, as well as instructor suggestions, are covered here. Also included is the cooperative planning of the course or program of study and the activities, to be participated in by all, in the presence of the entire group. This in no way means to suggest or maintain that the instructor is unable to direct or to guide the planning into purposeful channels. All that is intended for emphasis here is the conclusion that social situations which provide for face to face relationships are most desirable. Such situations are not the only possible social situations. However, in light of the interpretations derived from experimental philosophy, the practice of encouraging student activity and creativity seems defensible. Nevertheless, the adult is still responsible to analyze the readiness of students for certain activities and to see that the energies of youth are applied to worth-while efforts.

Of course, concurrent with cooperative democratic action is the development of convictions on the part of students, individually, that the effort required to cooperate is worth-while and will pay dividends to the group and each member of the group.[27] Here, one is reminded of the applicability of the concept of cooperation to the actions and conduct of the human species which was singled out as part of the social implication

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27 Pedagogical efforts along this approach would be included in other courses in general education which would be based on assumptions and interpretations similar to those of this investigation.

of science. To guide students toward the realization of the value of cooperative effort requires logically that some considerable part of the classwork be devoted to discussion, upon stimulation from the teacher, of what seem to be the worth-while goals and ends at the moment for the individual student and his society. This calls forthrightly for opinions by all concerned about the democratic ideals and the common values which each member of the group holds for himself, singularly, and with other members of the group, conjointly. Students should be guided to see that the classwork is more than competition between each other. Also, they should be guided to realize that the classwork is more than sheer cooperation for the point of being each other's helper only, but the development of a "joint economy".[28] This is a type of dynamic group activity that is distinctive and contributes effort to all for the welfare of all. Dewey has the following to say about joint activity:

> Individuals are certainly interested, at times, in having their own way, and their own way may go contrary to the ways of others. But they are also interested, and chiefly interested upon the whole, in entering into the activities of others and taking part in conjoint and cooperative doings. Otherwise, no such thing as a community would be possible.[29]

It would seem, then, that the logic of the argument presented herewith would lead to the interpretation that the most effective program for learning and emergence of mind is to be founded, in large part, upon student participation in the direction or guidance of the educative process.

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28 Guthrie E. Janssen, Basic Human Engineering Handbook. (Ann Arbor: Cushing-Malloy, Inc., 1950), p. 40.

29 Dewey, op. cit., pp. 28-29.

SUMMARY

This chapter has presented some alternatives to the traditional position which had been surveyed and assessed in earlier chapters. These alternatives have dealt with interpretations of the concepts of mind, subject matter, and method according to experimental philosophy. It was established that mind might be considered as a function of the relation of an individual with the natural events of the environment. Mind is the functioning of significant meanings which emerge from cooperative social activity. Mind as function is instrumental to the control of the environment of an individual.

It was pointed out that experimental philosophy holds that a re-examination of subject matter and methodology is needed in modern formalized educational institutions. Such a re-examination of subject matter would be concerned with identification of socially essential facts. These facts would be adequate and economic vehicles for building understanding and recognition of the applicability of information to the concerns of youth. Then, those elements which remained would need to be set in a social matrix. This would allow for transfer of school learnings to daily activities of ordinary citizens of the community.

As a distinct part of the method of experimental philosophy, attention was given to the consideration that methods of the classroom must of necessity be brought into coincidence with the democratic method practiced in the desirable ways of life in the community. This position is taken, according to experimental philosophy, on the assumption that

participation and acceptance of responsibilities in a democratic community are desirable outcomes or end-results of education.

On the basis of the general alternatives to the traditional educational situation presented in this chapter, it is now possible to inspect some specific alternatives to the elements of the three-fold authority relationship studied in the previous chapter. These specific alternatives will be discussed in the next chapter as logical derivatives of philosophical and psychological interpretations established to this point.

CHAPTER VI

CHAPTER VI

SPECIFIC ALTERNATIVES TO ELEMENTS OF AUTHORITY RELATIONSHIP

It would seem logical, now, to attempt an answer to the fourth corollary question which was originally stated: What are the methods for teaching a natural science course? Essentially, in this chapter, specific alternatives for each element of the three-fold authority relationship presented in Chapter IV will be discussed. Consequently, this chapter will be divided into four units which will provide convenient means for working with details of the corollary question. The four elements of the question concerning the means for achieving the goal of a natural science course in a general education program are: (1) the role of the expert, (2) the character and responsibility of the learner, (3) the nature of the learning situation, and (4) the nature of the field of natural science.

ROLE OF THE EXPERT

The expert, one of a group of professional specialists, is the person with the greatest command of the information about which he is an authority. Yet, his authority does not come so much from what he says or pronounces in relation to the information. Rather, it is derived from the actual field of information about which he is especially conversant. In the educational situation, the expert is a specially trained mediating

agent in the intricate process of formalized education in modern society. He possesses special theories and knowledge which are of immediate value in the narrow field of specialization. However, in a general education program, it would seem that the expert must become a man of action in certain aspects of the culture beyond his specialty. Since he is a man of special knowledge, he becomes a man of increased stature as division of labor increases in modern society. Such a person of stature has the responsibility of applying his theories and perspectives of expertness to conflicting situations in current society if social values are considered primary.[1]

Such an expert will recognize the shortcomings of the specialist as a maker of social policy. These shortcomings are due primarily to the restrictions of methodological orientation and techniques. The subject matter expert is habituated to working with and controlling events. He obtains data about events by means of thing-procedures and thing-techniques. Therefore, he is generally trained to disregard possible wishes, motives, and social outlooks of the things controlled. Nevertheless, the social responsible expert will agree,

> Any methodology or social technique that fails to recognize the characters of persons and the fragmentation of the community as active elements in the making of policies and decisions will slur over the genuine problems which lie behind the surface confusion and conflict. The social frustration arising out of conflicting social perspectives and the inability to deal adequately

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1 R. Bruce Raup, George E. Axtelle, Kenneth D. Benne, and B. Othanel Smith, The Improvement of Practical Intelligence. (New York: Harper and and Brothers, 1950), pp. 18-19. An argument similar to that in this section may be found in Chapter I.

> with them is therefore only increased by the thing-techniques of the expert when applied to problems of practical action.[2]

These statements suggest that the expert in a general education program has a special mediating role in his relation to students who are mainly interested in gaining a general insight into, and understanding of, the field which the expert represents. He will be especially concerned that this expertness is available to students in such form and manner as will be applicable to the social field in which they live and have their being. To do this, the expert will not interpret mind as content only. He will interpret the phenomenon of mind as a process relationship of the student to environments to which he is sensitive. Such an expert will not fail to realize that vital student interests must grow out of personal needs. He will realize that growth and development of interests through the medium of formalized education involve a constant reconstruction and broadening of basic concerns of the student (along with those of the instructor, for that matter).

Therefore, the role of the expert, in general education, seems to be that of working <u>with</u> students to facilitate learning by means of interests which are already manifest and through interests which the expert may arouse. The expert instructor, through imagination, ingenuity, and knowledge of the students, will be able to guide learning activity in positive, purposeful channels. To do this, the expert will need to utilize the concept of sociality in nature as well as the impersonal concepts of scientific materialism. Through utilization of the concept of sociality

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2 <u>Ibid</u>., p. 19.

in nature, it will be possible for the expert to escape the shortcomings of the specialist operating within limited perspectives. Adoption of the concept of sociality in nature would allow for recognition that "social conflicts and issues are not due so much to lack of accurate knowledge as to differences in value orientation ..."[3]. Value orientations are decidedly ideational products. Therefore, if an emergent viewpoint of mind is taken, it is possible for the science expert to incorporate into a natural science course the value orientations which are intimately related to his field of authority, and thus contribute to greater student understanding and interpretation of social issues. The emergent concept of mind seems in keeping with the concept of sociality in nature. This is pointed out since the fund of abstract ideas and significant symbols which in part comprise mind may be considered a "society" of mentations. This society of mentations evolves and changes as the social environment changes through the creative potential of thinking man. It has been mentioned already that the potential for creativity, and hence ideational extension of the sociality of nature, is high in the field of science. Therefore, the position of the science expert in a general education program is distinctly unique. Through the variations and openness of his thought processes and attitudes, he will be able to utilize the interests of students and the value orientations of his field. He will do this to enhance the development of understandings and significant symbolizations by students concerning the social applicability of information which inheres in this field of authority.

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3 Ibid., p. 19.

These interpretations of the role of the expert are predicated upon a particular exercise of authority. The specialist will exercise his expertness for purposes different from those which are implicit in the relation of patient to doctor or medical student to medical expert. The authority relation in these two situations has already been denoted in Chapter IV and need not be expanded here. It is possible to consider them as two extreme poles of a continuum of authority relationships. The patient never becomes an intimate member of the medical association. The medical student expects to be inducted into the medical association with all the common professional commitments and common information of an association member.

However, the authority relation of the science expert to the student in a general education program is located in some middle position on the continuum which separates patient from medical student. The patient never becomes involved directly in the medical field while the medical student becomes directly involved in the medical field. It is possible to consider the general education student in science as being involved in the field of science to an intermediate degree. It is as if the student, with certain unknown and unidentified needs, comes to the recognized authoritative representative of science, and asks that science expert to assist the student in developing or attaining social homeostasis at a level short of actual association membership. Yet, this involvement would be substantially more than the restoration of physiological balance which the medical physician re-establishes, desirably, for the patient.

These statements seem to suggest that teaching-learning situations for the general education student should offer learning experiences which

will contribute to the student's homeostasis, his social belongingness, or his social integration, as a means of reducing the effect of societal non-integrating or disintegrating "forces". If this be so, then, the science expert must certainly utilize consistent and non-contradictory criteria on the basis of which to include or exclude subject matter. Material must be selected for inclusion or exclusion on the basis of the expert's judgment as to its contribution "to the student's concept of himself or of the living world--at that level of organization of life phenomena with which the students will deal as men and citizens".[4] It would seem that this criterion refers to the level of life phenomena at which student social homeostasis might be reached.

Apparently, from what has been said about the role of the expert in the teaching-learning situation, a significant integration of objectives of the student and the science expert is implied. If student objectives do not concentrate upon attainment of membership in the science association, then the objectives which do exist must be searched out and identified. This is necessary so that they may be fused, properly, with those of the science expert, who is serving in the role of an adult member of society. Therefore, the latter is responsible for seeing to it that certain concepts of the science field are brought to the student's attention, since these concepts are contributing elements to the student's social homeostasis and are indispensable to the development of social intelligence.

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4 Joseph J. Schwab, "Deriving the Objectives and Content of the College Curriculum: The Natural Sciences", The Proceedings of the Institute for Administrative Officers of Higher Education. (Chicago: The University of Chicago Press, 1941), p. 19.

It would seem, also, that the expert must help the student feel that he is an indivual. This is important in mass education situations which have a potential for fatal impersonality, especially if the "traditional" solution to the educational task is resorted to. Students need an opportunity to express their opinions freely, to feel that their opinions carry some weight, and to feel that there are some things which they are able to decide. Commonly, the expert in traditional educational situations has been taken to be isolated and remote from the student. Such situations tended to make the expert impatient of individual student problems of study, understanding, and the like. Out of this impatience the authority relationship has fostered a feeling of superiority and dictation for the expert. With dictation and exclusive function of authority, the expert is in a position to deny democracy in the classroom situations. However, it would seem that the expert in general education can least afford such impatience, irresponsibility, or dictation if his role is one which contributes to the student's social homeostasis and development of social intelligence. This concept of the democracy of the teaching-learning situation will be taken up again in the third section of this chapter.

The expert in general education, who accepts the concept of interest implicit in experimental philosophy and who accepts the sociality of nature as being involved in the emergence of significant symbols as mind, will accept the responsibility of making the classroom as social as possible and as nearly democratic[5] in structure as is possible. This he

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5 Cf., pp.102-106,Chapter V.

will do because he will consider the student as an individual in a group. He will recognize that the student is seeking only general involvement in the field of expertness which he represents. Also, he will recognize that this can help the student to formulate, personally, a more integrated philosophy or outlook which will guide the student's performance as a participant in social conflicts.

CHARACTER AND RESPONSIBILITY OF THE LEARNER

Above all other considerations, it is maintained in this study that the learner in the general education program is not an apprentice for membership in the science association. This position questions the practice of educating, primarily, for the few who take a second, third, or fourth advanced course in a field.

It has been stated that the ethical devotion to a democratic way of life unifies all that may be proposed for educational philosophy, psychology, and methodology.[6] It is commonly felt in this country that the democratic way of life will permit the fullest development of all propensities which allow the human species to be human. To cultivate such a way of life makes the most profound demands upon the moral character of all people. If this democratic way of life is the goal, then, a good educational program must develop the kind of people who have traits, qualities, and abilities of desirable democratic character. Therefore, discussion of the learner who takes part in a general education program

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6 Raup, op. cit. An argument similar to that of this section may be found in Chapter XIII.

will center around considerations of (1) character and (2) responsibilities. By definition, the character that is required by a democratic way of living is one which is integral, socialized, and objective. The responsibilities of the learner will be those of a person with individuality who also is capable of functioning as an intimate member of a group.

Division, compartmentalization, confusion, and conflict in personal and societal outlook have been emphasized already. Also, mention has been made of the recognized need to tie man's knowledge into closer knit units. This has been done to point up the widespread search for "integration" as a reaction to the "diseased" status of society. This same idea of integration is involved in the statement that the character of the learner should be integral. All too often individuals think in fixed and rigid patterns. These patterns seem highly inadequate for an individual in a general education program.

Too often the individual takes on a stubbornness in devotion to an ideal or purpose or policy. To such an individual only one way is considered right and all others are considered wrong. However, there is a proper alternative to rigid thinking. The alternative is two-fold. It involves an ability to hold to a conviction strongly and effectively for the direction of conduct. Secondly, the individual should entertain other constructions and employ patterns of thought which allow for remaking convictions when the situations and understanding of the individual indicate desirability of such change. Thus, the character of the learner will have integrity when the individual is confidently strong in his ability to function in the deliberate expansion and reconstruction of

his own previous loyalties. Therefore, integration and integrity of personal character are deeply involved in the method of the educative process. This is especially so when individuals are lead to reconstruct their objects of loyalty and devotion, i.e., purposes, ideals, sustained strategies, policies, and the like.

However, the character of the learner should be more than integral. The learner should believe in the ideal tradition of America that integrity is obtained and kept through sustained opportunity for self-determination.

> But integration is also a problem of socialization. A character cannot be adequately integral if it is molded completely by social conditioning from the outside. Social conditioning is a part of the development of every character. Every character represents some sort of internalization in the individual of the common beliefs, values, and ways of life represented by the social context in which the character is nurtured. But ... . Integration in the individual must take place in interaction with the demands of society when often these are such as to exceed his readiness to adapt.[7]

This means that attainment of personal integration should always take place in a situation with two foci--the individual and the social group.

It would be very hard to imagine an integrated society made up of individuals who were not themselves integrated. Conversely, it would seem impossible to attain integrity in individuals if the social milieu were one of complete disintegration. This should make it clear that integration of the personal character of students in general education has two very definite poles, the individual and the social. If experts in the general education program intend to promote individual integration

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7 Ibid., pp. 258-259.

then they must see to it that the program serves both centers or poles effectively. This means that the general student cannot be schooled in imagination to live outside his community conditions. On the contrary, the individual student's relations with these community conditions must be incorporated within whatever degree of integrity the individual attains. Therefore, the educational task which is set for the expert in general education is to work toward an ideal of integration of the individual student, as he is, with the community conditions, as they are.

However, individual integration should be socially planned. This contrasts with the current emphasis. Usually integration has been interpreted only as deliberate planning for one of the two foci, the individual. In other words, the necessity for planning to promote integration at the focus of the social community has not been stressed, possibly because of an assumption that the individual focus is the only possible and necessary one.

> This is a crippling assumption, for the two integrations cannot ever be wholly identified. The individual is of the community but always a unique organization of experience, and, as such, is more than the common experiences of the community. Similarly the community is of its individuals, but its integrity incorporates them only in what they do have in common with the other members, not in their uniqueness.[8]

Therefore, general education instructors should recognize that their program will successfully enhance individual student integrity only if both foci are deliberately cultivated. One might say that any extreme attention to the individual seems nearly as inadequate in the long run as

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8 Ibid., p. 261.

the totalitarian extreme of giving exclusive attention to the group, the state. Of course, the expert in general education and the student alike must realize that the process of integration is never finished, but is an on-going process throughout the lifetime of the individual.

Implicit in this discussion of the nature of the general learner is the problem of objectification during the continual process of personal-social integration. This objectification is the third aspect of the character of the learner in general education. It is a method which facilitates and controls judgments wherein human values inhere. The term objective is used in the sense of describing a process which makes the character of the individual student an object of examination and revision by the student for himself. This process must include a high degree of self-objectivity.

> The individual must be objective not only with respect to his basic loyalties and commitments but also with respect to the human-relations skills and understandings which he uses as a member of the community. Individuals, quite aware of their beliefs and personal commitments and willing to bring these elements of their personal structures into the area of public deliberation, are frequently insensitive to their conceptions and skills of the interpersonal relations. Not infrequently these same persons find it difficult to look objectively at the way in which they work with others. As a result, the objectivity they possess regarding their ideals and beliefs is often dissipated in unhealthy personal relations in the very community in which they seek reorientation.
>
> This links again with the demand upon the character for its socialization. It is the presence of community orientations differing from that of the judger's own which does induce the judger to objectify his character in an effort to clarify the difference. The character that is ready for adequate participation in practical deliberations is the one that has the habits, the abilities, and the sensitive disposition required for this function of self-objectification.[9]

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9 Ibid., p. 264.

Thus, the character of the learner in the general education program is desirably typified by integration, socialization, and objectification.

Beyond this, however, the learner has a two-fold responsibility, at least, in the general education program. Not only is the student responsible to himself to develop his own individuality, but there is also the responsibility of membership in the group. Much of the discussion on the integrity of the learner covered degrees of individuality which is part of the responsibility of the student. The student is responsible to maintain an open outlook concerning the way in which he thinks things should be done. The effort at counter-balancing the tendency toward fixity of opinions and outlooks is definitely the task of the individual.

The aspect of the learner's character which was termed objectivity is another part of the individual's responsibility to himself. The learner has the job of examining his willingness to be present in the teaching-learning situation. The learner is responsible for inspecting his willingness to meet the required work of the learning activities presented for his experience. He also must be objective about his responsibility for completing assignment and study commitments. All these are essentially individual bases of responsibility.

Besides responsibility of the learner to himself as an individual, there are related responsibilities of the learner to the group or other members of the group. In Chapter V, the importance of group method in the educative process was brought out. This method is concerned with student participation, involvement, and concern. The importance of this method to a properly functioning general education program is based on two previously defined concepts, i.e., the idea of mind emerging most

effectively in a group and the interpretation of character incorporating socialization. For example, through group activity, both student suggestions as well as those of the instructor may be taken into consideration by the entire group. Cooperative planning of the course or program of study and its accompanying activities may thus become a part of the nature of the learner. In another respect, the aspect of character which involves socialization of the learner depends upon the learner accepting a responsibility to other members of the class. Only by each student accepting his own responsibility to other students would it be possible for the social center of integration to become a part of the learning situation. Only in the mutual acceptance of responsibilities would each student be able to hear orientations which might differ from his own.

By means of such cooperative action in a group of learners in general education, it will be possible to develop convictions on the part of each student. Also, through such means the value of cooperative effort itself may be made plain to general students. Through such a process democratic ideals and common values may be acquired by individuals as a result of the conjoint process of socializing and objectifying their own characters.

This entire section seems to keynote once again that students in such teaching-learning situations are not apprentices to science association membership. These students are apprentices to citizenship in a democratically structured society. Therefore, the student who participates in a general education program will be a dynamic hybrid of expert-patient-subject-field. The character and responsibility of the learner described here may lead to some modification of the existent confusion

that surrounds the myriad professional associations in today's complex, industrialized society. It would seem that one possible outcome would be a clearer understanding of the role of professional associations, and a recognition that they do not represent interests which are sufficiently broad or inclusive as to represent the totality of an individual's needs and wants. It is possible to assume that integration of character, socialization of character, and objectification of character will make it possible for the learner to understand better the myriad patterns of allegiances and specific objectives which are served by the professional associations. It may be possible to modify the outlook of the learner toward specialism.

Out of this section have come some directions for choosing the kinds of situations in which these traits of character and responsibility may be developed best. Therefore, the following section will discuss these directions for a revised natural science course in a democratic, general education program.

NATURE OF THE LEARNING SITUATION

The need for teaching that emphasizes a common core of essentials was treated in Chapter II. In Chapter III, the process of education was described as one whereby youth acquired desirable learnings which profited them as members of the adult society. In Chapter IV, the common traditional solution to the task of formal education was described as withdrawal from the social process which is society. All in all, these statements emphasize the central educational problem of today.

The central educational problem is the development of the kind of characters in people which will permit realization of democratic living. It was stated, in the previous section, that the character of the learner should be integral, socialized, and objective. How are characters of this type attained? Starting from experimental philosophy and psychology, one must conclude that people will develop this sort of character precisely by using methods which call for the disciplined use of democratic characters. This conclusion seems to demand the utilization of information for development of social intelligence. Also, the conclusion brings attention once again to the psychological concept of transfer of training or transfer of learning. In the treatment of this concept in Chapter V, it was stated that the worth of school learnings should be proved and substantiated according to the degree to which they actually merge with the social environment of youth. Therefore, it seems logical to inspect some further criteria for selecting situations which might influence development of the character of the learner in a general education program.[10]

There probably is no panacea for the difficulty of choosing situations which contribute to the development of democratic characters which are integral, socialized, and objective. Probably no one answer could be completely adequate. However, it may be possible to form a set of criteria which might be employed in the selection process. The choice of educational situations might be based on the following: (1) the

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10 Ibid., a similar set of criteria for selection may be found in Chapter XIV.

situation must demand inspection of value orientations, (2) the situation must stimulate personal commitments, and (3) the situation must demand extension of pertinent factual understandings.

An individual must be able to deal in a satisfactory manner with problems of today's society. Such an ability must be developed by way of situations wherein the disintegration of common value orientations becomes a conscious problem for student study and deliberation. Thus, the educative process must not be withdrawn from the social process. Incidental student examination of personal values is not sufficient.

Now, conditions within and without the nation make it pure blindness to assume democracy or take for granted the ethical orientation of democracy. Some mention of this need was made in Chapter II. However, keen realization of this need will spur attention of all to the long concentration of formalized education upon the "neutral" pursuit of indicative, informative knowledge and instruction. This instruction has not given the products of the educative process the facts or the methods of deliberation that would be functional in the confusion and indecision of today's society.

> Some schools may have taught their members about such conflict situations, but few have attempted to teach their students to judge in them, to further their resolution and the attainment of a new community. This latter is the situation in which, ... genuine socialization goes on, and (one) is forced to conclude that education has shied off from it. Judgmental characters are rarely being deliberately and adequately socialized through our organized education.[11]

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11 Ibid., p. 269.

It might be said, then, that this first criterion for selection of teaching-learning situations is calculated to assure that the character of the learner becomes oriented to social values.

A second criterion relates to the other side of character integration of the learner. This criterion requires that the situation call for some degree of personal commitment. This kind of situation arises as a result of the expression of differing and contrasting social opinions in the teaching-learning situation. The learner, in thus judging the challenge of the opinions of others, weaves the pattern of his own integrity and hence contributes to the formulation of his own philosophy of life and manner of conducting his life. This urge toward integrity was given considerable stress in the previous section. An important step in a formal educational process which would assist formation of integrity would be the choice of an educational situation in which it can grow and be strengthened.

Such a situation suited for the development of personal integrity should afford many opportunities for the character of the learner to be objectified to the learner. Mention has been made already of the development of blind inflexibility of character. Prevention of such pathological reactions may be gained through the kind of behavior the learner acquires when confronted with orientations which differ from his own. Of course, according to this criterion, it is imperative that the learner should work out some design for himself to meet the events which he cannot control and also meet the claims of many associations. It would seem that no educational scheme could be adequate for the development

of character for democratic living unless provision is made generously for situations in which the learner is challenged to personal commitments.

> Only when the situation elicits thought that commits the person to a course of conduct, to a course of action where social-moral consequences are confronted as imminent and inevitable, does it really tend to call the whole person into focus and to produce a setting in which the inclusive orientation of his character becomes amply an object of study and reconstruction.[12]

A third criterion for choosing an educational situation must be applied in sensitive relation with the other two criteria.

> Disciplines and techniques in surveying 'the facts' and in determining the uniform relationships in physical and in human nature--cause-effect, means-end, act-consequence, trends and probabilities--have attained a high degree of exactness in our culture, and their pursuit has been rightly honored.
>
> But there is another discipline which we have not learned, and other techniques are still seriously underdeveloped, namely, the discipline and techniques connected with maintaining a close relationship between the fact-finding function and the determination of the ends and purposes which the facts might and should serve.[13]

This statement seems to indicate that all the various moods or aspects of character of the learner must become interrelated. It is not satisfactory to have emphasis alone in the description of the state of affairs and the establishment of facts. It is also feasible that concurrent with this practice there must be (1) expression of what should be as far as a desired state of affairs is concerned, (2) habitual contemplation and searching for perspective, and (3) satisfaction of felt needs which demand action. No division of labor in education can be allowed to preclude the intimate interdependence of these intellectual functions.

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12 Ibid., p. 270.

13 Ibid., p. 272.

It is probably true that all these functions require some detachment from the shaping of practical policies and decisions. Yet, one must

> ... hasten to insist that the prevailing custom of conceiving and running the educational program in an amoral atmosphere of pseudo-neutrality and in a normatively indifferent fragmentation of human understanding serves to defeat the discipline of the most important functions of man's intelligence. It literally prevents the cultivation of wisdom in private and public decisions, choices, policy-making, and planning--the heart of the democratic process.[14]

With the employment of these three criteria for selection of an educational situation it would seem that some of the suggestions about the educative process which were mentioned in previous chapters are borne out. Limitations resulting from present educational policies, which isolate students from one another and from the teacher who stands before them as an authority, would seem to be greatly modified within educational situations which these criteria would suggest for selection. Also, the requirement for a social situation, in which gradual emergence of mind of the learner may occur, is met by these criteria. Likewise, the opportunity for real interaction in the learning process is possible. This activity would be directed toward acquisition of new meanings that give new direction and control to behavior.[15]

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14 Ibid., p. 273.

15 Ibid. However, the activity in these teaching-learning situations would be organized so as to anticipate problems of discipline. The "activities" curriculum of the so-called progressive educators has been plagued with a discipline problem. However, this movement has never seemed to be properly socialized. "Its range of human discipline always seemed to leave something to be desired. ...the clue to this weakness is found, first, in the concentration of attention too exclusively upon the individual focus of socialization and the consequent neglect of the community as the focus. ... The second clue to this failure of the activities movement to command sufficient confidence in itself as a socializing discipline is taken from the amazing persistence of the claim made by the subject matter to be the heart of the program." pp. 277-278.

This kind of activity in learning situations would seem to lead to involvement of attitudinal patterns and practice of democratic methods. In Chapter V, the need for approaches to attitude formation and utilization of the democratic method was mentioned repeatedly. Also, the similarity of the democratic method and the scientific method was pointed out. In that chapter, it was concluded that participation in a joint activity was the chief way of forming a socially-centered attitude or disposition toward other people. Also, in Chapter II, democracy was interpreted as a social system which provided the means or method of resolving disputed and uncertain situations. The chief aim of that system was interpreted to be the development of understandings, abilities, loyalties, and devotions which were formed in harmony with an inclusive ideal of uncoerced and active community of persuasion. These activities on the part of the individual learner in a group seem to be possible in the kind of situations which the above criteria would cause to be selected. Out of this type of activity, it would seem logical that an awareness of new perspectives, the integrating of these perspectives into a new hypothesis, the differentiation of this hypothesis into its details of implication, and finally, the integrating of these details into a total social pattern which might be used as a guide to conduct of one's life could emerge.

A final consideration of the nature of learning situations, which should be part of the general education program, is the problem of validation of objectives and evaluation of behavior. This question of validation and evaluation is only too often left unexamined by those

selecting educational situations, or left to the very last for consideration. Programs of evaluation are important in shaping student attitude toward situations in which they are expected to learn. Consequently, evaluation procedures ought not be afterthoughts. Rather, they should be integral and vital portions of the educational activities involved in teaching-learning situations. Based on the cooperative interpretations which have been presented in this chapter, it might be understood that validating and evaluating activity should include both student and instructor aspects or considerations. Accomplishment of student objectives is just as important in a general education program as accomplishment of objectives which might be formulated by the instructor or other adult members of the educational scene.

On the basis of the description of the learner's character and interpretation of criteria which may be used for selecting learning situations, it should also be understood that the validating and evaluating process would involve self-evaluation as well as instructor made evaluative instruments. The process of self-evaluation would seem to be an integral part of an educational program devoted to development of democratic character. Also, by such a method a greater insight into individual or personal study habits and thinking patterns would seem to be possible.

All in all, the problem of validation of objectives and evaluation of the outcome of educational activity must be interpreted as an on-going process throughout the entire life of an individual. Evaluation is not terminated at the close of formal education. This means that validating and evaluating projects must be carried out within the confines of the

the educational institutions and also through the entire community. Longitudinal studies of considerable duration will be necessary. Such studies would show that values gained from teaching-learning situations selected by the above criteria emerge as the individual learner matures and develops into adult membership in the complex relations of today's society.

This interpretation calls for considerable modification of the evaluation program common in formal educational institutions which places so much emphasis upon end-gaining. Emphasis upon end-gaining has so greatly influenced the educational scene, today, that students almost completely lose sight of the means by which they learn. Many fail to recognize the lasting value which such means may have for them as continual learners throughout the entire span of their lives.[16]

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16 See the following for validation and evaluation procedures and practices:

Committee on the Cooperative Study in General Education, Cooperation in General Education. (Washington: American Council on Education, 1947).

Committee on Educational Research, The Effective General College Curriculum as Revealed by Examination. (Minneapolis: The University of Minnesota Press, 1947).

C. Robert Pace, They Went to College. (Minneapolis: The University of Minnesota Press, 1941).

National Society for the Study of Education, General Education. Fifty-First Yearbook, Part I. (Chicago: The University of Chicago Press, 1952).

Present and Former Members of the Faculty, The Idea and Practice of General Education. (Chicago: The University of Chicago Press, 1950).

Ivol Spafford, Building a Curriculum for General Education. (Minneapolis: The University of Minnesota Press, 1943).

Cornelia T. Williams, These We Teach. (Minneapolis: The University of Minnesota Press, 1943).

NATURE OF THE FIELD

In general terms, the field is the means or vehicle through which the expert, the learner, and the methods of the teaching-learning situations function. The science field, along with its social implications and involvements, is a means whereby the learner is inducted into part of the social matrix of today's industrialized society. Based on the general function of education in society, it has been reasoned that the science field represents a specific body of information. This information could be employed by the science expert to mediate to the student specific portions of the cultural heritage into which he is being inducted as a potential member of society. Of course, the general education student is not an apprentice to membership in the science association. Yet, he is involved to a degree sufficient to gain some understanding about the role of the association as part of the societal complex. Today, it is becoming more and more apparent that the individual citizen should be able to communicate intelligently with men who are advancing science work and applying it. One of the stumbling blocks for the inexperienced person who attempts to evaluate proposals made by scientific experts is that person's ignorance of the way such experts think and talk. Consequently, the field of science in a general education program would occupy a middle ground as implied in discussing the exercise of expert authority.

In general, the social fundamentals of science are of paramount importance. These are the essentials of a science course in general education. Science material will be humanized to the extent to which it

connects with the common interests of men. Such a curriculum would include social relationships. The curriculum would present relevant problems about which observations and information might be worked out in a group process devised to develop social insight and interest. It would seem logical that the science field in general education would attempt to build student understanding of economic as well as social impacts of concepts and propositions of the larger science field. Such an attempt to get at social and economic impacts of the broader science field might contribute to realization of the hope as Eurich[17] saw it that students, who are products of general education, will be more capable of handling and possibly solving some of the social problems that face man today.

Specifically, an alternative to the customary fact-finding emphasis in science would involve greater use of social-ethical-moral generalizations. The effectiveness of these generalizations may be increased through systematic development of their interrelationships with the fact-finding tendencies of professional associations. The desirability of doing this may be taken from the everpresent urge among all peoples to establish systematic harmony among moral principles. In these times of social confusion and indecision people in this country need to cultivate a practice of moral principles and need to develop more ethical character.

> In a world that is striving to achieve and to maintain orderly relations among people and nations, it is desirable, if not essential, that the varying and often similar moral systems of different peoples become a part of the normative study of a program of mass education. Indeed, it is doubtful that the

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17 Cf., p. 22 of Chapter II.

> principles of any other moral system can be understood adequately without comparing and contrasting them with the principles of other ideologies. As long as the moral ideals of various peoples are growing and developing, there is hope that by deliberate effort all of these systems might converge upon a set of social norms to which all peoples can and will subscribe. There are few things more essential to the peace of the world than a common social-moral orientation in terms of which men can perceive a common social reality. Unless from the depths of their moral characters men can perceive the social world somewhat alike, public consensus on a world scale is impossible. In the absence of such a consensus, peace will always be flimsy and fleeting in tenure.[18]

Such an attempt to fuse social-moral principles with the commonly adopted fact-finding tendency of educational practices seems in keeping with an education which centers around learning situations where policies are made-that is policies that guide decisions of conduct of the learner's life.

What does such a proposal do to the field content of a natural science course in general education? Such a proposal provides an integrative basis for the functioning of the science expert, the learner searching for a middle ground in the science field, and the kinds of teaching-learning situations which may be developed according to criteria worked out in this chapter. It has been pointed out in the beginning of this study that the church long ago carried out a social function of teaching the beliefs and values which should be accepted and respected. Today, the state is responsible for education on all levels of government--national, state, county, town, and village. Therefore, it would seem that a natural science course, which has a field infused with social-ethical-moral principles as well as factual content of strictly scientific concepts and principles,

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18 Raup, op. cit., p. 281.

might very well be expected to meet the exigencies of present day conditions involved in the substitution of secular teaching for sectarian training.

This last section has raised questions relevant to selected situations and potential subject matter content in the field of natural science which might be applicable to the kind of teaching-learning requirements set down in this chapter. Therefore, for more explicit expression of appropriate areas of content for natural science, the next chapter will complete this study with a general outline of the natural science field in general education at the college level.

CHAPTER VII

CHAPTER VII

OBJECTIVES AND FIELD OF NATURAL SCIENCE IN A COLLEGE GENERAL EDUCATION PROGRAM

Throughout this study, repeated references have been made to the subject matter of a natural science course in general education. This chapter will give particular attention to such subject matter. In so doing, an answer to the fifth corollary question of this study will be developed. The discussion will be presented in two sections, (1) comments on objectives of general education and a science course in such a program, and (2) a general outline of appropriate natural science subject matter. Some objectives of general education which were introduced in Chapter II will be reviewed briefly in the first section. In the second section, discussion will center around fusion of ideal and identified existent conditions into a program of action which is more than a compromise, but a real synthesis for forging the ideal into reality. Therefore, the answer to the corollary question about selection of subject matter for general education natural science will be based on philosophical and psychological interpretations derived from examination of other corollary questions.

As implied in the last section of the previous chapter, natural science in general education would develop a middle ground in the professional field. The course would not dwell on specifics which might be required of an apprentice for association membership. On the contrary, broad generalizations in the field of science, with which ordinary citizens

should be conversant, would comprise the course content. This means selection of science material which is useful in social situations. Furthermore, the material would be organized at the same level at which students would use information as members of society. Therefore, in general, the purpose of the natural science course in general education would be: To assist students in utilizing specific knowledge of the natural sciences to increase their understanding of human behavior.

COMMENTS ON GENERAL EDUCATION OBJECTIVES

Numerous objectives for general education and for courses within a general education framework have been listed. Some reference to these was made in the second chapter. A specific list of objectives was included there which was taken from the report of the President's Commission on Higher Education.[1] It is easy to note that the terminology of those objectives is rather general. Also, those objectives were derived by a commission of experts as a guide for the formulation of an entire general education program. It follows, therefore, that specially trained teachers are responsible for going beyond this beginning point in planning and developing any course in general education. This interpretation applies to those who are interested in formulating a course in natural science for general education.

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1 President's Commission on Higher Education, Higher Education for American Democracy. (New York: Harper and Brothers, 1947), Vol. I, pp. 50-58.

There are several interpretations of objectives for science in general education which are more specific than those of the President's Commission. One list of specific objectives prepared by the Science Committee of the Evaluation Study of the American Council on Education is as follows:

> To develop in the students:
> 1. Knowledge of facts, laws and principles in the body of subject matter studied.
> 2. Ability to apply the science knowledge he possesses to new problems and situations.
> 3. Ability to analyze scientific data summarized in maps, tables, curves, charts, graphs.
> 4. Ability to recognize the need for additional scientific knowledge in a new situation, and the ability to acquire it.
> 5. Understanding of the point of view with which a scientist approaches his problems, and the kinds of things that he does.
> 6. Ability to read and evaluate popular writing on scientific developments.
> 7. Willingness to face facts, to revise judgments and to change behavior in the light of appropriate evidence.
> 8. Understanding of the role--development, importance and limitations--of science in the modern world.[2]

This list was presented at a conference on general education. It was offered as a partial answer to the request for a more specific spelling out of one broad objective:

> To understand the common phenomena in one's physical environment, to apply habits of scientific thought to both personal and civic problems, and to appreciate the implications of scientific discoveries for human welfare.[3]

However, these objectives seem to concentrate on the fact-finding tendencies of modern man. It seems that no major provision is made for contribution

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2 Robert D. Miller, editor, General Education at Mid-Century. (Tallahassee: Florida State University, 1950), pp. 133-134.

3 President's Commission, op. cit., p. 52.

of natural science classwork to development of the kind of character in the learner which has been discussed before. In short, there seems to be little planning for the character of the learner to be integral, socialized, and objective in the type of classwork which probably would be selected for implementing these eight objectives.

Another interpretation of science objectives in general education may be found in the report of a Workshop in Science in General Education. The following objectives were offered for clarifying the field of science in a general education program:

1. To acquaint the student with the scientific habit of thought and to encourage his using it in attacking problems of everyday living;
2. To give an understanding and appreciation of the development of science as one of man's great intellectual and cultural achievements;
3. To impart sufficient knowledge of man's physical and biological environment to enable the student to function intelligently in relation to it;
4. To disclose the impact of science and technology on contemporary life and to interpret some of the social problems that arise from it.[4]

These objectives are broad, also, but they might be interpreted as leading to teaching-learning situations which might be conducive to character development as it was described in the previous chapter. This conclusion is made because the report of the conference indicated that, in addition to key concepts of science, acquisition of scientific habits of thought, and familiarity with some of the history and philosophy of science, the general student must become aware of the effect of science upon daily

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4 I. Bernard Cohen and Fletcher G. Watson, editors, General Education in Science. (Cambridge: Harvard University Press, 1952), pp. 154-155.

living and aware of social problems which demand scientific knowledge for solution.[5]

Nevertheless, it is maintained that functional and operational relationships between general objectives or science objectives in general education and the broad areas of the field of natural science have been missed. Therefore, one functional and operational method of denoting relationships of these objectives to a natural science course will be proposed now. This method approaches the problem of implementing objectives by way of an intermediate step which compares some patterns of human behavioral phenomena to some of the listed objectives of the President's Commission.

It is suggested that, in cooperative teaching-learning situations like those described in the previous chapter, general students and a science instructor will be able to formulate a list of general and specific patterns of behavior of human beings. This list would be composed

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5 Ibid., pp. 152-154. Also, included in the report of this conference, is mention of social forces that are operative in man's societal relationships which interact and condition the development of culture. Mentioned first were forces that tend to preserve the habits, attitudes, and skills which either custom or utility has fitted into the pattern of life. On the other hand, there are forces that replace old ways of doing things. The latter put more rational or intelligible concepts in place of traditional concepts. At one time in man's cultural evolution these two kinds of forces were nearly balanced; but, today, the forces of cultural conservation are practically overcome by new surges of innovations which add stress and strain to the social structure. A preponderant role in these surges of innovations is played by scientific workers of today's technological culture. Because of this there is a growing interest in teaching science. That interest is reflected in the four objectives.

The following social-scientific problems were suggested: 1. Integration of racial and cultural minorities into a democratic society, 2. Scientific secrets and national defense, 3. Exploration of nuclear energy, 4. Scientific manpower and defense, 5. Conservation of mineral resources, and 6. Conservation of agricultural resources. pp. 161-164.

of important, ubiquitous phases of human behavior, and would include: (1) the tendencies of all men to think, develop a language, and communicate; (2) the tendencies of all men to recognize group action and identify natural laws; (3) the tendencies of all men to live in a social unit and maintain a means of livelihood, and (4) the tendencies of all men to explain unknowns and develop codes of behavior and value systems into a philosophy of life. Then, with judicious direction by the instructor, it would be possible to guide students to see that these activities of all men are directly related to objectives of general education.

In detail, the activities of man which may be included under the heading mental activity, i.e., thinking, inferring, questioning, inquiring, abstracting may be related to the objectives dealing with understanding the ideas of others along with effective expression of one's own ideas, and applying scientific attitudes and methods.

Secondly, the activities of conservation of natural and human resources, the study of group interactions, and the search for socio-scientific laws which explain events may be related to the objective of recognizing interdependencies of people and the need for cooperation.

Thirdly, the activities of living in social units of a family, clan, tribe, and the like may be related to the objectives of maintaining and improving health, and acquiring knowledge and attitudes necessary for participating in a satisfying family group.

Lastly, the activities explaining unknowns and developing codes of behavior and value systems into a philosophy of life may be related to

the objectives of attaining satisfactory emotional and social adjustment, and developing a code of behavior based on ethical principles consistent with democratic ideals.

Thus, the objectives of general education may be operationally defined. Students and instructor may derive a fuller meaning from the general terminology of the stated objectives. Also, by relating objectives to human behavior, the students may fuse such objectives with their own objectives. Then, in turn, these relationships would be utilized in social teaching-learning situations to relate the tendencies of all men to areas of natural science. This would permit cooperative selection of pertinent subject matter which should be studied in order to more fully understand human behavior. By making these further comparisons, this functional and operational method of interpreting general and specific objectives would be extended to involve scientific concepts and propositions.[6] Through this method objectives are made operational by comparison with ubiquitous tendencies of all men. Also, the selected subject matter content of natural science is likewise made functional due to its relevance to the described tendencies.

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6 As denoted, these relationships are in keeping with the outlook of experimental philosophy discussed in Chapter V. It was pointed out there that the worth of school learnings is proved and substantiated according to the degree to which they are actually confluent with the social environment of youth participating in learning activities. This was proposed as a criterion for correcting the isolation of formal educational institutions. For then, if experiences of education are set in a matrix which has great similarity to out-of-school activities of the learner, it is interpreted by the experimental philosopher that the potential for transfer is at a maximum. By presenting and handling school learnings so as to provide the greatest enhancement for transfer to social situations, formal educational institutions are conceived as fulfilling the role of mediating agents between youth of new generations and the habits, attitudes, mores, and so forth of the community into which they are being inducted.

APPROPRIATE NATURAL SCIENCE FIELD

This section presents a general outline of the subject field for natural science, but not a complete prescription. The discussion is derived from all the arguments developed in the six previous chapters. It is based upon relationships between formalized educational activity and utilization of socially significant essentials. These relationships are intended to contribute to that very desirable outcome of formalized educational activity, namely, transfer of school learnings to social situations in which youth find themselves. It has been stated that the schools in today's industrialized society mediate between youth and the "community". Therefore, it seems logical to find in societal activities a basis for an answer as to what subject matter should be a part of teaching-learning situations.

A study from the scientific viewpoint of the social process and human behavior comprises the appropriate subject field of natural science in a college general education program. This means that the real subject field of natural science will have group and individual foci of activities. The group efforts will include teacher-student planned experiences in the socializing process of discussion and other cooperative democratic activities for the extension of facts through study of social-scientific problems. This is supported by the discussion in Chapter V. The points of emphasis for the individual will include responsibilities, value orientations, self-objectification, personal integrity, and personal commitment. This is supported by discussion in Chapter VI. In other

words, the subject field that derives from previous chapter discussions is concentrated in study of phases of human behavior in the social process without the traditional limitations of subject matter specifics. In such a program the pedagogical emphasis is upon method. That method has both group and individual foci of integration. It is this emphasis on method in teaching-learning situations, which are selected according to criteria presented in Chapter VI, that will provide students with practice for direct action in their present social environments.

To facilitate discussion, the phases of human behavioral patterns in the social process may be grouped as suggested in the previous section. The four identified groups of behavioral patterns that correlated directly with general education objectives are: mental activity, socio-scientific laws, maintenance of life, and scientific philosophy.[7] By placing emphasis upon study of these groups of human behavioral tendencies, a means is

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7 It is suggested also that four departments could be planned which would cover to some degree all four groups of human behavioral tendencies, but with special concentration given to several areas or sub-areas in any one particular course. This would seem to implement the contributions of a general education program to integration of the individual learner's personal relationships to his environment, and also assure integration of the overall program.

It is suggested that a department of communicative arts would logically put greatest stress upon and be qualified to offer the most expert authority to the learner, searching for a middle ground in general education, in the area of man's tendencies to communicate. A department of social studies would be best prepared to follow through with most emphasis upon the area of conservation of resources and study of man's means of regulating himself and his environment. A department of natural science would concentrate upon maintenance of life, and also provide contributions to the other three areas as the general subject matter specifics of the sciences would allow. A department of humanities would give most emphasis to man's search for a philosophy of life and a code of values which can guide human behavior.

This program could be concentrated in the freshman and sophomore college years or arranged to extend throughout the four years of college.

established for selecting particular subject matter specifics. Specifics to be selected are those which are socially significant essentials, and which contribute to development of understandings, abilities, devotions, loyalties, values, and the like of youth.

For example, the activities of men grouped under the heading of mental activity are fundamental aspects of societal activity which have a definite correlation with scientific concepts and principles about irritability and nervous adjustment to the environment on the part of a living organism. Therefore, it would be quite logical for the study of human behavior in a natural science course to become involved in examination of some of the anatomy of the nervous system, muscles, and the like. Other sub-problems that might come out in studying man's acts of perceiving and adjusting to stimuli are: How does man learn? How does man perceive? What factors affect memory and forgetting? These activities have led to the great fund of knowledge which man possesses concerning his environment and himself. It is this tendency of all men for ideation and learning, a concept which involves the nervous system, which is offered as a logical and psychological beginning for a course to be formulated according to experimental philosophy.

Another aspect of this area involves the study methods which students employ in their formalized educational work. These processes ought to be a focus of their attention. Such objectification of the student's methods of learning will make fundamental contributions to the validity and worth of a natural science course in general education. In this way, the phenomenon of learning and communication should be a very important facet

of the educative process in a natural science course. This statement is based on the contention that awareness of some of the operative components of the complex learning activity and study methods might influence advantageously the academic performance of all youth participating in formalized educational experiences.

In studying the tendencies of men to find socio-scientific laws that explain events, a great opportunity is provided for development of the socialization of the learner. As a result of man's ability to think and have ideas and ask questions, he has come to control his environment and, to a lesser degree possibly, control himself. Man's knowledge of the forms of life and their interrelationships and interdependencies has resulted in control of animal competitors for his benefit.

Through control of parts of his environment, man has become aware of natural laws that apparently govern the physical and biological aspects of his environment. Animal competition and cooperation have been recognized as natural phenomena. As a result of studying these relationships, man has developed ecological concepts and principles of population dynamics. These in turn have led to concepts of societal relations among animals. Therefore, the second area of natural science should develop understandings of these concepts and principles. This area will permit the student to practice long-range extension of fact-finding tendencies by application of these generalizations to human behavior.

Also, this second main area would touch upon the human relations involved in cooperative group activities as extensions of animal ecological principles. Approach to human cooperation and competition would give rise

to discussion of the similarity of scientific methods and democratic activity. This is necessary in a science course if the theoretical commonalities of these two procedural techniques are going to be practiced. By practice of democratic processes in the science classroom (and in other classwork as well), it is conceivable that they may become more general operative forces in American culture.

Pertaining to the third tendency grouping of man's responses and adjustments, the basic social unit and self-maintenance, there are many, many facts concerning an individual's growth and his internal inter-relatedness. These specifics must be selected according to their socially essential nature in helping students understand human behavior.

This area could involve the whole phenomenon of child birth, physiological dependency of the developing young upon the mother, and possibly the inheritance of body characteristics. Films and demonstration materials of almost unlimited amount are available for classroom use to increase the understanding of the learner of the more important features of healthful living from a scientific point of view. Group activity through discussions, panels, and individual reports should provide a means for the learners to objectify to themselves some of their attitudes and dispositions toward human reproduction. This should contribute to individual integrity as well as to the learners' socialization.

The fourth large area of the appropriate subject field for a natural science course in general education would involve the tendency of all men to search for value systems which are internally consistent and which might be guides for daily behavior. The natural science course, which

involves social teaching-learning situations, would contribute to the development of an individual learner's philosophy of life. This would enhance integration of the individual learner with his personal environment.

In science, explanations of the development of various forms of life on the earth and interpretations of changes of the face of the earth are manifestations of this fourth behavioral tendency of man. These explanations have been developed by scientists over the centuries to explain unknowns of the past and give them some relation to the unknowns of the future. These explanations have been promulgated by scientists in keeping with their effort to formulate notions which have operational meaningfulness and predictive value. Discussion of these explanations would logically call for selection of some specifics concerning organic evolution. It can be shown that this all-inclusive scientific theory directly influenced the social structure of the times during which it appeared. It also has affected all subsequent modifications of man's societal arrangements.

Today, data of modern science experts is providing more and more conclusive proof that too much emphasis was put in the nineteenth century upon competition in organic evolution (Darwin[8] himself felt and tried to express this in his own cautious comments). This more complete interpretation of the theory of organic evolution presents a great social opportunity for modern science experts who work directly with general education

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8 Charles Darwin, The Descent of Man. (New York: D. Appleton and Company, 1886). In this volume Darwin strongly emphasized the principle of cooperation.

students. For now there is a basis for demonstrating to the general public some marked similarities between the value systems of societal man, which have been inherited through generations and generations of human beings, and value implications of the findings of scientific endeavor.

This situation places great social responsibility upon modern scientists. Modern scientists, working with general education students in social teaching-learning situations, would be in a position to act as potential ethical leaders in society. They are in a position to extend their special theories and principles to human societal behavior. They are in a position to aid learners in meeting today's social confusion and cultural indecision. Modern science educators, who are capable of recognizing the evolutionary trends toward organization and cooperative mutualism in life forms along with competitive action, would be in a position to contribute to the general learner's understanding of the importance of international consensus of values among all peoples of the world. Also, modern science educators should assist general learners to recognize that there is efficiency in the operation of small groups in a democratically coordinated society where all men may take part in decision and policy making processes.

There are many reasons for the statement that the science educator is a potential ethical leader in society. Essentially, he may implement the ethic which places primary value on the sacredness of truth. His method is inherently democratic as has been mentioned before. He may develop insight into the trends of evolution toward a cooperative as well

as a competitive life. He may acquire the rigor of training and practice in the method of objectifying how to do things and gain ends. He may understand the material evidence today which adds tremendous credence to the prophetic announcements of centuries ago. He may develop a concept of the tremendous "cosmic experiment" which has been continuing on the earth for eons of time. He should be able to recognize that man is on trial in that experiment for adaptability like all other life forms.

Therefore, in final conclusion, a natural science course in general education, like the one just outlined, is a partial answer to the conditions of modern secular education recognized in Chapter II. Throughout such a natural science course the group and individual activities already mentioned would be as important as the subject matter specifics of the sciences selected as aiding student understanding of human behavior. Also, through such a course which encompasses four large areas of human behavior, beliefs and values can be consciously introduced into the educative process, as they had been in Medieval time when religious teaching was paramount in the societies of man. By considering the social process as the appropriate subject field of a natural science course in general education, the teaching-learning situations would actually implement the logical derivatives of experimental philosophy enumerated in Chapter VI. Also, the course outlined is in keeping with the necessary role of science in modern societal culture.

> It (science) is incompatible with a system that breeds a disregard for objective truth or undermines the standard of personal honesty that requires a man to submit unfavorable as well as favorable evidence when he is testing a hypothesis. Science is possible because there are men engaged in it who <u>will not</u> sell out to the

> political boss, who will not falsify reports to support a preconceived notion, who will stay on the job even when the ordinary rewards are denied. Science, then, depends on ethical foundations, the chief of which is the unmercenary love of truth.[9]

Thus, scientific work is compatible with the concept of love[10] and worth and integrity of the individual which have so eternally been part of the value systems that have guided societal man. Thus, the outlined natural science course is concerned with guardianship of the "ways of life" as part of the secular teaching which is now an intended substitute for the sectarian training of man's earlier history.

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9 D. Elton Trueblood, The Predictament of Modern Man. (New York: Harper and Brothers, 1944), p. 41.

10 Ashley Montagu, On Being Human. (New York: Henry Schuman, 1950). He presents the following interpretations of the principle of love: "The biological basis of love consists in the organism's drive to satisfy its basic needs in a manner which causes it to feel secure. Love is security." p. 98. He says that behavior in terms of cooperation, in terms of love, provides the most fundamentally important means by which the socialization of the individual is achieved. "First, through love as a feeling of belongingness (security), and second, through love as authority, the authority of the affectionate tie." p. 94. In a third place, Montagu writes, "Love is an active state which is learned by the infant, and it is a state which is developed in dependency, and that is the pattern of love which is maintained throughout the life of the person." p. 82.

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