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SCIENCE EDUCATION FOR RESPONSIBLE SOCIAL ACTION: A DEVELOPING MODEL

by

Frank W. Clements

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
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APPROVAL PAGE

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This dissertation explores a model of science education for responsible social action, tested in practice through field implementation during a teacher workshop and revised using data and self-reflection. Change was recognized as a basic phenomenon of the universe and schools were offered as logical means for preparing for social change. The intent of this study was to provide a broad framework for science education while at the same time broadening what it entails. Movement from a focus on content to one of preparation for social action is the major objective presented for science education.

This study is both analytical and introspective in that an educational model was developed and altered after analysis and self-reflection. There appears to be an intimate and necessary relation between the action experiences of the model developer and the model itself. An attempt is made to identify and explore those dimensions which might make the model more workable.

The methodology used in dealing with these questions includes library research on society and education leading to the model of science education, a case study involving a workshop with twenty teacher participants to determine strengths and weaknesses of the model, and self-reflection in order to alter and improve the model. The case study

allowed the model to be grounded in reality in order to move from theory into practice and back again. Interaction among the model's components were analyzed from data collected during the workshop. Pre-tests and post-tests were used to determine gains in cognitive growth and moral reasoning among participants. Analysis of workshop results revealed successes in cognitive growth, involvement, moral deliberation, and action as well as recognition of problems in communication, egocentrism and the need to deal with psychological concerns. Both results and problems were considered, but detailed analysis of the problems and interactions of elements were of signal importance. These analysis combined with reflection led to a revised model that was intended to be more comprehensive.

It was pointed out that science education cannot deal only with a body of knowledge. Values cannot be ignored, if only because they will be present inevitably. Science teaching should be aligned with social realities, should allow students to experience science as a cause and a method of dealing with social issues, and should work for scientifically literate persons capable of using what has been learned in acting on the issue.

The initial model of science education led to knowledge gain, reflection, and resolutions of action as well as providing a solid base for a revised model. The revised model of science education appears to have the necessary components to develop competencies in dealing with social issues in science courses.

The dynamic nature of the model is communicated through the presentation of the initial and revised models, the indications of uncertainty, and the reality of struggling on the part of the model developer. Critical thinking, personal involvement, and moral deliberation were required in the development of the model as well as being the three major elements of the model.

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TABLE OF CONTENTS

	Page
APPROVAL PAGE	ii
ACKNOWLEDGMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
CHAPTER	
I. INTRODUCTION TO THE DISSERTATION	1
II. AN INQUIRY INTO SOCIAL AND EDUCATIONAL DILEMMAS	8
Society	9
Science and Technology	11
Education	15
Science Education	21
III. THE INITIAL MODEL	26
Introduction to the Model	36
Critical Thinking	40
Psychological Concerns	42
Moral Deliberation	44
IV. FIELD TEST OF THE INITIAL MODEL	55
Workshop Format	58
Sources of Data	60
Instrumentation	61
Outline of the Workshop	64
Implementation	67
Workshop Results	69
Criteria Used in Evaluating the Model	84
V. TOWARD A MORE COMPREHENSIVE MODEL	86
Major Concerns Deriving from the Workshop	86
Introduction to the Revised Model	98
The Revised Model	102
Commitment to Action and Reflection	126
The Revised Model in Practice	129

Page

CHAPTER

VI. SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS 139

Summary 139
Conclusions 142
Implications 148
Recommendations 150

BIBLIOGRAPHY 153

APPENDIX A Workshop Announcement 158

APPENDIX B Pre-Workshop Test 159

APPENDIX C Post-Workshop Test 161

APPENDIX D Pre-Workshop Moral Stories 163

APPENDIX E Post-Workshop Moral Stories 165

APPENDIX F Questionnaire Resulting from Inquiry into World Hunger Workshop 167

LIST OF TABLES

Table		Page
1.	Levels and Curricular Areas of Participants. .	68
2.	Participants' Attendance	69
3.	A Comparison of Cognitive Knowledge Gain in Participants Who Scored High on Openness and Moral Stages with Participants Who Scored Low on Openness and Moral Stages. .	72
4.	t-Test of Workshop Knowledge Gains	74
5.	Results of Questionnaire	82

LIST OF FIGURES

Figure		Page
1.	Multiple Alternatives Future Concept	26
2.	The Original Model	37
3.	Areas of Competence Required for Responsible Social Action	39
4.	A Model of Science Education for Responsible Social Action	107
5.	A Diagram of Kubie's Analysis of Knowledge . . .	109

CHAPTER I

INTRODUCTION TO THE DISSERTATION

This dissertation explores a model of science education for responsible social action tested in practice through field implementation during a teacher workshop and revised using data and self-reflection. This model was developed for science education, but it later became clear that it held implications for education in general. The intent is to provide a broad framework for science education while at the same time broadening what it entails. Movement from a focus on content to one of preparation for social action is the major objective presented for science education. Harold Shane asks:

> If, as scholars in policies research tell us, the future is malleable, if it resides in the soundness of our data gathering, in the wisdom of our choices, and in the courage of our actions, what is the charge that the future places before our schools?[1]

It appears that the charge is to counter the ominous trends toward doing irreversible damage to the environment and to ourselves. Preparation for responsible social action is needed and the elements required for this action must be identified and explored. To paraphrase Lawrence Kubie:

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[1]Harold G. Shane, The Educational Significance of the Future (Bloomington, Indiana: Phi Delta Kappan, Inc. 1973), p. 30.

Specialized instruction without corresponding emotional and social maturity places the tools for destroying civilization in the hands of the erudite immature.

Science curricula in particular, and curricula in general, tend to ignore the ideological, valuing, and ethical concerns of young people. Today we have a societal value crisis; the traditional certainties are being swept away. Our society needs a public that understands the relationship between freedom and responsibility in a continually changing world. Responsibility is of prime significance to science curricula when dealing with social issues.

In looking at science education one must ask some very hard questions. The first of these is: Can or should science education deal only with the body of knowledge within the discipline, or must it deal with values, commitment and action? "Science has solved many of the mysteries of our existence and enlightened our world, but it has eroded much of the moral certainty without offering means to lead us out of our confusion."[2] The scientist has primarily confined his interests to exploring and interpreting the natural world; he has not had a major interest in managing it for the common good.

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[2]David Purpel and Kevin Ryan, "Moral Education: Where Sages Fear to Tread," Phi Delta Kappan, LVI, June, 1975.

Education is a major vehicle society must use in preparing responsible citizens so that social problems can be overcome. A basic assumption is that curriculum development and implementation focusing upon social issues can be a powerful tool for responsible decision making. The aid is to develop citizens who are prepared to deal with social issues and to strive for harmony with nature and for increased social justice.

A second questions is: What is the relationship between scientific knowledge and moral values? Scientific discoveries leading to technological advancements have helped to precipitate many of the social dilemmas we now face. To deal with these dilemmas, science alone offers only a nebulous relativism. When working with social issues, it is necessary to differentiate between the terms problem and dilemma. In this dissertation, a problem will be defined as a specific difficulty capable of a definable solution. Most of the questions proposed for solution in traditional science classes are single answer situations and would be classified as problems. Dilemmas, on the other hand, are defined as those situations which offer a choice between "equally" desirable or undesirable alternatives. Reconciliation of dilemmas often involves compromise. In working toward a resolution of a moral dilemma the nature and causes must be ascertained and then evaluated on a moral basis. The pervasive belief in value-free scientific knowledge must be altered if major societal dilemmas are to be resolved.

This dissertation is concerned with science education directed toward social action; the relationship between science education and social issues must be explored. The intent is to reconceptualize and broaden the science curriculum to include emphasis on responsible social action through a model that links the best of science with a paradigm for vigorous moral consideration of social dilemmas. This dissertation began with a focus on science but it has evolved into an education model with much broader applications.

A third question then arises: If science is to be taught with emphasis on social issues with moral implications, can an educational model be developed that lends itself to a comprehensive study of the selected issue and to exploration of possible avenues and commitments to its effective resolution? This model requires some degree of commitment to action. In order to effect social change, action must be taken.

In order to accomplish social change, the educational model will require dealing with what one knows, what one values, and who one is. In the model, these elements have been identified as Critical Thinking, Moral Deliberation, and Personal Involvement. Each of the elements is necessary, but none alone is sufficient; each is dependent on the others. The aim of education in the words of Paul F. Brandwein is, ". . . to interpose evidence, reason, and judgment between

desire and action."[3] Positive social action requires background information, well thought-out values, and an adequate self concept.

Primarily, the dissertation will concentrate on the moral deliberation component. Recognizing that it is not enough by itself, the intent is a heuristic study concentrating on moral deliberation guided by values clarification. The works of Kohlberg, Newmann, and Harman are heavily utilized to provide the framework for the development and implementation of the moral deliberation component.

Dissertations are written in a linear fashion, but the reader should realize this study is circular in that the process of implementation resulted in new insights that continued to feed back into the model. This process caused the model to be altered and also provided new bases and different vantage points for evaluationg new experiences. The intent is to develop a workable model of science education that has been tested in a small way; the objective was not to evolve a static model, but rather to evolve a dynamic one that allows for continuing growth and understanding.

The model is not an attempt to increase moral reasoning leading to responsible social action at the expense of valuable factual knowledge. Certainly, factual data must be utlized in making responsible decisions. The goal is to gain in decision making ability without sacrificing needed

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[3]Paul F. Brandwein, Toward a Discipline of Responsible Consent (New York: Harcourt, Brace, and World, Inc., 1969), p. 1.

factual knowledge by using the model as a paradigm for consideration of the social implications of the identified alternatives within an issue.

While this dissertation concentrates on the moral deliberation component of the model, the interactions between the components are of signal importance. For example, moral deliberation without personal awareness and courage cannot lead to the resolution of a social dilemma. Insights emerging from the workshop pertaining to these interactions will be closely scrutinized and will yield understandings vital to the success of the model.

A final question is: How can a model builder communicate what happened in such a way that the dynamic, heuristic nature of the model emerges? This dissertation is both analytical and introspective in that an educational model was developed and altered after analysis and self-refelction. There appears to be an intimate and necessary relation between the action experiences of the model developer and the model itself. The critical element of experience is its quality. I will be seeking to identify and explore the quality based dimensions which help make the model more workable.

The methodology used in dealing with these questions includes library research on society and education leading to the model of education, a workshop with twenty teacher participants to determine strengths and weaknesses of the model, and self-reflection in order to alter and improve the model.

A workshop format was utilized so that the model could be tested and revised. The workshop allowed the model to be grounded in reality in order to move from theory into practice and back again. Interaction among the model's components were better analyzed from participant data collected during the workshop. Pre-tests and post-tests were used to determine gains in cognitive growth and moral reasoning among participants. By combining the results of these tests with analysis and self-reflection, the comprehensiveness of the model could be evaluated.

CHAPTER II

AN INQUIRY INTO SOCIAL AND EDUCATIONAL DILEMMAS

Education should constantly adapt to the needs of society. The needs of the previous decade are not the needs of today. Today a primary need is for an enlightened citizenry capable of making decisions in a world beset by technological and social dilemmas. Society needs to be brought back to its sense of values. The major educational task is to prepare students to cope with an environment characterized by rapid change.

In order to develop an educational model for effectively dealing with social issues, one must be cognizant of the symptoms and identified causes of social dilemmas. This chapter briefly deals with society, science, and education. The intent is to provide an overview of social and educational dilemmas so that a reasonable model of science education can be developed to work toward resolving the identified dilemmas.

Science education, with its opportunities for personal involvement, is ideally suited to produce effective cognitive learning, and, more importantly, to emphasize the vital lessons of the affective domain. This chapter considers the recent shifts in our culture and the changing responsibilities of science education within this culture. It is an attempt

to lay the groundwork on aligning social action with social realities.

I. Society. Our society is locked into old institutional habits and their supporting mythologies, permitting technology and organizational technique to become the central determinants of social change. The definition of reality and progress is determined by the established system, which has become self-perpetuating with the aid of these definitions and the fact that it creates its own goals. Social change has been equated with social progress. Increasingly, people have begun to ask whether or not change is synonomous with progress.

As John L. Lambert wrote in The New Prometheans:

> In emphasizing Promethean skill and neglecting Promethean understanding, we have provided ourselves with more and more instruments of power without increasing our wisdom. Western societies are presently entering a dangerous period of disequilibrium. Our means of creating immediate life or death problems far exceeds our means of solving or even properly describing them. We are daily applying Promethean vigor and enthusiasm to the alteration of our environment, while daily we grow more disillusioned with what seems to be useless, unresponsive institutions and irrelevant, old-fashioned values.[1]

This becomes apparent when one considers pressing dilemmas such as: 1. population growth, affluence growth, and food shortages; 2. the energy crisis and limits to natural resources; and 3. the unequal distribution and usage of resources between the developed and developing

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[1] John L. Lambert, The New Prometheans (New York: Harper and Row, 1973), p. 4.

nations. This country is being shocked into reality by inflation, monetary devaluations, recession, and the possibility of depression. These problems are compounded by the ever-increasing complexity of ethical questions and decisions in medicine, genetics, religion, and philosophy.

Loss of confidence in leadership has occurred with the increasing complexity of problems in government, industry, social institutions, and the military; and individual decision-making competence has never been more crucial. A major societal objective should be responsible social action, and this is contingent upon individual competence in decision-making.

The roots of the crisis in which we find ourselves are deep in the processes that for a long time have been at work in the cultural and economic history of the West. We have been victims not only of faulty planning, but also, in crucial respects, of no humane planning at all.[2] As Michael Harrington remarks in The Accidental Century:

> History, after all, has always been stumbling into new social systems. The industrial revolution and the capitalist economy were neither anticipated or planned, The English in the seventeenth century thought that their upheaval was over theology, the French of the eighteenth that theirs was over philosophy. In retrospect, each event had more to do with the rise of a business civilization than with either God or man . . . . This accidental revolution is the sweeping and unprecedented technolgical transformation of the

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[2]Bayard Rustin, "Minority Groups: Development of the Individual," Environment and Policy: The Next Fifty Years (Bloomington, Indiana: Indiana University Press, 1968), p. 12.

> Western environment which has been, and is being, carried out in a casual way. In it, this technology is essentially under private purposes; this situation is justified in the name of the conservative ideology; and the byproduct is a historical change which would have staggered the imagination of any nineteenth century visionary. In following their individual aims, industrialists blundered into a social revolution. There is indeed an invisible hand in all of this. Only it is shaping an unstable new world rather than Adam Smith's middle-class harmony.[3]

Our society has attempted to conquer its problems through technological advancements. However, societal dilemmas are like the mythological monster Hydra that sprouted two new heads each time one was severed from its body. We must have new approaches to aid our future decision-makers in making enlightened decisions, if the new approaches are to reach fruition, the base causes for social problems must be identified, internalized, and acted upon.

There is disagreement as to what the "Good Life" is. What is the life style we seek, and what does it imply for social, economic, and political policies? What practices need to be accepted as we seek to cope with moral dilemmas brought about by ecological, industrial, and religious problems?

II. Science and Technology. Science is a central force in shaping the lives of all persons. Forces have developed that carry within themselves the power to destroy freedom of choice. Many decisions are now being made by scientists without reference to the electorate--decisions

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[3]Michael Harrington, The Accidental Century (New York: Macmillan, 1965), p. 16.

that start chains of events over which the individual feels no possibility of control. Huxley elaborated on this when he said, "our procedures for participation in decisions need to be revised."[4] They need to be revised so that individuals can see the alternatives of different choices in the scientific area and regain some of their feelings of having some control over their destiny. If people do not have a choice in the decision-making process, society could reach the point where it ceases to regard the human person as being of ultimate value.

Ohst offers the following analysis of science:

> Science has its origins in human values and is itself a value system. Science originally responded to the needs of humankind and resulting knowledge had direct effects on people . . . . An ever increasing void between science and the masses is developing; an ever increasing reliance on technology is evident.[5]

The resolution of every social issue imposed on us by modern scientific progress can be shown to require a decision based on value judgments. Barry Commoner has stated,

> Certainly science can validly describe the hard facts about issues. But the choice of the balance point between benefit and hazard is a value judgment; it is based on ideals of social good or morality--not of science. And if the choice is a social and moral judgment, it ought to be made by all citizens.[6]

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[4]Julian S. Huxley, The Uniqueness of Man (London: Chatto and Windus, 1941), p. 16.

[5]David H. Ohst, "Ethical Systems and Education in an Evolving Culture," Science Education, 1974, p. 569.

[6]Barry Commoner, "The Dual Crisis In Science and Society," Today's Education, October, 1968, p. 13

There must be an awareness of the moral dilemmas emerging from advances in scientific knowledge and technological implementation. Glenn T. Seaborg has pointed out,

> Man's technology and morality have come face to face, where he can scarcely treat fact and value separately, and where he may see principles as diverse as The Second Law of Thermodynamics and The Golden Rule being considered side by side in determining his future.[7]

Science in this respect is a determinant; it sets the stage for dilemmas that must be dealt with ethically.

Advancing technology has a life of its own. Its dynamic nature carries it forward, and it feeds on its own gains. It behaves "organically." A view held by many is that this problem will be solved by a more advanced technology, but it is more logical to assume that human needs and desires will remain subservient to the system. Science today is challenging and changing our lives and our values. Tomorrow's science will require even greater adjustments. In Future Shock, Toffler underscores the extreme problems of adaptation, assimilation, and maintenance of one's equilibrium in a society enmeshed in rapidly accelerating change:

> For while we tend to focus on only one situation at a time, the increased rate at which situations flow past us vastly complicates the entire structure of life, multiplying the number of roles we must play and the number of choices we are forced to make.

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[7]Glenn T. Seaborg, "Science in a World of Widening Horizons" (From an Address before the Joint Graduate Consortium of Washington, D. C., January 17, 1966).

> This in turn, accounts for the shocking sense of complexity about contemporary life.[8]

Technology is not inherently evil, but when it develops without corresponding political, economic, and educational advances, society is changing without a plan. "A society without control over change is a society with its future out of control," according to William Boyer, who further states, "The race is between more fundamental planning than we have ever engaged in and catastrophe."[9]

Just as misuse of technology has created many present difficulties, so the wise use of technological developments is needed to extricate us from the pitfalls in which we find ourselves. In the process we must beware that we do not demonize technology. The fault is not in our skills but in ourselves, and we need to find technically sound procedures to overcome technolgical crisis.[10]

Responsible social action is needed so that knowledge pertaining to social issues can be synthesized into intelligent policies. Preventive as well as curative policies must be formulated so that a dynamic steady state system can evolve: A system that works in cooperation with nature and strives to increase social justice. Responsible

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[8]Alvin Toffler, Future Shock (New York: Bantam Books, 1970), pp. 33-34.

[9]William H. Boyer, "Education For Survival," Phi Delta Kappan, January, 1971, p. 258.

[10]Shane, op. cit., p. 48.

social action should be a major societal ofjective, and this is contingent upon individual competence in decision making.

III. Education: Because of its conservative posture, education responds slowly to changing biosocial conditions. Because of the pressures of trying to serve society, educators have been committed to teaching students what they need to know on the assumption that society will remain stable. As has already been pointed out, we are in the midst of an ever increasing spiral of transition. The rate at which science, technology, and society have changed has far exceeded the pace of change within the education system. This results in the school's facing the"facts" of a bygone era and neglecting much that is genuinely "true" amd important. For example, the notion of the emerging world society with its increasing interdependence is mentioned rarely, if at all, in contemporary curricula. By the time the school system prepares a person for a societal niche, the niche may no longer exist. Education for change appears to be a necessary response. This can be accomplished by preparing students for decision making through processes of independent judgment.

One of the most difficult problems in working toward a desired end in education is the question: How do we get there from here? Any view of the future must begin with the present or immediate past. All to often we have little comprehension of what is actually happening at the present time, but we must still be dedicated to developing the

opportunity for a positive future for everyone. This position assumes the need for action to right wrongs and the need for technological skills to meet human requirements. These exciting possibilities should serve as impetus for intellectual and humanistic growth.

Education should serve as an adaptive mechanism for the social system and the individuals within it. Education has too often focused exclusively on the past. In our rapidly changing society, we must look to the future. Our society is in desperate need of a curriculum that will help students sort out confused and often conflicting value systems. Competent and consistent decisions cannot be made if personal value systems are riddled with contradictions.

In order to educate successfully for social change, two myths must be overcome: the myths of "Teacher as Fount of Knowledge" and "Pedagogical Growth as a Function of Positivistic Mentality."

"Teacher as Fount of Knowledge"--The essence of this myth is the student going to the fount, drinking his fill, and coming to know by taking this intellectual nourishment. The teacher serves as purveyor of knowledge. The pieces of knowledge worth knowing are decided upon by interaction among the teacher, textbook authors, curriculum developers, etc., and are presented to the student in a prepared package.

Often schools operate, paradoxically, as instruments for the perpetuation of ignorance. The curriculum is

presented as if the results are all in. It is subject centered with very specific goals and little allowance for exploration by students. Ideas frequently tend to be squelched rather than tried out.

Studies of biology teachers have indicated that teacher-talk occurred 75 percent of the time in lecture-discussion time and about 50 percent of the time in laboratory settings[11] and that 94 percent of teacher behavior pertained either to management or content development.[12] In these studies, the teachers were directive and disseminated the information they had identified important. They were serving in the finest tradition of "teacher as fount of knowledge."

Science is cumulative knowledge. This makes scientific theories relatively impermanent, especially during the epochs when knowledge piles up in geometric progression. Science educators should be conscious of the provisional and transient nature of their subject.[13]

Education should aim for the acquisition of understanding and the means to further understanding. If we want

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[11]J. S. Parakh, "Study of Pupil-Teacher Interaction in High School Biology Classes," Journal of Research in Science Education, 1970, pp. 103-105.

[12]T. P. Evans and L. Balzer, "Inductive Apprach to the Study of Biology Teachers' Behavior," Journal of Research in Science Education, 1970, pp. 47-56.

[13]Theodosius Dobshansky, Mankind Evolving (New York: Bantam Books, 1962).

students to have a better understanding of their own epoch, introduce teaching methods consistent with these ends. The complexity of our society can be looked upon as an advantage. There are many interest bases on which to build, and Habermas has argued persuasively that knowledge cannot be divorced from human interest.[14]

Once it is understood that knowledge is interest based, it is possible to move away from the simplistic methodology just described. Opportunities for self-discovery are apparent; learning can become personalized; interaction can be established between the student and a problem resulting in the student arriving at solutions, rather than having answers prescribed for memorization. The teacher can now serve as facilitator and interpreter, rather than purveyor, by aiding in a non-directive manner.[15]

"Pedagogical Growth as a Function of Positivistic Mentality"--Early in the nineteenth century August Comte, the father of positivism, maintained that the scientific attitude is the highest level of intellectual insight, the only avenue of real knowledge. Through the exact sciences, Comte argued, man is able to identify fundamental laws and relations which describe existence with a sophistication and

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[14]Jurgen Habermas, Knowledge and Human Interests (Boston: Beacon Press, 1972).

[15]James B. MacDonald, "A Transcendental Developmental Ideology of Education," Phi Delta Kappan, September 1969.

accuracy unequaled by lesser, more subjective approaches to knowledge.

Positivism has permeated our society and educational system. Modern science, technology, and specialization have accustomed man to precision and have made him impatient with speculation concerning ultimate aims, origins, causes, and results. The positivist has little time for personal feelings and concerns. The emphasis is on verifiable knowledge, objectivity, and fact. Observations need to be precise, succinct, and without sentimentality or emotion.[16]

Schools exhibit the "positivistic mentality" in at least two major ways. First, the emphasis on objectivity, external data, and verifiability is not only sanctioned but nourished. Those in authoritative roles have come to assert empirical expectations. Their pedagogical assumptions are that the most significant aspects of learning can accurately be measured, that the administration of an exam is the best way to evaluate the effect of the school on the student, and that objective measurement is necessarily beneficial to the learning process.[17]

The second dimension of the "positivistic mentality" is the reluctance to honor a student's highly subjective approach to life. The objective approach does not fit the

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[16]Eden and Cedar Paul (trans.), Man in the Modern Age, by Karl Jaspers (Garden City, New York: Doubleday, 1957), pp. 47-49.

[17]Michael B. McMahon, "Positivism and the Public Schools," Phi Delta Kappan, June, 1970, p. 516.

subjectively oriented individual who is more inclined to value inner experiences and feelings which are unique and essentially incommunicable. The school is objectively sensitive to the technological society that rewards efficiency, not to the individual striving to understand his being. This objectivity curtails creative responses and learning about one's self by establishing a personal position on issues.[18]

Educational priorities need to be reordered. The positivistic, objective method must be rejected as the avenue to pedagogical growth. This method has given rise to great improvements in standard of living, but, it does not follow that knowledge discovered by a certain methodology must be learned in the same manner. The "positivistic method" does not lend itself to working with the great contemporary dilemmas.

IV. Science Education. How can a typical citizen make sound judgments on these technologically based dilemmas: Resolving these issues requires a confrontation between human values and rather complex scientific data that most people are poorly prepared to understand. "Any ethical attempt to educate the young must deal with the impact of man and technology on man and the environment so that the electorate can make sound decisions on human condition."[19]

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[18] Ibid, p. 517.

[19] Commoner, op. cit., p. 82.

Emphasis on values and on the social aspects of science and technology must be integral parts of any science curriculum. This means dealing with social dilemmas and human values. Increasingly, educators are coming to realize that science cannot be divorced from moral implications. Everything from the problems of pollution and the quality of our environment to genetic manipulation confronts us with ethical dilemmas.

Science teaching must reflect social realities. Consequences of modern science have made myths of traditional educational goals in science and rendered obsolete large amounts of subject matter in our courses. The aim is not to lessen the authority or validity of the established laws and concepts of science, but to combine the focus on the structure of disciplines with the real world of the student. The student must become aware of the moral dilemmas which have developed as a result of scientific knowledge and technological implementation.[20]

"The broad goal of science teaching ought to foster the emergence of an enlightened citizenry, capable of using the intellectual resources of science to create a favorable environment that will promote the development of man as a human being."[21] The scientifically enlightened person is

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[20] Paul Dehart Hurd, "Scientific Enlightenment for an age of Science," The Science Teacher, January, 1970.

[21] Ibid., p. 14.

capable of using what has been learned about science for cultural adaptation and social progress. It is important for all students to come to grips with what tomorrow's science has to offer; to consider the possibilities while there is still time for thoughtful discussion. Atomic testing, the ecological crisis, the population explosion, and biological warfare are all examples of critical controversies that were recognized too late to be comprehensively debated by an informed public.

Before we can have science instruction similar to what has been described, the disposal of at least one additional myth must occur. That is the myth of "Value Free Science Education."

"Value Free Science Education" "The notion that scientific discovery consists of a standard series of hypothetico-deductive steps that are carried on dispassionately by the scientist wholly independent of his metaphysical commitments has permeated science education."[22] This statement by Harry S. Broudy is followed by his analysis:

> It is this notion of science, fruitful though it is, that has isolated science from value and value from science. Positivism makes the knowledge of fact objective and impersonal at the cost of rendering judgments of value incorrigibly subjective and idiosyncratic. But if reality is a coherent whole, then its value components are no less objective than are its fact components, and science has its passion as well as art.

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[22]Harry S. Broudy, "Science and Human Values," The Science Teacher, March, 1969, p. 23.

One product of scientific rationality has been the attempt at neutral or value free education. Values are transmitted in virtually every social interaction between or among human beings. Despite any disinclination to do so, every teacher displays his values. His own conduct in the classroom, his attitudes toward students, his choice of materials and methods attest to his own value system.

Polanyi insists that the great scientific discoveries depended heavily on tacit components. This insight is not developed logically from painstaking observation and tests, Polanyi argues, but rather guides an gives sense to observation, experimentation, and theorizing. For this reason, he regards all knowledge as "personal knowledge" involving moral and aesthetic, as well as cognitive factors. If Polanyi is correct, a better understanding of the value based components of scientific effort would provide the student with a sense of the unity of science as a whole.[23]

Silberman argues that the greates weakness in American education is the failure to develop sensitive, autonomous, thinking, human individuals. This weakness results largely from a false dichotomy in the schools between the affective and cognitive domains, between feeling and thinking. People must be educated not only to think but to feel. It is only

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[23]Michael Polanyi, The Tacit Dimension (Garden City, New York: Anchor Books, Doubleday and Company, Inc., 1966).

through a combination of the two domains that we can apply what we have learned in order to create a more humane world.[24]

What are science teachers doing about values? It appears that most have avoided dealing with values. Under the guise of objectivity, too many teachers have avoided dealing with the moral issues surrounding science. Other approaches sufficed in an earlier, less complex world; but "we cannot afford to educate a generation of students who know the how and why of scientific phenomena, but do not have a process of inquiry into the values and moral implications raised by their studies."[25]

Margaret Mead has argued that our task is to prepare the young so they can cope with problems previously unknown and remake themselves in the process. Certainly, this should have been the major thrust since the beginning of formal education. Lip service is given toward this end, but today the luxury of saying we should do it cannot be afforded: we must do it.

If the school is to be an effective social institution, it must afford students experiences in social action. Willingness to make choices of action in the light of the welfare

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[24]Charles Silberman, Crisis in the Classroom (New York: Random House, 1970).

[25]Merrill Harmin, Howard Kirchenbaum, and Sidney B. Simon, "Teaching Science With a Focus on Values," The Science Teacher, January, 1970.

of society must be fostered as an integral aspect of the school curriculum. If this rationale is accepted, the next step is to develop a model for responsible social action.

CHAPTER III

THE INITIAL MODEL

Concern about the future is within each of us, and it ranks second only to concern about the present. Individuals effect social change by identifying a concern, collecting data, reaching an enlightened decision, and working for the desired change. Well thought-out actions normally follow this pattern and it appears logical that students should have similar experiences in preparation for decision-making. This dissertation recognizes this need and is following this pattern.

Change is a basic phenomenon of the universe. There is no single inevitable future but rather an infinite number of alternative futures. The diagram below illustrates the concept that tomorrow can certainly be influenced.

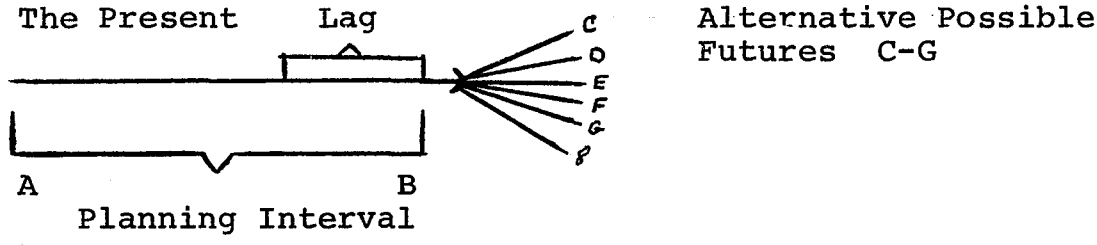

Figure 1

Multiple Alternatives Future Concept[1]

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[1]Harold G. Shane, The Educational Significance of the Future (Bloomington, Indiana: Phi Delta Kappan, Inc., 1973), p. 8.

If one accepts the idea of influenceable futures, one must still ask whether or not man should use his time, energy, money, and intellect to shape tomorrow. This dissertation accepts intervention as a logical and necessary tool in the continuing search for the "good life."

The central question to be considered then becomes: How can education help reverse some of the ominous trends before we do ourselves and our environment irreversible damage? Earlier in this century many authors were expounding on the myth that education could do almost anything. As Wilma Longstreet has pointed out, we have moved away from the idea that education is infallible. No longer do we see it as a panacea for compensating for weakening church-family-community influences or developing a totally literate population.[2] In the sixties, Christopher Jencks discussed an antimyth to infallibility. This concept states that the schools can actually do very little since ". . . the character of a school's output depends largely on a single input, namely the characteristics of the entering children."[3] What schools actually can do appears to lie somewhere between the myth of their infallibility and the antimyth of their impotence.

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[2]Wilma Longstreet, Beyond Jencks: The Myth of Equal Schooling (Washington, D. C.: Association for Supervision and Curriculum Development, 1973).

[3]Chrisopher Jencks, Inequality: A Reassessment of the Effect of Family and Schooling in America (New York: Basic Books, 1972).

The question is not whether schools are able to effect social change but how they can best be utilized in the coming decades to prepare for social change. One of our vital tasks is to identify the responsibility that education has in healing inequality, exploitation, inhumanity, and other acute tensions. We need a new concept of our personal relationships with other humans. Man is a social creature or he is nothing. We must align social action with social realities. We must consider the recent changes in our society and the changing responsibilities of science education within this society.

During this century, our schools have been characterized by a wide spectrum of both academic and humane goals. The science curriculum certianly illustrates this when you consider diverse treatments such as PSSC and Harvard Project Physics. Although much has been written about lack of direction in today's schools, the opposite appears to be true. Our problem has not been the lack of educational goals but a surplus of conflicting or ambiguous goals. Some were subject matter goals: others ranged from human development to ambitious approaches involving social reform and help for the gifted and the disadvantaged. Disagreements appear to permeate the entire educational system.

Perhaps what is needed is a new emphasis in existing science courses on human and social concerns. Rather than offering new courses or new subject matter in old courses, we can successfully utilize the current course framework in

stressing social issues such as the value crisis, the naive use of technology precipitated by rapid change, the have and have-not dilemma, etc. The emphasis is on a reordering of priorities with the intent of preparing personally competent individuals able to cope with and direct a rapidly changing society.

This new emphasis must be guided by some type of model. I will elaborate on the model that informed and guided my examination of the study of social issues.

Why and How a Model? A model is a symbolic representation of the interactions within a complex system. It is an imaginative tool for ordering experience, rather than a description of a facet of the world. A mental picture is provided whose unity can be easily understood. In this dissertation, the model is a mental construct, to be taken seriously but not literally.[4]

Models direct attention to particular patterns in events and restructure the way one sees the world. A model presupposes a commitment to ethical norms and certain policies of action as well as a set of conceptual and methodological assumptions. Commitment to a model allows its potentialities to be systematically explored. Its existence allows analysis and discussion.

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[4]Ian G. Barbour, Myths, Models, and Paradigms (New York: Harper and Row, 1974).

A model is useful in altering the way one looks at things, but a dynamic model will also offer avenues toward modifications that should occur in the model itself. It is open-ended and extensible. Models provide the types of questions to be asked and the types of explanations to be sought. When using a model, it is imperative to remember that we do not just see, "we see as" a unique individual.

Goals of the Model. Every curriculum model contains a set of personal and social values and beliefs about how people learn. My personal set of values leads me to believe that the curriculum should focus on responsible social action stressing self-concept and clarification of values by emphasizing self-growth and person-centered concerns.

In Curriculum and the Cultural Revolution, Purpel's and Belanger's "Framework for a Humanistic Curriculum" provides insight in constructing such a curriculum.[5] They focus on two major areas: values and ways of knowing.

The first area comprises a series of values and statements about what society should be like, expressed essentially in moral terms. This area deals with the rapid societal changes occurring in attitudes, policies, and beliefs.

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[5]David E. Purpel and Maurice Belanger, eds. Curriculum and the Cultural Revolution (Berkely, California: McCutchan Publishing Corp., 1972), p. 65.

1. Social and Personal Values
    a. Concern for the human being as an individual
    b. Concern for social justice and social involvement
    c. Concern about need for rapid, peaceful, and fundamental social change on a moral basis

The second area deals with the psychological and philosophical questions about how people come to know, comprehend and accept. Schools have emphasized public rather than private ways of knowing. They point out that private experiences such as intuition and inner seeking should be valued. Purpel and Belanger emphasize that curricula need to reintroduce the person as the main agent in the construction of knowledge.

2. Ways of knowing
    a. The limitations of empiricism
    b. Knowledge and futurism

Our ever increasing technological ability has implications for both areas. The emphasis should be on personal integrity and on allowing flexibility so that a student can acquire knowledge in a manner that allows him to truly understand. The anticipated end is the "wholeness" of the individual incorporating necessary competencies for responsible social action.

The curriculum should affect students' personal lives and their ability to participate sensitively and intelligently in decisions that will influence local, national, and international events. It should encourage linear approaches to learning. It should be human-centered and counteract the depersonalizing tendencies of our

society. The curriculum should result in growth in self-concept, moral deliberation through clarification of values, and, hence, decision-making ability.

By emphasizing the future, students can become cognizant of the Past-Present-Future continuum. In order to avoid the dilemma of Buridan's Ass, who starved midway between two bales of hay because he could not decide which he preferred, we must often make choices among almost equally plausible possibilities. Possible and probable futures should be emphasized and hopefully, preferable futures will emerge.

According to Gardner,

> Our society must have the wisdom to reflect and the fortitude to act. It must provide a creative soil for new ideas and the skill and practice to put these ideas into action. And yet every man who thinks seriously about the problems of science and society finds himself groping toward some reconciliation of action and reflection.[6]

Education is the logical choice for providing means for this reconciliation and it must provide the opportunities for students to become competent in this area through curricular experiences.

General goals can be identified so that the curriculum can be structured to allow gains toward attaining these goals. The values of the model builder determine which of the myriad of possible goals are selected. Based on earlier arguments,

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[6]J. Gardner, No Easy Victories (New York: Harper and Row, 1968), p. 84.

the following goals were chosen and are presented as outcomes of education: 1. rational decision-making; 2. self-reflection; 3. personal integrity; and 4. moral responsibility.

Rational decision-making--an outcome of education: Our increasingly urban and technology-dependent society is related to professional education and the successful ordering of complex experiences. Our rapidly changing society offers an ever-increasing number of experiences and these experiences influence and affect each other. The ability to design, manage, and improve such a society is directly related to both professional skills and the wisdom of the leadership and citizens produced. Education should be held accountable for providing decision-making experiences closely approximating situations that students will face.

Robert Ubbelohde's words sum up the need for decision-making activities in our schools, "Education is the process of forming fundamental dispositions. To have a disposition is to be disposed to act. The possessor of a disposition exercises choice in action; his action is discriminating. Disposition implies intelligence."[7] These dispositions are necessary if we are to succeed as inhabitants of a world increasingly transformed by technology.

Self-reflection--an outcome of education: Self-reflection refers to mental consideration of an experience.

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[7]Robert Ubbelohde, "Social Studies and Reality - A Commitment to Intelligent Social Action," Publication #1 of the University of North Carolina--Greensboro, Humanistic Education Project. Directed by Dale L. Brubaker and James B. MacDonald.

It gives rise to a thought, idea, or opinion after attentive consideration. MacDonald describes self-reflection as a dialectic between the inner and outer self.[8] It is a process that enables a person to understand and make sense out of an experience after careful, attentive scrutiny.

Technology has created problems because of the careless way it has been used. Our society should engage in a process of self-reflection in order to gain insights as to what should be done about this dilemma. Education should be accountable for getting this point across to the next generation as quickly as possible.

Albert Schweitzer stated, "Our age has discovered how to divorce knowledge from thought, with the results that we have, indeed, a science which is free, but hardly any science left which reflects."[9] Science education should allow students to enter into a critique through self-reflection of the dilemmas that stemmed from technological developments.

Personal integrity--an outcome of education: Personal integrity refers to an individual attaining a state or quality of being complete. I see this completeness encompassing three areas. The first being: consistency

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[8]James MacDonald, "A Transcendental Developmental Ideology of Education," Phi Delta Kappan, September, 1969.

[9]Theodosius Dobshansky, Mankind Evolving (New York: Bantam Books, 1962), p. xiii.

with the inner self leading to the establishment of genuineness with one's self. A second area is the individual's condition of "wholeness" leading to a celebration of uniqueness. The third area is moral soundness in what a person considers right and just. When in operation, personal integrity involves taking the interests of all into account in assessing the situation.

The future offers an opportunity to evolve a better society. A sense of destiny emerges from a belief in better things in the future. Human energies can be devoted to qualitative rather than quantitative growth. Knowledge, art, love, and spirit can be integrated in the search for self-identity and worth.

The goal should be for self-fulfillment by attaining personal integrity. In order to reach this state of completeness, the individual should be the center because of the necessary concentration on person-centered concerns. This should lead to an awareness of each individual's importance. Before meaningful advances can occur, a person must become in touch with himself. The curriculum should provide means to peel off the societal covering that prevents the true person from emerging.

Moral responsibility--an outcome of education: Moral responsibility is being accountable for the carrying out of a duty or obligation to one's self or others. The individual accepts being answerable for his actions or non-actions. A person acting in a morally responsible manner

can be termed a moral agent.

Newmann defines a moral agent as

> Someone who deliberates upon what he or she ought to do in a situation that involves possible conflicts between self-interests and the interests of others, or between the rights of parties in conflict. Unless there is concern for what an individual ought to do, the person cannot be considered a moral agent.[10]

The major proposition here is that the less ability one has to exert influence in the world, the more difficult it becomes to consider oneself a moral agent.

The ability to affect the environment is critical to one's identity as a morally responsible individual. There is a persistent human tendency to explore, manipulate, and exert impact on one's environment.[11] In order for this impact to be worthwhile and meaningful, the person must qualify as a moral agent; and, as society evolves, moral responsibility will have to take on greater significance. Moral responsibility on an individual basis, coupled with the other goals that have been alluded to, is what we must have in order to attain responsible social action.

Introduction to the Model

Given the goals of rational decision-making, self-reflection, personal integrity, and moral responsibility,

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[10]Fred M. Newmann, Education for Citizen Action (Berkely, California: McCutchan Publishing Corp, 1975), p.29.

[11]Jean Piaget, The Construction of Reality in the Child (New York: Basic Books, 1954)

what experiences are necessary to achieve them? The model originated from concerns about the total education of the student with specific concerns about social issues and social action. Research yielded a paradigm in which three areas were identified as those in which students need experiences. These were: cognitive skills, values, and personal growth. The original model was set up as follows:

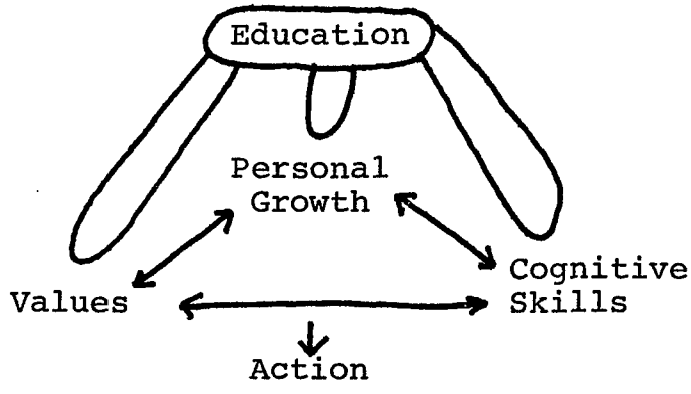

Figure 2

The Original Model

Further research yielded a more detailed model that was used as the educational model in the workshop. The area of issues was the primary thrust, and more inclusive terms emerged as the model builder grappled with descriptive headings that would lead to necessary experiences. The model was broadened so that it included critical thinking (cognitive skills), moral deliberation (values), and psychological concerns (personal growth). Newmann's work was of great influence and help in the evolution of the model at this point. The model at the time of the workshop follows.

The Workshop Model

If increasing student ability to handle social issues with more sophisticated reasoning and to exert influence on decisions in the resolution of these issues is accepted as a valid educational objective, the need arises to establish competencies associated with such ability. This objective can be broken down into specific parts and the curriculum can be designed so that responsible social action can become a reality.

Since desires and values of individuals are tied up in any social problem, these become factors in the definition and solution of the problem. Desires and values are highly significant in the make-up of an individual and can be termed personal structure. Only as these conflicting elements of personal structure are somehow reconciled can social problems be solved. This implies that the resolution of any social issue usually entails modification of the personal structure of those persons who are parties to the issue.

A social issues core provides an excellent medium for learning value standards and how to use these in the process of critical thought. It will encourage students to work toward solving social problems and to act upon their conclusions in cases where the problem falls within their power to act. Hopefully, the myth of objectivity will be overcome. If so, this will allow personal feelings, subjective in nature, to play an important role in consideration

of truth. Demonstrable data will remain powerful, but other avenues will be opened for developmental growth. A much more unified view of human experience will be allowed as well as a more unified view of the process of personal change and development which occurs in education.

The model presented in Figure 3 presents major components that a curriculum for rational social action needs to teach. Each of the components is extremely valuable, but a scientific study embodying a detailed analysis of each component is not the objective. Rather, a heuristic study concentrating on moral deliberation through clarification of values is the intent.

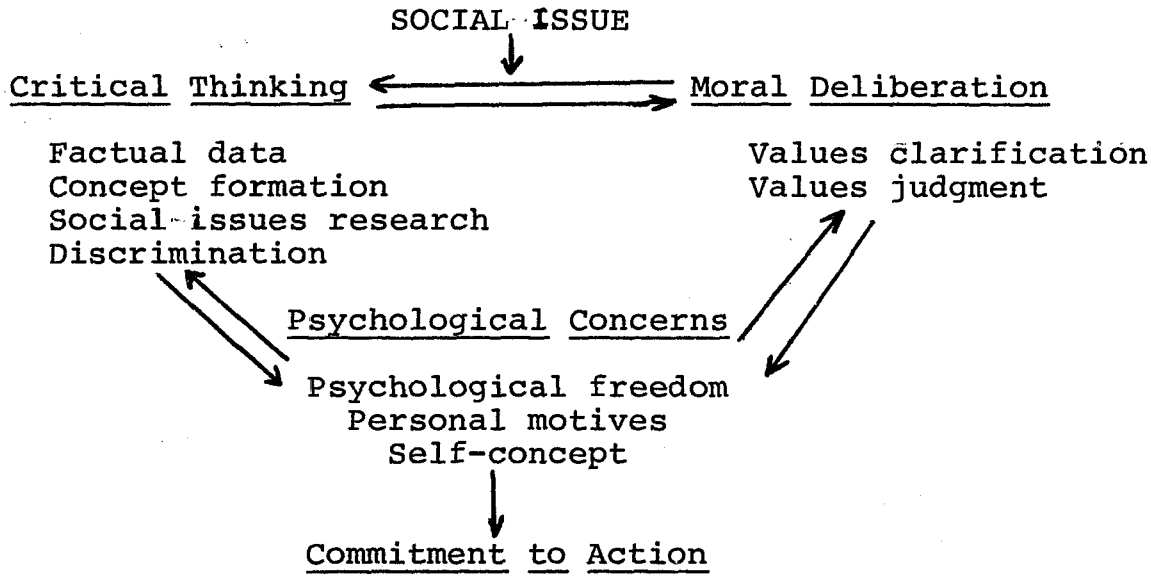

Figure 3

Areas of Competence Required for Responsible Social Action

As previously indicated, the model's implementation will center on moral deliberation through values clarification, but definitions and descriptions of the remaining components are needed. The critical thinking and psychological concerns components will be discussed at this time.

Critical Thinking

In order for one to be a rational decision-maker one must be able to think critically. Critical thinking involves disciplined thought and inquiry in the cognitive areas. It includes recognition of assumptions behind an argument, identification of logical inconsistency, and support for one's generalizations through reason and evidence.[12] In order to handle critical thinking, one must be able to deal with factual data, concept formation, research and discrimination skills in the collection, and organization, and interpretation of data. There appears to be a definite hierarchy, beginning with factual data and ending with discrimination skills, leading to competence in critical thinking.

Factual Data

In this model critical thinking is directed toward social issues. The focus is on points of contention between parties and the point where an issue becomes ripe for a decision. Social issues are complex and require background information in conjunction with skills in interpreting what

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[12]Fred Newmann, op. cit., p. 84.

has occurred in time or space. The inferences and conclusions strived for depend on facts.

In order to make rational decisions one needs data. This model recognizes the importance of accurate, relevant data when dealing with social issues. The factual data presented by the teacher should be chosen for contrast and potential values discussion. In attempting to justify most positions we must be able to verify factual claims, but, too often, factual information gain is the educational objective.

Concept Formation

The major thrust of the science projects of the sixties was concept formation. A concept refers to an idea that includes all that is characteristically associated with a term or skill. When a concept is internalized, facts become grouped by association; these relationships are understood and become precise and clear.

Concept formation through categorizing and generalizing can be a very powerful method of instruction. Normally, it is experience-centered with an inquiry approach, but, as an end, it does not prepare students for the complicated issue-centered decisions they will face.

Social Issues Research

Social issues research should provide evidence to support or reject certain positions on an issue. This competence would enable the student to move beyond the more direct teacher influence present at the factual and conceptual levels. To formulate defensible positions, the student must

contend with empirical and definitional data. Research skills in the collection, organization, and interpretation of data are necessary so that defensible positions may be established. This skill would enable the student to be cognizant of the alternatives and probable consequences of "each" identified alternative in an issue.

Discrimination

Discrimination is competence in making a judgment about the relevance of data in analyzing an issue. Qualitative, as well as some quantitative, judgments about the extent to which certain data provide insight into a deeper understanding of an issue.

Discrimination is a mental recognition of a difference marking one quality from another. It produces carefully estimated results in characteristics, motives, and realities. When a student masters discrimination skills, then he can recognize assumptions behind an argument, identify logical inconsistencies, and provide support for his generalizations through reason and evidence.

Psychological Concerns

A general goal for the curriculum is to prevent students from becoming immobilized by psychological concerns and to help them work toward resolutions that enhance rather than inhibit their ability to make decisions.[13] There are dangers when students feel paralyzed because they cannot

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[13] Ibid., p. 93.

make the perfect decision, feeling incompetent in their decision-making ability, and having guilt feelings when their personal feelings do not fit with higher moral positions.

Psychological Freedom

Psychological freedom is used to describe the learning environment. It implies the opportunity to try out new ideas without fear of being unduly criticized. In order for a moral deliberation process to be successful, the students must be able to engage in self-reflection considering some trial ideas. The teacher must work toward establishing a climate of psychological freedom.

Personal Motives

Personal motives for the selected alternatives should be examined. This will allow personal growth. Humans want to exert an impact on their environment. This desire can provide insights, through self-reflection, leading to qualitative growth in the search for self-identity.

Self-Concept

As indicated above, the curriculum should stress self-concept by emphasizing self-growth and person-centered concerns. The student could explore the issues from a personal topic arrangement based on immediate interests. The psychological question of--Who am I?--should be the focus with intellectual energies interacting with critical thinking and moral deliberation.

Moral Deliberation

The moral deliberation element will now be discussed. The major thrust of the dissertation will be in this area, and it will serve as the vehicle by which education can elicit responsible social action.

Moral deliberation is a process by which a person formulates and justifies a position on an issue. "Values conflicts emerge because of the perceived rights and obligations of individuals to themselves and their immediate interests versus their duties and rights in relation to a larger community."[14] Distinctions can be made between more and less adequate ways of justifying one's value preferences.[15] One should be able to justify a decision on an issue by reference to a general value position.

Two main reasons why we should attempt to teach an approach to moral deliberation guided by values clarification are:[16]

1. Each person has a moral duty to justify the policies and values advocated if they affect the lives of others.

2. Those who reason on the basis of "higher" values will be better able to exert influence.

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[14] Ibid., p. 79.

[15] Lawrence Kohlberg and Rochelle Mayer, "Development as the Aim of Education," Harvard Educational Review, November, 1972.

[16] Newmann, op. cit., p. 81

Values Clarification

Values serve as standards by which we determine if a particular thing is good or bad, desirable or undesirable, worthy or unworthy, or someplace in between these extremes.[17] Values clarification provides an opportunity for the student to develop skills in the valuing process. Students should be encouraged to use knowledge, gained in the cognitive domain, to support a value system; but the valuing process also involves the student in an issue because a stand, and hopefully action, is taken toward solving the problem. It should be emphasized that values clarification is a process toward an end, but not the end.

Questions utilizing values clarification have "you" in them. These kinds of questions attempt to lead the students toward a greater awareness of personal thoughts and feelings. Values clarifying questions help the student rely upon his own abilities in considering issues. The emphasis is on possible and probable futures but a very strong emphasis is placed on preferable futures.

There are two obvious dangers in a values clarifying procedure. The first is that a teacher might use the process to transfer, under the guise of psychological freedom, his personal value system. The second danger is that the teacher might be so intent in maintaining a nonjudgmental attitude

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[17] Jack R. Fraenkel, "Strategies for Developing Values," Today's Education, November, 1973.

that the student flounders and derives a value system riddled with contradictions. Also, equal approval of all values seems to sanction all the expressed values. The student may feel that any action is morally justifiable. Personally, I do not feel a teacher can project a value free image because values are involved in every social interaction between or among humans. A flexible position between the "purveyor of values" and "laissez-faire" attitudes must be established. The student has the right to compare and contrast the value systems present in an educational environment, and this right must be exercised in order for psychological freedom to exist.

Moral Judgment

The primary function of science is to explain why and how things happen as they do. Therefore, the aim of all scientific investigation is to arrive at statements about the relationships between or among things. Statements about the conditions an individual thinks ought to exist are called value judgments.

We are learning that many matters which appear to be "technical," and hence subject to "expert" decision, are actually questions which are moral, social, and economic in nature. We must all participate in answering these questions as individuals, citizens, and members of the web of life.

The moral judgment on the social policies favored must come from critical thinking and social issue research,

knowledge of the individual as decision maker, and most importantly, moral deliberation guided by values clarification.

It is necessary to emphasize that the three major components of the model do not stand alone. It is evident that each depends on the others. For example, critical thinking depends on values that determine what one considers important. At this point the relationship between and among the components is very hazy, but it will be more closely scrutinized later.

Commitment to Action

Newmann defines action as "purposeful behavior in which a person attempts to exert influence in the environment." He further states that "environmental competence is the ability to engage in behavior that leads to one's intended consequences in the environment. Action is a necessary, though not sufficient experience in the learning of environmental competence."[18] An objective is to help students not just understand their environment but to affect it.

Dewey argues that reconstruction of experience occurs only through the person's active intervention or interaction with people, objects, and issues in the environment.[19] Understanding is gained from our actions on external reality.

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[18]Newmann, op. cit., p. 19.

[19]John Dewey, Democracy of Education (New York: Free Press, 1966).

Action involves initiation, evaluation, and choice by the student. Processes included in action are setting up goals (initiation), preparing means necessary to achieve goals (planning), performing the means (execution), and judging the extent of realization of the goals (evaluation).

If possible, after one reaches a decision in a social issue, some degree of action should be taken. Having taken a stand the next step is to work for its support through political action. This might involve rather mundane behind-the-scenes work, or it might entail attention-grabbing action in the limelight. Whatever the situation, the action presupposes reflection.

This model is designed to place students in roles that require caring for fellow humans, becoming aware of social dilemmas, reaching a decision through moral deliberations, and taking some degree of responsible action in the real world.

Learning Environment

The continuing responsibility of the teacher using this model is to help students deal with social issues intelligently in an effort to bring about needed social change. In order for this to occur, a comfortable climate should be maintained between a highly structured and free flowing open session. Unique discovery is the flower of the thinking process. It can bloom only in a climate of freedom. This is true whether in individual or group discovery. The task is to develop the kind of communicational setting where a student feels free to express his feelings if he wishes to do so.

The teacher should stimulate a questioning attitude by presenting various and conflicting values involved in an issue to encourage discussion and evaluation and to help students evolve and arrange their own value systems. While at times it may be desirable for a teacher to appear neutral on an issue when introducing it, in general it is much better if the teacher is open about his own preferences. This enables the student to take the teacher's biases into account in assessing how objectively and fairly a unit of work has been developed. In addition, the teacher should serve as a model of a democratic citizen. It is important that he be viewed as a person with clear, well thought-out value preferences or as a person striving to establish these value preferences.

The student has the right of privacy of his feelings and should not be coerced into expressing his feelings when he does not wish to do so. The teacher should be more interested in providing opportunities for a student to express his feelings than in forcing such feelings to the surface and making value judgments as to the validity of the response. The issues that students raise must be dealt with in a personal manner. Little growth will occur if this is not the case. Creative responses should be allowed so that a person may learn about himself by establishing a personal position on the issue.

Although the teacher should not focus on inculcating values or forced responses, he should be very thorough in trying for moral developmental growth. The value of social

justice and moral responsibility should be emphasized. According to Newmann, "Moral development occurs primarily because students at a higher stage present arguments that attract lower stage students."[20] If students have rigorously prepared background information, dialogues focused on social issues can encourage thinking about moral decisions and movement toward a higher reasoning stage may occur.

Implementation

The first objective is to make students aware of value inconsistencies they have learned from the society around them. This leads into the need to help the student develop a consistent, well-understood set of values that he knows how to use as he faces a society full of value confusion.[21] According to Oliver and Shaver,[22] the basic purpose is to encourage a student to explore a controversial issue, and to find where he stands and how he can best defend his position in terms of social reality. Strong emphasis is placed on the development of the student's ability to clarify a point of controversy, test evidence, advance an argument, and use other skills needed in discussion.

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[20]Newmann, loc. cit.

[21]Maurice Hunt and Lawrence Metcalf, Teaching High School Social Studies (New York: Harper and Row, 1968)

[22]Donald W. Oliver and James P. Shaver, Teaching Public Issues in the High School (New York: Houghton Mifflin, 1966)

Students want to know who they are and the alternatives they may elect for their lives. They want to compare "truths" and values with others. "A valid curriculum for young people is one that directly approaches the questions of their age and time."[23]

The question arises as to how to handle a discussion involving social issues. Newmann and Oliver have developed strategies for rational operation in handling a discussion format. They include the following:[24]

1. Issue Stating. Phrasing specific policy issues in terms of more general issues; stating the particular issues relevant to the policy in question; distinguishing among factual, definitional, and value issues.

2. Summary-Inventory-Agenda. Discussing which issues should be discussed in which order, identifying points of agreement and disagreement, on issues that have already been discussed, summarizing arguments of participants and the progress of the discussion.

3. Clarification-Elaboration. Requesting or providing clarification or elaboration of a statement.

4. Relevance. Questioning or substantiating the relevance of statements.

5. Referring to Qualified General Ethical and Legal Principles. Arguing a policy to be consistent with general values in the society's moral tradition, but stating exceptions, qualifications, limitations on the general

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[23]Chris Buethe, "A Curriculum of Value," Curricular Concerns in a Revolutionary Era (Washington, D. C.: Association for Supervision and Curriculum Development, 1971), p. 18.

[24]Fred Newmann and Donald Oliver, Clarifying Public Controversies (Boston: Little Brown and Company, 1963).

values or policies one supports. Using analogy as an effective method of arriving at a qualified position.

6. Consistency. Pointing out logical and empirical inconsistencies in arguments and inconsistencies between ideals and actions, means and ends, etc.

7. Conditional Reasoning. Raising logical and empirical implications of policies and claims; stating premises and stipulations assumed in the argument. This operation is most easily recognized in "if. . . then" statements.

8. Weighing Opposing and Alternative Positions. Stating and responding to counterarguments, including modifying one's position and conceding points in light of persuasive opposition.

9. Defining Terms. Explaining or asking for the meaning of key concepts by using examples, analogies, or general defining criteria.

10. Comparison and Distinction. Stating the specific bases for similarities and differences among concepts, events, policies, etc.

11. Evidence and Examples. Providing data, specific claims, examples, etc. to support or challenge factual claims.

12. Using Source and Authority. Citing sources and authorities for claims and evaluating the reliability thereof.

13. Need for Information. Acknowledging those issues for which it would be desirable to have more information.

The following plan provides an outline for <u>implementation</u> of the moral deliberation guided by values clarification component of the model. This plan lends itself to the discussion format. The social issues should present a real conflict, include a number of moral issues for consideration, and generate differences of opinion among participants. It is based on a similar plan by Newmann and Oliver.

I. Social issue: e.g., What can be done to insure an adequate food supply for all humans?

   A. Value conflict: Freedom of life-styles versus the right of every person to satisfy basic food requirements.

   B. Important factual data behind the conflict.

   C. Definitional Problems.

   D. Activities to make the value conflict more salient.
      1. analogies
      2. role-playing
      3. value incidents
      4. rank order
      5. values continuum
      6. triage
      7. others

II. Implementation issue: e.g., Who is responsible for insuring an adequate food supply for all humans?

   A. Value conflict: Should certain nations go through periods of reduced consumption in order to provide needed food in less developed nations or should each nation work independently in solving its own problems.

   B. Important factual data behind the conflicts.

   C. Definitional problems.

   D. Activities to make the value conflict more salient.

III. Higher Morality Issue: e.g., The life of each human being is an ultimate, universally approximate value.

When leading a discussion on social issues dealing with moral arguments, one must establish guidelines so that learning occurs. Rules for moral arguments:[25]

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[25] Barry Sugarman, John Wilson, and Norman Williams, Introduction to Moral Education (New York: W. W. Norton, and Company, Inc. 1963).

1) We should stick to the laws of logic.
2) We should use language correctly.
3) We should attend to the facts.
4) We should be aware of our own and other's feelings, desires, and interests.
5) We should count other people as our equals.

This model presents methods available for use by teachers when working with social issues. They include: 1) the findings and procedures of the social, physical, and life sciences: 2) values clarification and moral deliberation techniques; 3) formats for leading discussions dealing with social issues: and 4) an open idea environment enbodying psychological freedom.

CHAPTER IV

FIELD TEST OF THE INITIAL MODEL

How does one test a model? A model is an analogy that represents a system in operation. It suggests what is not directly accessible or observable. Willingness to ask difficult questions and to commit one's self to the need for acquiring new ways of perceiving appears to be critical when evaluating a model. These questions should be stated so their solutions provide meaningful results in determining the effectiveness of the model.

A workshop format with public school teachers was chosen as a vehicle for field testing the model to allow demonstration and exploration as it moved from a theoretical domain to one of reality. Courses in pre-service teacher education as well as high school science were considered as potential testing grounds for the model. My previous experience in coordinating science education workshops was instrumental in the selection of this format. These experiences have illustrated that workshops tend to be informal and should allow free discussion of an issue while guided by the three model elements.

Workshops provide opportunities for active involvement that can lead to practical implications. Experienced teachers, currently practicing their profession, can implement aspects

of the model and report its effectiveness. A variety of educational backgrounds in a workshop offers different perspectives in evaluation.

The intent of this workshop was to provide data, insights, and opportunitites for reflection that would test the theorectical model of science education. Results stemming from the test might illustrate strengths and weaknesses inherent in the model, and insights from the inquiry would have implications for altering the model.

A necessary step in field testing and evaluating the model is the selection of the issue to be considered. The issue should facilitate the implementation and evaluation of the model, in this case, by providing opportunities for critical thinking, personal involvement, and moral deliberation.

World hunger was selected as the issue to be considered. The hunger issue certainly met these requirements in providing an adequate evaluation of the model. As Lester Brown has stated, "The assumption of boundless abundance of raw materials is being replaced by the prospect of chronic scarcity for many vital ones."[1] An ecological ethic appears to be one of the greatest needs in today's world. In order for this ethic to permeate society, the

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[1]Lester R. Brown, In the Human Interest (New York: W. W. Norton and Company, Inc., 1974), p. 13.

reality that nations of the world are interdependent must strike home. Many nations have turned inward because of domestic problems, but they must scrutinize the world situation without their view being blocked by national self-interest.

A recent survey of attitudes among young people between the ages of eighteen and twenty-five revealed that more young Americans assign "top priority" to the solution of world hunger and poverty than to the solution of any other world problems.[2] But, the survey also revealed the misperceptions that young people have about these problems. Particularly important for educators is that the survey showed that American attitudes on such issues are more directly a function of education than any other variable.

For these four reasons--the need for an environmental ethic, the spectre of an interdependent world, the high level of interest among students for this issue, and the evident relationship between education and the development of concern for the dilemma of world hunger--world hunger was chosen as the issue considered in the model for responsible social action. "Who shall survive?" That question is a suitable place to begin a more ethically active existence.

The consideration of world hunger within the paradigm

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[2]Paul A. Laudicina, World Poverty and Development: A Survey of American Opinion (New York: Overseas Development Council, 1973).

is designed to provide opportunities for the needed experiences, data and insights. It is now appropriate to present a more precise design of the study of that particular issue.

Workshop Format

The workshop consisted of seven meetings, a total of sixteen contact hours. It met each Wednesday for seven successive weeks with five of the sessions running two hours and two running three hours. One unit of certificate renewal credit was offered on completion of the workshop with renewal credit based on attendance and participation. A description of the workshop was sent to each of the twenty-one Alamance County Schools one month prior to its beginning, emphasizing that it would be inter-disciplinary and for teachers K-12. Even though all participants were educators, a variety of backgrounds among particpants was considered desirable.

The intent was to evaluate the intial model with special emphasis on the moral deliberation element. This heuristic emphasis does not preclude the critical thinking and psychological concerns elements. The model builder recognizes that each element is necessary but none alone is sufficient. Before presenting a more precise description of the workshop, it is necessary to give attention to the model's elements and allude to considerations of these elements in the format.

Critical thinking requires recognizing assumptions

behind an argument, identifying logical inconsistencies, and providing support for one's generalizations through reason and evidence. The critical thinking element requires data and experiences leading to discrimination ability so that one can think critically. Relevant factual data should be available, generalizations should occur and research skills should be honed in order for the participants to acquire competence in critical thinking.

Some of the anticipated psychological concerns are feelings of incompetence in decision-making and guilt feelings caused by a disparity between actions or behaviors and higher moral standards. In order not to be immobilized by these, it is necessary to provide a climate of psychological safety and support. The realization that other participants are wrestling with similar concerns should help alleviate some of these paralyzing fears and provide a base for confidence building. It is imperative that an atmosphere of psychological safety and mutual respect be established.

Moral deliberation is a process by which a person formulates and justifies a position on an issue. In order for moral deliberation to occur, participants must be sensitized to the issue and have available means for making choices about the issue. Values clarification strategies help the participants to know and accept themselves and to be able to make choices freely and carefully. Moral judgment strategies enable participants to subject these values and choices to critical evaluation from a moral perspective. It is hoped that moral actions will follow moral judgments.

The format is designed to allow experiences in thinking critically about the issue, to build a sense of self-confidence, and to encourage judgment-action consistency.

Sources of Data

Materials should be available in order to facilitate the model. This is necessary for the critical thinking element so that relevant data are available. The following materials were classified as essential readings and suggested readings:

Essential Readings: Sufficient copies were available so that at any given time each participant could have access to a copy of one book.

1. Paddock, William and Paul Paddock. Famine 1975! America's Decision: Who Will Survive?
2. Borgstrom, George. World Food Resources.
3. Meadows, Donella, et. al. The Limits to Growth.
4. Hardin, Garrett. Exploring New Ethics for Survival: The Voyage of the Spaceship Beagle.
5. Brown, Lester. In the Human Interest.

Famine 1975! was selected because it was one of the first attempts to sound the alarm concerning the impending food crisis. Much of what the Paddocks' predicted in 1967 did come to pass and the participants could reflect on the Paddocks' success when analyzing predictions made in 1975. Also, we were living in the year that the Paddocks' predicted famine.

World Food Resources was selected because of the excellent presentation of data and tables. This reference gave relevant data without the concentration on ominous warnings so that the reader could project and try his own hand at predicting outcomes.

The Limits to Growth was selected because of its unique means of acquiring data and making predictions. Data were collected and fed into computers with the book being based largely on these cybernetic projections. The "Club of Rome" was responsible for this publication.

Exploring New Ethics for Survival was selected primarily for two reasons: the first being the ethics study examining morals and right conduct, and the second being the excellent use of a scenario in the voyage of the Beagle that recreates present day problems.

In the Human Interest was selected because it combined many of the desired aspects of the other selections. It provides an excellent overall analysis of the world hunger issue as well as related issues.

Suggested Readings: At least single copies were available.

1. Brown, Lester. By Bread Alone.
2. Brown, Lester and Gail Finsterbusch. Man and His Environment: Food.
3. Commoner, Barry. The Closing Circle.
4. Dubos, Rene and Barbara Ward. Only One Earth.
5. Ehrlich, Paul. Population Bomb.
6. Ehrlich, Paul and Ann Ehrlich. Population, Resources, Environment.
7. Pirages, Dennis and Paul Ehrlich. Ark II.
8. AID. War on Hunger.
9. Newsweek--November 11, 1974
10. Time--November 11, 1974.

Instrumentation

In order to acquire the necessary data and insights to be used in evaluating the model, instruments must be utilized to provide relevant data in answering raised questions. The problem then becomes what kinds of data are needed and from where should it come?

The instruments are designed to yield necessary data and insights to evaluate the initial model. Prior to selecting appropriate instrumentation, questions must be formulated

whose solutions offer perception bases in such an evaluation. When analyzing the initial model, one has to focus on the participants to determine its effectiveness. The purpose of the workshop for participants was to sensitize them to social issues, to offer a model of education for responsible social action, and to secure a commitment to some form of action on the selected issue.

Insights from the inquiry will have implication for the model of education, and these insights should emerge as solutions to the following questions which are pursued by examining the indicated instruments.

1. Were the participants involved in moral deliberation in order to select an identified alternative in the social issue?
   Examine--Logs, observational data, and interviews. The participants will keep a log of their reactions to the world hunger inquiry and ideas generated from the workshop. This record of events and reactions provides an excellent medium for moral deliberation toward a position or alternative in the world hunger issue

   The coordinator and outside observers will observe interactions between and among participants during the workshop as well as during free time periods in order to gain insights into the depth of moral deliberation taking place. There will be informal interviews in order to ascertain whether or not individuals are being affected by the program.

2. Does the Kohlberg scale work in this situation? Do the results of pre-analyses and post-analyses of moral reasoning correlate with observational and written data?
   Examine--Kohlberg scale results compared with log entries and observational data. Kohlberg's theory postulates that a person has qualitatively different bases for making moral judgments at successive stages. Independent of the specific values involved, there is a three-step sequence from the first preconventional stage in which good, bad are judged by consequences in terms

of punishment, reward, exchange of favors; to a second, conventional stage in which the importance of maintaining and justifying existing rules is the basis of judgment; and to a third, post-conventional stage in which the individual works with self-chosen universal principles such as justice, equality of human rights, respect for the dignity of human beings as individuals, etc.

There will be pre-analysis and post-analysis of moral dilemmas as well as moral levels.

A Teacher Problems Q-Sort will be given to participants. Simply stated, a Q-Sort is a method of making objective and verbal description. In making this Q-Sort description, participants were given a set of cards with statements of varying degrees of openness and asked to sort these according to quasi-normal distribution to describe his ideal. The cards were arranged from least pressing to most pressing ideals. The Q-Sort and method of scoring to determine teacher openness was devised by Dr. Robert Beale of the University of Alabama.

3. Did the participants gain in factual and conceptual knowledge as a result of workshop experiences?
   Examine--Pre-analysis and post-analysis of factual and conceptual knowledge. Also examine logs, observational data, and interview results.

4. Were the particpants concerned with the values underlying their decisions? Did a clarifying of values--both an evolution of values and an ability to be more precise in stating what they value--take place?
   Examine--Logs and observational data.

5. Did the participants become aware of the complex implications in social issues due to the socio-political and psychological tendencies present in the world hunger issue?
   Examine--Logs, observational data, and interview results.

6. Did the participants keep abreast of information related to the issue? Were there indications of awareness of media reports and outside reading related to the issue?
   Examine--Logs and observational data

7. Did the participants indicate that they are committed to some form of action such as change of life style, educating others, or becoming politically involved for a particular policy?
   Examine--Logs and observational data.

8. Did the participants generalize from the interdependence of world hunger to the interdependence of other global issues?
   Examine--Logs and observational data.

Outline of the Workshop

An outline will now be presented to more clearly illustrate the major features of the workshop. The outline includes the method of procedure in ordering participant experiences.

Workshop Outline:

April 9 - Introduction (Two Hours)

1. Pre-workshop analysis
   a. Factual and conceptual knowledge
   b. Moral level--Kohlberg scale
2. Introduction
   a. Purpose of the workshop
   b. Nature of the workshop
   c. Participant responsibilities
3. Brief history of food problems--presentation by coordinator
4. Activity: Divide groups into six smaller groups. These groups will represent Asia, Western Europe, North America, Latin America, Africa, and Eastern Europe (including U.S.S.R.)
   One half of the participants will represent Asia's population with the other half broken into fifths representing the remaining areas. Doughnuts will represent world food supply and will be divided according to per capita consumption of food.
5. Examine feelings of the members of each group in the activity.
   a. Values continuum of how you felt during this activity
   b. Values continuum of how you felt about the world hunger dilemma.
6. Present individual copies of the map--"The Fat Nations and the Thin Nations," Newsweek (November 11, 1974), page 58.

7. Present individual copies of "Declaration on Food and Population," Social Education (Nov./Dec., 1974).

April 16 - Causes of Present Global Food Crisis (Two Hours)
1. Discussion of causes
   a. Information will come from participants and coordinator
   b. Population growth and affluence will be emphasized with hand-outs
      1. Chart of population growth since 1830 (emphasis on exponential growth)
      2. Structure of present world population by area and age
      3. Annual per capita grain consumption in selected nations--based on Indian consumption
2. Small group discussions exploring:
   a. Reasons for population growth
   b. Reasons for affluence growth
   c. Reasons for other identified causes
   d. Individual rights, women's liberation, abortion, etc.
3. Use the "Man from Mars Approach" in deciding major causes
4. Individual rank ordering of causes
5. Assignment: Complete Q-Sort by April 23

April 23 - Effects of Hunger and Malnutrition (Three Hours)
1. "Hunger in Alamance County. . .and American Paradox" presentation by Ms. Georgia Walters, Nutritionist with Alamance County Health Department
   a. Personal experiences with hunger
   b. Attitude of society toward problem (her perception)
   c. Samples of nutritious food given to hungry
2. Effects of malnutrition
   a. Personal
   b. Societal
3. Values continuum
   a. Parenthood--right or privilege?
   b. Hungry children--whose responsibility?

April 30 - Potential Solutions or Mythological Panaceas (Two Hours)
1. General discussion of possibilities in
   a. Technology
   b. Population control
   c. Reduced consumption
   d. Land reform
   e. Change in political and social values and mores
2. Small group discussions of each potential solution
   a. Is it a "mythological panacea"?

b. If it looks good, how should it be implemented:

3. Rank ordering of most logical solutions by individual participants
4. Rethinking of "solutions"--rhetorical question: At what point does the interest of society at large override the interest of the individual--justifying individual penalties

May 7 - Self-Sufficiency vs. Interdependence (Two Hours)

1. Analysis of countries that have moved toward "self-sufficiency"
   a. China
   b. Muslim Tunisia
   c. Philippines
   d. Singapore
   e. Japan
   f. Bangladesh, Mali, and Iraq
2. Analysis of "self-sufficiency" vs. interdependence--small group discussions based on the following
   a. Spaceship Earth Concept
   b. Developed countries as producers and consumers
   c. Developing countries as producers and consumers
   d. "What right do Americans, now only five percent of the world's people, have to consume nearly one-third of the earth's energy and materials."
3. Group analysis of Garrett Hardin's "Tradegy of the Commons"

May 14 - Means of Deciding Who Shall Survive (Three Hours)

1. Dr. Paul Lutz, Professor of Biology at the University of North Carolina at Greensboro and Participant at the World Population Bucharest Conference, discussing world conferences on population and food
2. Analysis of triage, isolationism, and global cooperation
3. "Mini world conference" with participants selected to present arguments for selected countries

May 21 - Recapitulation and Post-Analysis (Two Hours)

1. Post-Analysis
   a. What can be done to insure an adequate food supply for all humans?
   b. Value conflict--freedom of life-styles versus the right of every person to satisfy basic food requirements
   c. Who is responsible for insuring an adequate food supply for all humans?

Implementation

The workshop was held each Wednesday for seven weeks, from April 9, 1975 to May 21, 1975 in Alamance County Schools' Board Room. Twenty-one teachers enrolled representing a variety of curricular levels and areas (Table 1). One participant was forced to drop out due to a conflict arising after the workshop began. Two participants were able to offer different and in certain cases unique perspectives since one was reared in Puerto Rico and the other was born and reared in the Philippines.

The participants were seated in a round-table pattern in order to foster discussion. All were treated as equals, but, as always occurs, certain participants voiced their opinions and concerns more readily than others. Permission was secured from each particpant for the workshop to be recorded on tape. The tape recordings of the sessions allowed closer scrutiny of the interactions taking place.

Attendance and participation were excellent (Table 2). The participants appeared to be involved in the issue and were striving for better understanding and possible solutions. High interest levels were maintained although the complexity of the dilemma caused frustrations to emerge. The workshop itself should be rated a success. When attendance, interest, and interactions are high, positive experiences should be forthcoming.

The next chapter will deal in more detail with workshop results and evaluation of the initial model. Data

Table 1

Levels and Curricular Areas of Participants

	Areas							
Levels	General	English	Math	Social Studies	Science	Health	Special Education	Library
K - 2	3							
3 - 5	3						1	
Middle School			1	1				1
High School		3	1	1	4	1		
Totals	6	3	2	2	4	1	1	1

acquired from the instruments will be analyzed in order to alter the model where deemed necessary in the quest for a more comprehensive model.

Table 2

Participant Attendance

Number of Participants	Number of Sessions	Total Possible Attendance	Total Absent	Total Present	Percent Present
20	7	140	8	132	94.29

Workshop Results

In the section presenting the design of the field test, eight questions were presented that would guide the evaluation of the initial model. Selected instruments were identified for data collection to be utilized in answering the questions and, thus, in evaluating the model. It is now appropriate to return to these questions and an examination of data.

> Question one: Were the participants involved in moral deliberation in order to select an identified alternative in the social issue?

The logs of the participants indicated that sixteen of the twenty participants were engaged in a moral deliberation process concerning world hunger. The four remaining

participants seemed to enjoy the workshop and attended regulary, but instruments (logs and tapes) indicated they did not become involved in a moral deliberation process. Of the sixteen who were involved in moral deliberation, nine were actively involved in that they regularly utilized the log and participated in discussion. An example taken from one of the logs of a participant involved in moral deliberation . . .

> This brings us back to the thought of who is responsible for feeding the hungry of the world? Are we to abandon the poor countries to their fate or give aid with no strings attached. Either attitude seems dangerous.

The following indicates involvement in moral deliberation to select an alternative in the social issue and is taken from a discussion:

> I think it is easy to see that we have to think in global terms. It almost seems impossible for us because of the way we live. When asked to think about rights versus privileges, I have difficulty doing that. How can I determine this? Even if we believe in the problem, we still react to it from our experiences. You cannot get away from that.

They did not find an alternative with which they were completely comfortable, in that they left the workshop striving for such a position. The participants were vacillating, but the process of coming to grips with the issue and seeking the alternative appears to be important. The participants indicated that they were much better prepared to deal with issues at the conclusion of the workshop in that they now had a process or method to deal with issues such as world hunger. Rather than prescribing for all

participants a standard method of attacking social issues, the model is designed to increase one's ability to make enlightened decisions. Each individual must retain choice as to how he or she wishes to use the processes just as each teacher must choose how he or she may best utilize the model of education.

> Question two: Does the Kohlberg scale work in this situation? Do the results of pre- and post-analysis of moral reasoning correlate with observational and written data?

The reaction to the pre-moral and post-moral dilemma questions did not indicate the gains in moral reasoning that log entries and observation data would have led me to expect. Apparently, either the relatively short period of elapsed time during the workshop did not lend itself to fundamental moral change or the instrument did not measure moral reasoning gains.

This researcher was unable to distinguish sharply between reasons a participant had for reactions to moral dilemmas. The participant reactions were very difficult to classify as fitting a particular Kohlberg stage. Perhaps moral levels are not as distinct as Kohlberg has stated, or, more likely, the inexperience of this researcher reduced the effectiveness of the instrument.

Previous studies using the Kohlberg moral stories and questions have been successful in measuring moral levels. The instrument was used in this study in a way similar to its use in previous studies. It would appear that the

relatively short amount of time in the workshop was a major reason for no apparent significant gains in moral reasoning. The researcher's use of the model was aimed at fundamental moral change, but the limited amount of contact time apparently did not lend itself to the desired change. There appeared to be some specific changes but they apparently have not been generalized.

When looking at three participants (A, B, C, in the table below) who scored high on the Q Sort (test for openness) and relatively high on moral reasoning, it was discovered that they exhibited larger gains in knowledge than three (D, E, F) who scored lowest on the Q Sort and relatively low on moral reasoning.

Table 3

A Comparison of Cognitive Knowledge Gain in Participants Who Scored High on Openness and Moral Stages With Participants Who Scored Low on Openness and Moral Stages

Participant	Q Sort	Moral Stage	Pre-Test	Post-Test	
A	+19	5(4)	2	8	
B	+17	5	11	17	Average
C	+13	5	6	15	Gain 7
D	- 9	3(2)	6	12	
E	-22	3(2)	6	9	Average
F	-27	3(2)	4	7	Gain 4

The three who scored high in openness and moral reasoning averaged a gain of seven correct answers when comparing the post-test and pre-test of factual and conceptual knowledge, while the three who scored lower averaged a gain of four. Obviously, this data sample is not large enough to make definitive conclusions, but it appears that knowledge gain is correlated with openness and moral reasoning ability when using this model. The heuristic concentration on moral deliberation did not prevent knowledge gain and individuals who are open to new ideas appear to have greater knowledge gains.

Question three: Did the participants gain in factual and conceptual knowledge as a result of workshop experiences?

The participants were involved in critical thinking through involvement, exploration, interaction, and problem solving that led to significant increases in factual and conceptual knowledge. During the first meeting of the workshop, a twenty item pre-test of factual and conceptual knowledge of world hunger was given immediately after an introduction to the workshop. A twenty item post-test was given at the beginning of the last session. A t-test of gains in knowledge between the pre- and post-tests was significant at the .01 level.

Table 4

t-Test of Workshop Knowledge Gains

Pre-Test	Post-Test
$N = 20$	$N = 20$
$\bar{X} = 7.6$	$\bar{X} = 11.55$
$SD = 2.48$	$SD = 2.98$
$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1 - \bar{X}_2}} = 4.46$	$(dF) = 18$

In addition, at the conclusion of the workshop, the participants were better able to use the terminology needed in a study of world hunger. This was determined by observations of the interactions occurring during the workshop and by comparing log entries at the end of the workshop with those at the beginning of the workshop. The following quotations are taken from two participants. The first of each pair was at the beginning of the workshop while the second was taken from interactions at the conclusion of the workshop.

> So many things can be done by governments, but what can I do as an individual.

> It all comes down to your own personal feelings and what you are willing to do yourself. Until we are willing to take individual responsibility, I see no change. We are in a supreme position since we can feed so many other people. It is a part of our responsibility to at least try.

> The world hunger crisis is very difficult for me to grasp. It seems that this world has so much and yet people appear to be starving.

> After having these sessions on world hunger, I feel that I am much more knowledgeable about the problem than I was when we began the study. Also, I shall be much more concerned in the future in using my vote to make it

> count toward planning and implementing the necessary work to ward off hunger crises.

Neither of these before and after reactions utilize terminology associated specifically with world hunger, but they illustrate individuals who have become more knowledgeable about the dilemma and more confident in working for its resolution. The first participant's comments indicate that an awareness of individual responsibility has been internalized, and the emphatic second statement indicates growing confidence due to knowledge and conceptual gain. The second participant represents those who have difficulty accepting the dilemma due to this country's living conditions. But, understanding does occur and a personal resolution and commitment is made after knowledge of the social issue is attained.

> Question four: Were the participants concerned with the values underlying their decisions? Did a "clarifying of values" take place - both an evolution of values and an ability to be more precise in stating what they value?

The model provided means for the participants to wrestle with what they value, but they generally did not become precise in stating these values. For example, the participants used examples of how they felt rather than trying to analyze why they felt as they did. The participants tended to use critical thinking skills alone as contrasted to more affective skills in trying to arrive at workable resolutions of the issues. Even though they were involved in moral deliberation, when they were striving for a position they appeared to rely on a critical thinking type of analysis.

For example, one of the participants offered the following analysis when examining causes of world hunger:

> I think we should divide the problems causing world hunger into sub-causes. If necessary we then can break the sub-problems down further.

Many were trying to think the world hunger issue into small understandable pieces. This skill is essential, but it appears to be only part of the process of understanding an issue. Often, it is difficult to maintain a "sense of the whole" when attempting to solve sub-problems due to fragmentation causing loss of perspective.

Much of our present educational system, thus including the subsequent behavior patterns of those who go through it, consists largely of reducing wholes into parts. We relate to our surroundings in the manner that we perceive them. The participants' difficulty in becoming precise in stating what they value appears to be related to this perception. Reducing wholes into parts is important, but one should also be aware that these parts when combined equal the whole.

The social, scientific, and technical dilemmas we face cannot be solved by knowledge alone. One must suggest the consequences of certain choices, and to do that one should consider values and personal needs. Participants were urged to get in touch with their values and were asked to give explanations concerning stated positions. An attempt was made to prevent participants from being comfortable with an objective analysis of the dilemma by emphasizing their

values and personal feelings. Processes in the moral deliberation and personal involvement elements were offered as means other than critical thinking in reaching decisions.

Concern about values underlying decisions was evident, but lack of time along with this perception problem appeared to prevent participants from reaching a definite defensible value position. However, values were clarified because the participants were involved in a self-reflection process and were able to compare their feelings with the stated positions of other praticipants. Although the data in the logs is unorganized, it is relevant to and concerned with questions such as these: Who am I? Which of my characteristics are common and which are unique? What do I value? Actually the participants were not only working on the hunger issue, they were also working on themselves. The workshop provided opportunities for participants to become conscious of what they value. This is illustrated by the following statements of which the first is taken from a log and the others from group discussions:

> Every person has a right to a decent life, meeting basic needs in food, clothing, and shelter before other people should have surpluses way above their needs.
>
> There is enough on this earth to be shared by all. But when you look at the contrast between wealth and poverty you realize that this is not right.
>
> If we could just deal with human values, not American values or Indian values, but basic human needs and values.

It is difficult to determine whether or not there was an evolution of values. The participants became aware of alternate value positions and joined in discussions of these

positions. Cognitive developmentalists have stated that awareness and interaction with individuals of different value positions is necessary for evolution of values such as world peace and equality. The workshop, as guided by the initial model, provided these experiences.

> Question five: Did the participants become aware of the complex implications in social issues due to the socio-politcal and psychological tendencies present in the world hunger issue?

All felt stymied when confronted with political realities. The participants relished attacking the issue, but they exhibited anguish over not being able to come up with "the solution." Some of the participants were interested in trouble-shotting (trying for an overall solution) while others wanted to clear up small parts of the issue. A feeling of helplessness soon emerged among the trouble-shooters, but the individuals who were concentrating their efforts on one aspect of the dilemma appeared to enjoy some success.

For example, two entries taken from logs are:

> I don't see this hunger problem being solved no matter how many ways our workshop groups suggest doing it. It seems useless because the situation looks hopeless to me.

This position of hopelessness can be compared to the following reaction:

> I am interested in finding hope in lessening the hunger crisis and I am reading about food production. Of course, food waste is a problem, too. One idea of interest is C.S.M., a balanced, nutritious blend of corn meal, soybean flour and oil, and non-fat dry milk solids. It contains plenty of protein and is fortified with vitamins and minerals.

> The flavor of C.S.M. is bland, so people in different parts of the world are willing to eat it. Bland C.S.M. can easily be seasoned so it tastes like native dishes. It also has a texture which seems to be acceptable most anywhere. And it's relatively cheap to produce. This is encouraging to me and seems to offer hope.

The participants came to realize that the world cannot remain divided between the permanently rich and the permanently poor. Sooner or later a collision between those who "have" and those who "have not" is inevitable. Recent events have clearly shown that economic power and consequently, political power is shifting toward resource rich countries. For example, with its control over petroleum, Saudi Arabia has emerged as a new kind of "superpower."

The following quote taken from a discussion indicates this awareness:

> It is time for us to realize that Africa, Asia, and all these other places have resources that we really need, but we also have resources that they need. To me there is no solution to it all until we begin to think in big terms like this.

Although recognizing the necessity for global cooperation, a small number of the participants had major difficulties with the interdependence concept. They tended to overvalue our nation's interests and culture while undervaluing the interests and cultures of other people. For example, blame and anger arose when some pointed at the way our goods were handled when we sent developing countries charitable supplies and goods.

Question six: Did the participants keep abreast of information related to the issue? Were there indications of awareness of media reports and outside readings related to the issue?

There were numerous references to articles dealing with the hunger issue in logs and discussions. Also, several timely television programs were aired during the workshop. These references included the literature available in the workshop as well as outside sources such as television, newspapers, magazines, and books. The model and the issue allowed opportunity for outside experiences and the participants took advantage of the opportunities.

For example, some log entries leading into discussions of articles are:

> I read an article called "mirrors of Washington" by Isabelle Shelton in the Burlington Daily Times-News. She quoted Dr. Margaret Mead on U.S. agriculture and where it is taking us.
>
> This past weekend, I read three articles concerning world hunger that were optimistic.
>
> After coming home and reading the November, 1974 issue of Time Magazine, I have a better idea of the scope of the world hunger problem.
>
> This article, "New Food Collection Schedule," taken from the Burlington Daily Times-News shows one of the things being done in Alamance County to solve local hunger problems.
>
> On reading Commoner's book, The Closing Circle, - I am struck by the fact that Commoner is so logical and makes so much sense - yet, has this book had that great an impact since it was published in 1971?
>
> The Other America by Michael Harrington states, "In our America, one of the wealthiest nations the world has ever seen, there are tens of millions of Americans, at this moment, maimed in body and spirit, existing at levels beneath those for human decency.

> Question seven: Did the participants indicate that they are committed to some form of action such as change of life style, educating others, or becoming politically involved for a particular policy?

The participants indicated that they wanted to educate others on the issue, but there was little indication of dramatic life-style changes. In the logs and discussions there were indications of individual efforts to curb food wastes, attempts at diets that would be more efficient, and the knowledgeable use of voting rights in order to influence the hunger issue. Reactions were manifested primarily as stress and concern evolved which led to a commitment to inform and educate others. This is not surprising in that all the participants were educators.

The following analysis is taken from one of the logs and typifies the responses:

> I feel strongly moved to do something, personally, for the cause. At the same time, I feel my small efforts are ineffectual in view of the ignorance of most of the population. That is, until those individuals with power make an effort to inform the people of the existing problem, it seems as if individual efforts are ridiculous. Rather than myself giving up steaks, I feel my efforts would best be directed toward informing the public. It seems little has been done in this direction.

In February, 1977, a follow-up questionnaire (see appendix) was sent to participants in order to determine what actions followed the workshop. Seventeen of twenty participants returned the questionnaire. The results tended to reinforce what had been written in the logs, but the questionnaire yielded a surprisingly small number of participants who had taught a formal lesson on world hunger

since the conclusion of the workshop. The nature of teaching assignments and age of students appeared to be major causes in this relatively small number. Other interesting results were that thirteen indicated consciously changed lifestyles (see table), sixteen indicated that they are more conscious of waste, and all respondents stated that they keep up with printed materials on world hunger and have discussed the issue with others.

Table 5

Results of Questionnaire

1.	Have you consciously changed your lifestyle as a result of experiences in the "Inquiry into World Hunger" Workshop? Yes 13 No 2 Somewhat (Comments) 2
2.	Areas describing lifestyle changes. I have or am--
8	educating others about the world hunger issue.
11	altered my diet so that it is more efficient in using natural resources.
16	now more conscious of and attempt to prevent food waste.
3	become politically involved in working for certain positions on the issue.
17	attempting to become more knowledgeable on the world hunger issue by reading, media reports, etc.
4	raised money or provided food to fight hunger and malnutrition.
13	examining my present lifestyle in light of the world hunger crisis.
3.	Have you taught a unit or formal lesson on world hunger since the conclusion of the workshop? Yes 11 No 6
4.	Since the conclusion of the workshop have you discussed the hunger crisis informally? Yes 17 No 0
5.	Groups with which informal discussions occurred--
14	with students
15	with peers
17	with family
4	other

Results from the second question illustrated that the more passive modes of action occurred more frequently than overt actions. For example, a comparatively larger number indicated they are now more conscious of wastes, reading literature on world hunger, and examining their present position on world hunger while fewer indicated actions such as educating others, altering their diet, becoming politically involved, and raising money for hunger relief. The participants who answered question one negatively responded to the second question even though they were asked to refrain from responding.

Question eight: Did the participants generalize from the interdependence of world hunger to the interdependence of other global issues?

It is extremely difficult to separate world hunger from related issues such as overpopulation, birth control, world trade, right to life, etc.; so generalizations automatically take place. The participants also dealt with issues not as closely related such as women's liberation, individual rights, effect of religion, illiteracy, unemployment, and distribution of wealth, etc., so they did generalize to other issues.

Discussion often centered on the concept that the world is fast becoming a single unit. Resource scarcities, international trade, shared food supplies, and ecological crises are but a few of the ties among people and nations of the world. Also it became apparent that these issues are

interrelated. Participants' reactions usually nominated education as the means for arriving at an understanding of these interdependencies. These reactions concentrated on a new perspective for global living: a perspective that includes knowledge about and acceptance of individual peoples and cultures at the same time that it recognizes the interrelationships among all nations.

Criteria Used in Evaluating the Model

When evaluating a model, one needs criteria to guide the examination. The initial model has been considered for comprehensiveness and boundaries, inner consistency of elements, interaction of elements, and validity.

Validity or outer consistency refers to the model-environment relationship. This examination focuses on whether or not the model affects the environment as intended. Means for an examination of the effectiveness of the model have been presented in the preceding section, and it is now time to discuss the other criteria.

The comprehensiveness and boundaries of the model can be dealt with by questioning three aspects of the model. First: Is the model critical? Does the model developer appear to exercise careful judgment and analysis? The second aspect is: Are all necessary elements included? Do the elements allow a comprehensive study of the issue? The last aspect is: Are the boundary conditions established? Does commitment to action primarily emerge from moral deliberation?

or, is the relationship between model and environment as linear as it appears in the initial model? This consideration of comprehensiveness and boundaries is a check to determine whether or not necessary variables are included and defined.

Inner consistency refers to the model's structure. One examines the model to determine whether or not the elements are consistent. One should ask, Are the elements comparable in importance and function? Are the elements designed to guide experiences in similar manner? Is each element a process? Inner consistency helps in determining whether or not the elements work together for the intended purpose.

The final criterion used in evaluating this initial model is the interaction of elements. Do the elements allow "cooperative" consideration of the issue? Are there important interfaces between the moral deliberation and personal involvement elements? The intent of the model was to identify dynamic interactive processes that have reciprocal influence.

These are primary criteria applied in examining this model. The aim is to improve the model so that it is more effective. These criteria provide examination opportunities that should lead to bases for a more comprehensive model for responsible social action.

CHAPTER V

TOWARD A MORE COMPREHENSIVE MODEL

This chapter will present concerns emerging from the workshop, a revised model stemming from workshop experiences and additional reflection, and an applied model offering a look at the model in practice. It should be emphasized that this chapter does not imply that the model in chapter three should be forgotten; an opposite statement would be more accurate. The initial model was designed to guide the field test, to be tested in reality, and to be revised where necessary. This chapter attempts to build on and expand the initial model in order to arrive at a more workable paradigm for the study of social issues.

At this time, the researcher still has uncertainties and is struggling with certain aspects of the model. As previously indicated, this dissertation involves the evolution of a model as well as the model builder himself. The presentation emphasizes the dynamic character of the model, and it should not be considered as static or complete.

Major Concerns Deriving from the Workshop

Many problems emerged during the workshop, as was anticipated. Among the difficulties were at least two that were inherent in the design of the workshop. These were lack

of time and difficulty in maintaining continuity. The sixteen contact hours did not allow enough time for the participants to explore all aspects of the issue. A pre-determined ending does not lend itself to a comprehensive study of an issue. Continuity is always difficult when a week elapses between meetings. These difficulties are part of reality when working with school teachers.

Other problems that emerged need to be closely analyzed because of their relationship to the model. I am grouping these problems under the following headings for discussion purposes: communication difficulties, egocentrism, and the need to deal with psychological concerns.

Communication difficulties. The problem of communication in social-issues education was made particularly clear during the last session of the workshop. "Recapitulation" was the topic for the session; and, as the title indicates, we were discussing some of the previously made points. The role of the lifestyle of women in controlling population was brought up for consideration. Women's Liberation emerged as a base for this short discussion. After several exchanges the participants realized that several different and conflicting concepts of Women's Liberation were operating in the discussion. Many of the participants were amazed when they discovered that this topic elicited so many different interpretations.

This topic led to a discussion of some of the

communication difficulties experienced in the workshop. The participants came to understand the necessity for a common language in dealing with social issues. This discussion resulted in agreement that the problem appeared to center on our tendency to overestimate what people know. One's experiences provide the basis for communication. Communication is the end result of a process in which there is an interchange of thoughts or opinions. It makes known the knowledge or quality conveyed. We assume individuals "know where we are coming from," but often no groundwork has been laid for this knowledge.

According to Weller, "language is both a vehicle for communicating ideas and creator of a particular world view."[1] He elaborates by stating that, "It is extremely difficult to conceptualize something for which one has no readily accessible terminology." The language that adults speak contains in both its semantic and its syntactic organization a vehicle for organizing the world. The way in which words are put together can be seen as a logical system. Some theorists, such as Jerome Bruner, suggest that language learning, the development of adequate terminologies, is one of the tools of cognitive development.[2] Others, such as Jean Piaget,

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[1]Richard H. Weller (ed.), Humanistic Education (Berkely, California: McCutchan Publishing Company, 1977), p. 7.

[2]Jerome Bruner, R. Oliver, and P. Greenfield, Studies in Cognitive Growth (New York: Wiley Publications, 1966).

suggest that the advancement of language follows rather than precedes the attainment of more elaborate cognitive structures.[3] No one has been able to prove conclusively whether language accounts for advanced cognitive behavior or advanced cognitive behavior accounts for language development. What appears to be recognized by all developmentalists is that language, thought, and behavior are intricately interrelated. This relationship appears to emerge with both greater clarity and greater complexity as development proceeds.

In establishing a personal position on an issue, one may create a void between understanding one's self and other individuals. How can this void be overcome? Language serves as the bridge between individual ideas of positions and enables a sharing of pools of information and feelings. Ian Barbour states:

> Knowledge of other selves is difficult at best. We ascribe to another person a non-observable self which transcends our direct experience of his body and behavior. Selfhood is not fully describable by the attributes predicated of objects in space and time. A person is an agent as well as an activity, a center of thought, intentionality, and decisions, who can reveal himself to us in deliberate communication.[4]

A common understanding of terms used in dealing with issues is of the utmost importance. Dilemmas offer many areas of confusion, so common discussion bases are important in order to deal adequately with a social issue. An attempt at

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[3]Jean Piaget, The Construction of Reality in the Child (New York: Basic Books, 1954).

[4]Ian G. Barbour, Myths, Models, and Paradigms (New York: Harper and Row, 1974), p. 139.

overcoming communication difficulties appears to have two major hurdles--one technical, the other fundamental. Part of the problem is technical in that additional contact time and agreement on definitions of important terms, for example a glossary, could help to alleviate this difficulty. The technical part can be worked out with some confidence, but the fundamental problem should be recognized as an ongoing difficulty. The fundamental part is based on "the treachery of language" arising from basic definitional and understanding difficulties. Weller has written that, "Language both implies and generates particular assumption systems that may be all but invisible to the user."[5] This dilemma must be recognized in order to prevent it from undermining the social issues study. The nature of language, and its use on an individual basis, enables this problem to be a constant one. Although this difficulty cannot be prevented, one must not allow it to override the total consideration of an issue. Realization of the inevitability of "the treachery of language," while at the same time working on aspects that can be controlled, enables one to deal more adequately with communication difficulties by successfully negotiating one of the major hurdles and by alleviating the destructive potential of "the treachery of language" hurdle.

Fundamental and technical difficulties have been discussed, but there is a third area of difficulty to consider in communication. This difficulty is dogmatism. Some

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[5]Weller, op. cit., p. 9

participants made statements as if they were established facts. Positiveness was exhibited in their assertions, but often they were based on assumptions rather than evidence. This observed dogmatism appeared to fall primarily in two areas: entrenched positions and value rigidity.

The establishment of entrenched positions occurred when one fortified and defended his positions without benefit of examination from other perspectives. Entrenched positions offer a very difficult problem for the teacher due to the lack of flexibility caused by this perspective. Thought processes involved regulative functions such as convincing, checking, and proving. Much of an integrated logical thought process is derived from an orientation toward others' points of view and from the attempt to make understandable to others what one knows intuitively.

Value rigidity offers blocks that prevent an individual from analyzing the many sides of a dilemma. It weakens ability to recognize new facts and others' opinions by offering resistance to new information. This causes an inability to stretch one's mind, to clear away the cobwebs, and to handle a dilemma forthrightly, Often, such an individual does not see social dilemmas as dilemmas, but rather as problems that will be solved if a certain action is taken.

In order for communication to occur, by definition individuals should have a common language base. We all communicate based on our experiences and thus may have different understandings of basic terms and concepts. Definitions

or understandings of important terms and concepts should be agreed upon prior to meaningful discussion. In a short workshop format, the coordinator or instructor should be responsible for providing common understanding, but in a setting with more time the participants should work toward evolving a language that will facilitate the intended purpose. The instructor should also be aware of the possibility of dogmatic behavior such as entrenched positions and value rigidity that lessens the effectiveness of the model.

Egocentrism. Egocentrism is a term referring to concentration upon an individual's own welfare and excessive concern with the self rather than others. The person does not make adequate distinction between his own perceptions, thoughts, and feelings and those of others. It is a problem in perspective and is related to lack of empathy. The lack of recognition or acceptance of others' points of view stands in intimate relationship with lack of adequately dealing with a social issue. Egocentrism can lead to the epistemological predicament of apparently being unable to get outside one's own mind because all the knower can know will be what is present to his own mind.

Some of the participants appeared to be using the workshop primarily for their own purposes, regarding themselves rather than the hunger dilemma as the primary focus. Introspection is necessary for establishing a position, but this can be dangerous if the individual becomes too egocentric. Self-analysis is a major element of this dissertation

in that one should get in touch with his values and feelings, but if the self assumes such overriding importance that a true analysis of the issue is precluded, then the individual does not grow. In this situation the issue and individual are not allowed to affect each other; the individual only attempts to affect the issue.

Morally responsible behavior is blocked by egocentrism. According to Robert White:

> The self is perceived as causally important, as effective in the world--which is to a major extent a world of other people--as likely to be able to bring about desired effects, and as accepting responsibility when effects do not correspond to desire.[6]

Moral responsibility involves being accountable for the carrying out of a duty or obligation to one's self or others. The egocentric individual cannot behave in a morally responsible manner in that there is no apparent empathy with others as well as no apparent recognition of other's perspectives. Aristotle's writings state that one is responsible for one's action if it is "voluntary." In doing what one does, one causes certain events to happen. One's actions affect others, but egocentrism precludes accurate recognition of the affect due to the preoccupation with one's self.

A morally responsible person is capable of determining his own acts and capable of being deterred by sanctions or consequences. A morally responsible person has the character of a free moral agent. Moral agency involves choosing between

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[6]Robert W. White, "Ego and Reality in Psychoanalytic Theory," Psychological Issues, 1963, p. 281.

self-interests and the interests of others. The position of being moral only when it is in one's best interest rules out being a moral agent. Morality applies where interests conflict. If self-interest is the primary basis of one's perception, it is very unlikely that the person will become a morally responsible agent as advocated in the initial model because there would not be a moral solution of conflicts of interests. Egocentrism prevents a true analysis of an issue in the spirit of this model of science education.

Dealing with egocentrism is a very difficult problem because the individual does not concentrate on the issue due to self-preoccupation. But, if one is able to act as a moral agent, does this model have all the answers? Anytime one asks people to act responsibly one raises the spectre of "playing God." In dealing with social issues that involve life and death, the problem of "playing God" emerges. Sensitizing the conscience toward the stark reality of a specific problem or dilemma is what Paulo Freire call "concientizacao."[7] When one acts positively after discovering this reality, the decisions may require "diety like" reasoning process. Concientizacao must be exercised in sensitizing individuals so that one can attain awareness of the reality of the issue. One must admit this reality before adequately dealing with an issue. Perhaps this will aid in dealing with issues that are

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[7]Paulo Freire, Pedagogy of the Oppressed (New York: Herder and Herder, 1970), p. 186.

currently precipitating so much anguish in potential decision-makers. Admitting and working with this reality leads to another area of concern identified in the workshop: psychological concerns.

Need to deal with psychological concerns. The needs of some of the participants appeared to exceed my ability to deal with their concerns. Some were not ready for the enormity of the dilemma and thus appeared to have their energies drained. Even though their intellectual ability may have been greater than that of other participants, they may have achieved less because of their perception of the issue. These participants seemed to fall victims to what Persig has termed "gumption traps,"[8] and lost enthusiasm for what they were doing. In this analysis gumption refers to quickness of perception and depends on common sense and resourcefulness. A feeling of powerlessness emerged in that participants felt impotent in producing an effect. When successfully dealing with a complex issue, one should attack it energetically and zestfully. Some were not ready for the complexity of the issue and appeared to lose their energy and zest. For example, three participants readily offered ideas at the beginning of the workshop; but when non-acceptance of these ideas occurred and alternatives were offered they had a tendency to retreat and offer ideas less frequently or not at all.

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[8]Robert Persig, Zen and the Art of Motorcycle Maintenance: An Inquiry into Values (New York: Bantam Books, 1974).

Guilt feelings also appeared to cause problems in dealing with the issue. Guilt usually refers to the state of one who has committed a breach of conduct. Everyone exhibited guilt feelings at one time or another during the workshop. Guilt often arises because one fails to do something he knows to be right. The guilt emerging from the workshop appeared to have a different origin due to awareness of inequities. It was often a "psychological guilt" in that our standard of living was immeasurably better than that in the hungry world, and that our actions, individually and nationally, appeared to go against personal standards. For example, there were numerous entries in logs similar to the following:

> I am concerned about this country's seeming self-centeredness.

Lack of self-confidence offers another psychological concern. Self-confidence refers to being confident of one's own reasoning powers. The self develops by being conscious of objects and activities in the outer world. Competence in decision-making is an anticipated end result of the model of education. Robert White offers the following analysis:

> Competence is a foundation of self-esteem based on self-respect, in contrast, for example to self-love. An accumulated sense of competence builds ego-strength--the ability to overcome anxiety associated with perceived "dangers" or "threats."[9]

Dogmatic behavior on the part of certain participants contributed to this lack of self-confidence. Positiveness

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[9]White, loc. cit., p. 281.

in their assertions along with accompanying entrenched positions and/or value rigidity contributed to self-confidence problems with other participants.

Individuals with self-confidence problems need a supportive environment. Often the study of social issues leads to confrontations precipitated by divergent opinion. The teacher should make a sincere effort to establish an atmosphere of mutual respect in order to build self-confidence as well as providing the best environment for meaningful dialogue. Willis Harman offers the following analysis that speaks to this need.

> A "self-realization ethic" asserts that the proper end of all individual experience is the further development of the emergent self and of the human species. The appropriate function of all social institutions is to create an environment which will foster that process.[10]

When working toward resolutions of social issues, one must become precise about language, be careful of egocentrism, and be prepared for the psychologically taxing complexity of the issue. The question of what one holds to be good and right should be answered and utilized in working toward developing justifications. The appropriateness of the definitions and justifications are of utmost importance in determining the success of "playing God." Ethical relationships between man and man as well as nation and nation should be emphasized. Difficult questions and answers are

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[10]Willis Harman, "The Coming Transformation," The Futurist, April, 1977, p. 110.

required in reaching these decisions and they depend on rigorous efforts in critical thinking, personal involvement, and moral deliberation.

Communication difficulties, egocentrism, and the need to deal with psychological concerns have been analyzed because of their apparent relationship with difficulties experienced during the workshop. Each presents a hurdle to be overcome when dealing with social issues in a group setting.

As has been indicated, the individual who successfully, deals with social issues must first know himself. "Successful" is used in the sense of attaining a defensible position with which one is comfortable and committed. One must try to remove the "psychological burdens" that pressure him to act in predetermined ways. In order for the person to lessen these pressures, some degree of personal liberation must occur. Personal liberation refers to a process in which an individual clears away restraints which entangle or burden the mind so that a range of thought is possible. It enables a person to extricate himself from a difficulty by disentangling the threads of his perplexities. The individual then possesses means to focus on the issue in a single-minded manner. The process leading to personal liberation appears to involve interaction among the three elements of the model.

Introduction to the Revised Model

A recent article by Willis Harman speaks eloquently, as few have, about the future of science education. In "The

Coming Transformation in Our View of Knowledge" Harman discusses a new knowledge paradigm, and the implications for science education are powerful.

In Harman's knowledge paradigm he argues that:[11]

> 1. Knowledge will be seen as inclusive rather than exclusive--Science will no longer look at much of the wide range of human experiences and say "We will leave that to religion and the humanities." There will be recognition that any system of knowledge that has guided a stable society may be assumed to be rooted in the human experience.
>
> 2. Science will be eclectic in methodology and in its definition of what constitutes knowledge. The controlled experiment will not be viewed as the only way to revealed truth. Antoine de St. Exupery, the French Novelist, said "Truth is not that which is demonstrable. Truth is that which is ineluctable"--that which cannot be escaped.
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> 3. The new knowledge paradigm will be hospitable to some sort of systematization of subjective experiences, the domain which has heretofore largely been left to non-science--the humanities and religion. Science will include the study of those experiences from which we derive our basic value commitments.

Harman's knowledge paradigm appears to have implications for any curriculum effort in science education. The revised model has been developed with science education as its base but it is clear that it has much broader implications. Its purpose was to broaden science education and provide means toward knowledge and understanding of the human experience. It has evolved into an attempt to move science education in the direction of the new knowledge paradigm that

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[11]Willis Harman , "The Coming Transformation in Our View of Knowledge," The Futurist, 1974.

Harman outlined. Responsible social action appears to be dependent upon an inclusive knowledge paradigm, understanding of the self, and rigorous moral deliberation efforts. An inclusive knowledge paradigm should lead to new research and inquiry skills for social decision making. The "facts" are frequently contradictory or inconclusive; thus the broadening of allowable means of data collection will provide better decision-making bases. The inclusive knowledge paradigm will provide more opportunities for self-reflection and moral deliberation due to the greater variety of experiences.

The use of the model should promote intellectual growth, a better understanding of what one believes, and opportunities to become actively involved in resolving dilemmas that precipitate from the issue. Processes are presented that offer a framework for guiding critical thinking, personal involvement, and moral deliberation activities.

In chapter three a working model was presented (figure 3) that was to be used in a teacher workshop. The purpose of the workshop and that initial model was to allow movement from theory into practice and back again. The workshop allowed the model to be grounded in reality so that it could be tested and revised.

It is now time to direct attention to a more comprehensive model, revising the workshop model in light of some of the discovered weaknesses evident in the workshop. When deriving a more comprehensive model it is clear that one cannot deal only with science education or for that matter,

education; one should deal with humanity. The greatly changing conditions of life and world events are demanding a new perspective for all people as well as for teaching science. The problem is that of "humanizing the focus and feeling of science while at the same time organizing and rationalizing the forces of humanity."[12] The task we face is to align the teaching of science with social realities. To do so we need to consider the recent social changes and changing responsibilities of science within the culture. The things people do, use, value, and base decisions on are more science related than ever before. Science is a value system and thus has a human frame of reference.

Teaching science with an issue-focus may provide the student with a means for interpreting what he has learned within his own experiences. The student should be capable of using what has been learned about science for cultural adaptation and social progress. The student should be able to effect responsible action on science-based social dilemmas.

This theoretical model attempts to depict a dynamic construct in operation. Rapidly accelerating change in society is assumed to be a primary variable. This study concentrates on a model or paradigm for science education leading to responsible social action. A conceptual framework is provided so

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[12]Glenn T. Seaborg, "The Positive Power of Science," Environment and Society in Transition, (New York: New York Academy of Science, 1971), Vol. 184, p. 686.

that certain important components of humanitarian knowledge will be included in the science curriculum.

A democratic society postualtes change based upon intelligent participation. The process of intelligent change includes all of the elements presented in the revised model to arrive at effective positions or solutions and constructive action. To be an effective member of society one must be able to take an active part in the constant reformulation of social values. The success of our society is dependent upon the extent to which citizens can assume responsibility for necessary group or individual action. The ability to function effectively as a member of society must be acquired. With these thoughts in mind the revised model of science education is presented as a human process model for responsible social action. The thrust is for science to work toward the enhancement of individuality and a sense of worldwide community.

The Revised Model

The social issue to be considered and its selection are of the utmost importance. This researcher is seeking to develop a model to be used when considering issues in science courses rather than developing a new course totally for the study of issues. The optimum potential value of this model would appear to emerge when study in a science course raised a specific issue: the model could then be applied to that issue's consideration.

But if a teacher wants to provide social action experiences as an integral part of the science curriculum to be taught at a specific time, does the model have merit? The model would also appear to have merit in this situation. In this case a social issue may or may not be selected rather than emerging from class activities. Selecting an issue can be a complicated and time consuming procedure. It involves asking questions about the major issues facing our society. This researcher feels that an attempt to determine the major issues facing society in the coming decade should serve as a time parameter with today's issues receiving major consideration. If one attempts to deal with potential issues well into the future, opportunities for action and reflection are reduced or lost.

It is important that students participate in selecting the issue to be considered. The workshop does not provide insights as to how this might be accomplished since the issue was selected prior to the participants' election to participate in the workshop. It is apparent that an inordinate amount of time may be used in the selection of the issue, and one should develop guidelines for such a selection. Newmann offers procedures for such a selection in Education for Citizen Action[13] and Skills in Citizen Action.[14]

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[13]Fred M. Newmann, Education for Citizen Action (Berkely, California: McCutchan Publishing Corporation, 1975).

[14]Fred M. Newmann, Thomas A. Bertocci, and Ruthanne M. Landsness, Skills in Citizen Action (Madison, Wisconsin: Citizen Participation Curriculum Project, 1977).

The revised model differs from the initial model in at least three ways. These differences will be pointed out at this time and elaborated on in the discussion of the revised model. A greater emphasis on interactions of elements and self-reflection as well as alteration of the elements themselves are the major changes in the revised model.

One must deal with the interactions among the elements of a model. In this model it is important to remember that concern is a total perspective involving the whole person and requiring his allegiance. Certain personal-impersonal polarities need to be overcome so that personal action may be taken. These polarities include the difficulties that arose during the workshop such as communication, egocentrism, and psychological concerns. It is important to be cognizant of and work with these interactions so that a reconcilation overcoming the personal-impersonal separation can occur. Concern will help to alleviate the separation while courage will overcome the accompanying anxiety. Ian Ramsey has written that, "Love is reconciliation overcoming estrangement between personal beings and it is also the reunion of that which was separated, the recovery of fundamental identity."[15] Concern, courage, and love are important in the fundamental identity that appears to be of major importance in responsible social action.

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[15]Ian Ramsey, Religious Language (New York: SCM Press, 1957).

The initial model discussed the importance of self-reflection but the revised model heavily emphasizes the importance of it. When one deals with an issue, self-reflection is a major determinant of the endeavor's success. The revised model includes action and reflection which are necessary for responsible social action as major components of the model.

Two of the model's elements have undergone major changes while the third, moral deliberation, is more detailed. The experiences in the critical thinking element of the initial model were changed to processes leading to discriminating critical thinking in the revised model. The psychological concerns element of the initial model was renamed personal involvement in the revised model so that each element is a process and its emphasis was altered so that a fixation on individual concerns would not preclude valuable group interactions.

The initial model was grounded in Newmann's works. The revised model for responsible social action differs from Newmann's model to exert influence in public affairs primarily in two ways. First, Newmann's model is an agenda for a new curriculum or course in which issues would be considered, while this model is for issues to be considered within the parameters of science courses. The second major difference is that Newmann appears to be primarily concerned with group advocacy, even though he deals with individual concerns, leading to group actions while this model is more concerned with personal liberation leading to resonsible social action

on an individual basis.

The social issue should serve as the core to stimulate initial thought processes because it is a point of contention between parties and is ripe for decision. The issue provides interactive opportunities between each of the model's elements. Each of these interactions provide opportunities for the issue to be examined and in return allow for additional information that leads to bases for further reaction and interactions among the elements. After these interactions have occurred, rational thought processes should be more adequately based on knowledge of the issue, knowledge of one's self, and value positions.

The thoughts originating with the issue will be affected by each element, altered somewhat by the elements and their interactions, and ultimately should trigger an action and reflection process. Self-reflection should cause the thought patterns to feed back into the model. For example, the experiences one has as he attempts to put his values into action should bring about a rethinking of his values. A goal is for the interactions of beliefs, ideas, and attitudes to evolve into a more total philosophy or world view. If this occurs the model then becomes a human process, one with implications not only for science education, or education, but for humanity.

The model provides opportunities for scientific and historical interactions with social structures, for the individual to act on the outer world and test it on himself,

and for reactions with one's inner self in determining values. Experiences can originate anywhere in the model and ultimately will affect and be affected by all other aspects of the model.

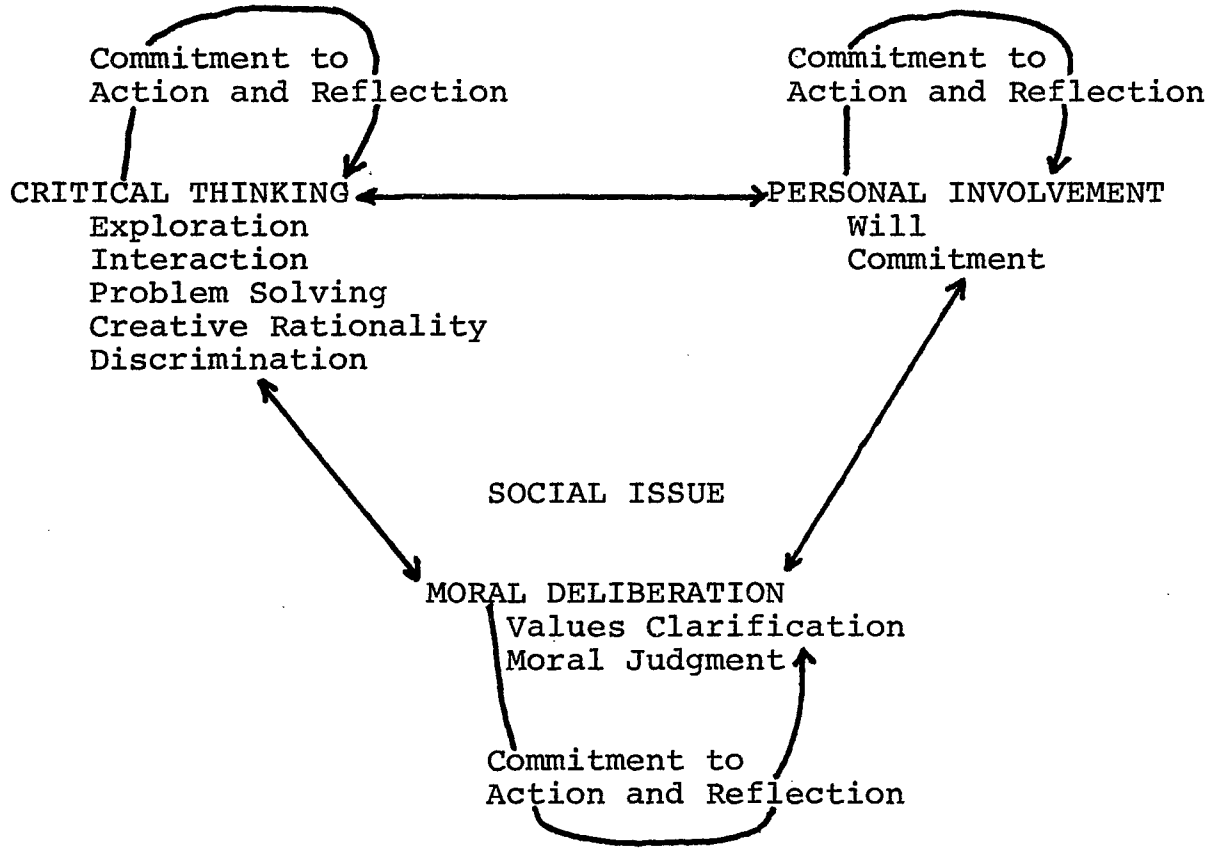

Figure 4
A Model of Science Education for
Responsible Social Action

Critical Thinking. In the initial model critical thinking was broken down into four types of experiences needed in order to develop competence in critical thinking. These were opportunities to acquire factual data, concept formation, social-issues research, and discrimination. A hierarchy of necessary skills appears to exist among the four experiences, with acquiring factual data being the simplest and discrimination experiences the most complex.

Reaching a decision from data that have been collected and reflected upon is much more powerful than discussing solutions that have already been reached. There is a need to develop ways of working within schools that will bring all persons who will be affected by decisions into the process by which decisions are made. We can make the learning and use of the methods of intelligence, of critical thinking, and of experimental processes a part of the continuing experience of the learner. Citizens can then apply their specialized knowledge, wherever it may have relevance, to the social issue of the day.

Lawrence Kubie's analysis of knowledge sheds some light on aspects we might consider when striving to develop critical thinkers. He states that the major processes of thinking and learning are not conscious activities but essentially preconscious.[16] The diagram presented in Figure 5 illustrates Kubie's point.

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[16] Lawrence Kubie, "Protecting Preconscious Functions," Nurturing Individual Potential (Washington, D. C.: Association for Supervision and Curriculum Development, 1963).

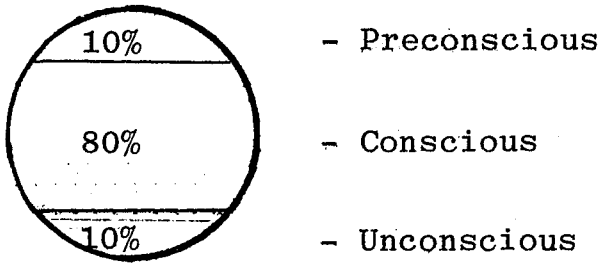

Figure 5

A Diagram of Kubie's Analysis of Knowledge

Preconscious refers to knowledge not present in one's conscious but capable of being recalled without inner resistance. Kubie illustrates that it is not the intake of knowledge that is most crucial but the individual's ability to do preconscious sampling.

In order for students to reach competence in decision-making, we must help them to be flexible and creative. One of our tasks should be to teach how to be in touch with the preconscious. Education has tended to freeze the lines between conscious and preconscious by its concentration on verbal skills. Part of our task is to find the major ideas and deal with them in ordinary language. Processes and experiences must allow discovery between the inner and outer self. This discovery involves inner subjective aspects interacting with outer objective realities of society.

Processes leading to discrimination need to be presented rather than just the necessary experience skills. The emphasis is on the process of thinking rather than on the content of thinking. The same basic patterns of inquiry appear to be involved in all studies.

The process leading to discriminating critical thinking depend on factual data, conceptual skills, and research skills and include exploration, interaction, problem solving, and creative rationality. The initial model presented a mixture of activities for data collection with each coming from a different source. It was unclear as to who was responsible for providing the experiences. The revised model presents processes that should be guided and augmented by the teacher so that the learner can acquire the competencies required in each process.

Exploration. Exploration involves careful investigation and examination of an issue. The teacher's responsibility includes introducing the issue, providing necessary factual data, and offering possible sources for further research. When involved in exploration, the student is seeking insight and knowledge through a wide range of experiences and materials. The individual analyzes the condition in the environment by probing into the different aspects of the issue in preparation for decision making.

Interaction. The mutual stimulation of one person by another, where both are changed, and the responses that result are included in interaction. A desired end is circular interaction in which each student's responses is not only elicited by the common issue but also affected by the responses of others in the group. If most of the students are involved, a more stimulating learning environment can be established. Interaction has been discussed primarily from the standpoint

of group interaction, but it also includes meaningful exchanges between an individual and the environment. The interactions allow a sharing of data and insights gathered during the different phases of exploration.

Problem Solving. Problem solving is a process of discovering new relationships among things observed or sensed. It includes a conscious or preconscious assumption or hypothesis, and a test by exploring the acceptability of the assumption. Problem solving bases result from exploration and interaction. It depends largely on concept formation in that categorizing and generalizing are important in arriving at a solution. The solution implies discovery of a relationship that is accepted as adequate by the individual or, in the case of group problem solving, by the group.

Creative Rationality. Creativity is the human attribute of constructive originality. Whenever an individual takes a set of knowns and contrives a new response or concept, he is creative. Rational is defined as the quality or state of being reasonable. Thus, creative rationality is reasonable constructive originality. In order for creative rationality to occur, a student or group must be flexible and adaptive. Understanding will emerge through ideational fluency. This process may be fostered or inhibited by the teacher. The student should be able to consider trial ideas and react toward them in order to become creative.

Discrimination. Exploration, interaction, problem solving, and creative rationality are processes that should

lead to discrimination abilities. Discrimination is competence in making a judgment about the relevance of data in analyzing an issue. It requires comparison and involves weighing motives, character, and qualities. It compares and estimates critically different aspects of an issue. When a student masters discrimination skills then he can recognize assumptions behind an argument, identify logical inconsistencies, and provide support for one's generalizations through reason and evidence.

Critical thinking is one of the necessary but not sufficient elements in dealing with social issues. Opportunity is provided to acquire data and make enlightened decisions based on the data through discriminating critical thinking. In order for purposeful action to occur, personal involvement and moral deliberation are needed.

Personal Involvement. This element was identified as psychological concerns in the initial model, and it encompassed psychological disturbances which result from conflicts in decision making. It guided work toward enhancing rather than inhibiting decision-making ability. The psychological concerns element was broken down into psychological freedom, personal motives, and self-concept. Analysis of the element included discussion of the importance of psychological freedom in the learning environment and emphasized that self-knowledge and self-concept are of utmost importance when dealing with social issues.

In the revised model the psychological concerns element has been renamed personal involvement. The rationale for this change primarily involves making the model's elements equitable. Each element is now presented as a process. Involvement is a process by which an individual becomes engaged in external ideas or events. It is a necessary step in order to truly deal with social issues. When involved, the individual is immersing himself in the different aspects of the issue and devoting a large portion of his attention and energies to the issue. Involvement prepares a student for meaningful discoveries and experiences.

One's attention and energies are not sufficient, for meaningful involvement should include will and commitment. Will is defined as the power by which one decides upon and directs his energies to carry out an action; choice and determination by one's own volition are directed toward a certain end. Leslie Farber has made the assertion that our period should be called the "age of disordered will."[17] Rollo May has discussed possible causes of this phenomena and states that the primary cause seems to be a condition close to apathy. He provides meaningful analysis of love and will as well as the necessity for incorporating them in the model in the following:

> Apathy is particularly important because of its close relation to love and will. Hate is not the opposite of love; apathy is. The opposite of will is not indecision but being uninvolved, detached,

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[17]Leslie Farber, The Ways of the Will (New York: Basic Books, 1965), p. 48.

> unrelated to the significant events. Then the issue of will never can arise. The interrelation of love and will inheres in the fact that both terms describe a person in the process of reaching out, moving toward the world, seeking to affect others, and opening himself to be affected. This is why love and will are so difficult in an age of transition, when all the familiar mooring places are gone. The result is that our society is suffering from a withdrawal of feeling.[18]

Robert Heilbroner's basic thrust in an Inquiry into the Human Prospect is that if mankind is to rescue life from its present perils, it must first preserve the will to live.[19] This statement expresses a comforting thought in that it implies that within us there exist the elements of fortitude and will to improve the quality of life. In order to tap the resources of fortitude and will, one must become personally involved. This involvement is complex because our personal positions preselect the data we are going to be conscious of, and this selection process involves who we are with who we are becoming. There needs to be awareness of the dynamic qualities of the individual.

Commitment is defined as an open declaration of adherence to a position. This declaration comes from a strong belief and one's convictions. One is committed when one becomes convinced of a certain policy or action and is satisfied this policy or action is best among available alternatives.

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[18]Rollo May, Love and Will (New York: Basic Books, 1965), pp. 29-30.

[19]Robert Heilbroner, An Inquiry into the Human Prospect (New York: W. W. Norton and Company, Inc., 1974)

In almost all of our society's promises of great power and freedom, a passive role is expected of the citizen who is the recipient. Rolla May offers the following analysis of this point:

> Our curious predicament is that the same processes which make modern man so powerful--the magnificent development of atomic and other kinds of technical energy--are the very processes which render us powerless. The dilemma is sharpened by the fact that just as we feel most powerless, we are called upon to take responsibility for much vaster choices.[20]

This is why the reuniting of love and will is such an important achievement. What is necessary is a new understanding of personal relationships. This is certainly required in this age of radical transition. Lacking adequate models, we shift our morality inward, resulting in a new demand upon the individual for personal responsibility. We are required to discover on a deeper level what it means to be human, pointing toward maturity, integration, and wholeness.

All of the expressed concerns and means to overcome psychological concerns in the initial model are important and have not been rejected. In order to determine personal motives, questions need to be asked: Am I doing what is "reasonable" even when it is not good? Do I strive toward good for others or good for myself? But it is apparent in light of workshop results that this element should have broader considerations than it did in the initial model.

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[20]May, op. cit., pp. 186-87.

When reflecting on the workshop, it became apparent that the personal involvement element (psychological concerns in the initial model) was too heavily concentrated on the individual. It appears that there is danger in focusing too closely on the individual learner and reducing opportunities for interaction. The altered focus is on building a sense of self-confidence but also includes working toward interpersonal trust. This differs in that originally the model was stressing "work for the good of all;" now it is nearer to "Harambee," the motto of Kenya, which is "work <u>together</u> for the good of all."

Social concern is really an expression of man's interdependence. Provincialism, isolationism, and a rejection of "community" at the local level have caused anti-social behavior. The personal involvement element calls for recognition of these social concerns. One promotes social concern in teaching by modeling concern and providing opportunities for involvement so that an inner security may be established as an antidote for uncertainty. The will to contribute to a superior, humane lifestyle is developed in a good psychological climate. Ability to contribute becomes meaningless without the motivation and commitment to give of one's self.

If it is accepted that people are the most important asset on earth, personal involvement acquires extreme importance. If we are considering man and his future with compassion, then we must have students coming out of science

courses with commitments and convictions about what is worthwhile. Improvements will come by individuals making sound decisions and recognizing individual worth. Personal involvement is a necessary but not sufficient means toward this end.

Moral Deliberation. In the initial model moral deliberation was defined as a process by which a person formulates and justifies a position on an issue. Two necessary experiences were presented as leading to moral deliberation. These were values clarification and moral judgment. The heuristic nature of this study focused on this element although it has been emphasized that critical thinking and personal involvement are vital in formulating and justifying a position on an issue.

In order to handle the decision-making ability this model seeks, an esteem for others must emerge. The teacher should model esteem for others by appreciating the worth of individual students and by valuing real or intrinsic worth. Concern for the welfare of others is needed beyond any personal gain that one can receive. This requires disinterested love. Agape is the term that best incorporates these feelings.

Agape carries with it certain risks due to the necessity of deep involvement with others. But this is a risk that we need to take and can take. Certainly, no human's motives are purely disinterested. Everyone's motives are, at best, a blending of different kinds of love. Each

kind of love presupposes care, for it asserts that something does matter.

At this point it is necessary to present means to guide experiences designed to foster concern and love for fellow humans so that these qualities will affect decision-making in social issues. If fellow humans are suffering, the goal is to reach a fellowship in feeling or compassion and act to alleviate the suffering.

In recent years teachers have been exposed to two major approaches in moral or value education: the values clarification methods advanced by Sidney Simon and his colleagues and Lawrence Kohlberg's theory of moral development as he applies it to education. This writer argues that even though the values clarification and moral development approaches seem incompatible in some areas, integration of the two is both possible and highly desirable.

The two methods differ in that values clarification embodies ethical relativity while moral development identifies more and less adequate levels of moral reasoning. Values clarification appears to provide a first step in a rational approach to moral deliberation. It allows a setting for a student's own opinions about issues or situations where values conflict. It elicits awareness of values, but it does not go further.

The values clarification and moral development approaches share several psychological assumptions. They

focus on the student's conception of values and moral issues rather than pressuring the student to respond in a particular way. Both approaches aim for increased clarity of thinking and are not primarily concerned with increasing particular beliefs or values as were traditional approaches to education.

Values clarification and moral development approaches stress open or Socratic peer discussion of value dilemmas. The moral development discussion has the aim of stimulating movement to the next stage of moral reasoning. Stimulation of movement to the next stage of reasoning is not indoctrinative for the following reasons:[21]

1. Change is in the way of reasoning rather than in the particular beliefs involved.

2. Students in a class are at different stages; the aim is to aid movement of each to the next stage, not convergence on a common pattern.

3. The teacher's own opinion is neither stressed nor invoked as authoritative. It enters only as one of many opinions.

4. The notion that some judgments are more adequate than others is communicated. This means that the student is encouraged to articulate a position which seems most adequate to him and to judge the adequacy of the reasoning of others.

The work of Kohlberg and his associates is based on a theory of six stages of moral/cognitive development. People in the first two stages think and act on the traditional bases of fear of punishment, desire for reward, or exchange of favors. In the middle two stages they think and act on

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[21]Lawrence Kohlberg, "The Cognitive-Developmental Approach to Moral Education," Phi Delta Kappan, June, 1975, p. 674.

the conventional bases devoted to maintaining the political and social order by meeting the expectations held out for them or duties imposed upon them by authorities for the sake of the good of the order. In the upper two stages people think and act on the basis of moral principles genuinely accepted by the individual rather than on the basis of conforming to the authority of the group. Stage five is the stage of the social contract and human rights, and, stage six is the stage of universal ethical principles pertaining to liberty, equality, and justice.[22]

Moral deliberation should be concerned with the values underlying an individual's decisions or behavior rather than with just the behavior itself. The interest should be in a person's state of mind, from which his reasons and motives--and ultimately his behavior will flow. The focus is on the reasons for which or the way in which one comes to believe rather than what one believes.

The reasons should be rational--backed up by sound judgment. The value of anything is directly related to someone's interests and desires. Reasons offered should relate to these interests. Rational actions are those for which the agent is responsible. They are for a reason and the reason is causally operative.

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[22]R. Freeman Butts, "Once Again the Question for Liberal Public Educators: Whose Twilight?" Phi Delta Kappan, September, 1976, p. 13.

Moral responsibility involves being accountable for the carrying out of a duty or obligation to one's self or others. Hardin has written that, "A decision is responsible when the person or group that makes it has to answer for it to those who are directly or indirectly affected by it."[23] The solution must be translated into some form of action to be responsible and reasonable. According to Sugarman, if one acts morally he must know what he is doing, must do it freely, and it must be intentional.[24]

A moral philosophy that offers substance to the moral deliberation element is the "deontological" philosophy running from Immanuel Kant to John Rawls. This philosophy holds that principled morality makes judgments based on universal principles applicable to all mankind. An example is Kant's "categorical imperative." "Act only on that maxim whereby thou canst at the same time will that it should become universal law."[25] You are requested to act in a situation only as you would be willing for everyone to act in that situation.

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[23]Garrett Hardin, Exploring New Ethics for Survival: The Voyage of the Spaceship Beagle (Baltimore: Penguin Books, Inc., 1973), p. 103.

[24]Barry Sugarman, John Wilson, and Norman Williams, Introduction to Moral Education (New York: W. W. Norton & Co. Inc., 1963).

[25]William K. Frankena and John T. Granrose (eds.), Introductory Readings in Ethics (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1974), p. 117.

Moral or value education appears to be dealt with logically in a cognitive-developmental approach. John Dewey laid the groundwork for this approach. It is called cognitive because active thinking is necessary to stimulate true decisions, and it is called developmental because its aim is movement through moral stages.

Dewey provided a theoretical background first for Jean Piaget and then Lawrence Kohlberg to work toward what has evolved into the cognitive-developmental approach. In many ways, Kohlberg's theory of moral development[26] corresponds with Piaget's theory of general cognitive development.[27] According to Kohlberg, a child establishes a moral view and uses the same reasoning processes to analyze other moral situations. This cognitive growth seems to occur in the same sequence of stages for all people. The universality of the stage sequence has been documented cross culturally.[28] The reality of moral stages as structured wholes is documented by high degrees of consistency across various verbal situations.[29]

The moral deliberation element of the model is composed of values clarification and moral judgment.

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[26]Lawrence Kohlberg, "Early Education: A Cognitive-Developmental View," Child Development, December, 1968.

[27]Jean Piaget, The Moral Judgment of the Child, 2nd ed. (Glencoe, Illinois: Free Press, 1948).

[28]Lawrence Kohlberg, "Stage and Sequence: The Cognitive-Developmental Approach to Socialization," In D. Goalin, (ed.) Handbook of Socialization Theory and Research (New York: Rand McNally, 1969).

[29]Ibid.

Experiences are necessary for a clarification of values about one's own value-assumptions in social issues. Values clarification concentrates on the careful choice of values while moral judgment deals with what one feels should occur.

Values Clarification. Values have to do with modes of conduct and end-states of existence. If a person has a value he has an enduring belief that a specific mode of conduct (honesty, courage) or end-states of existence (world peace, equality) is personally and socially preferable to the available alternatives. Once a value is internalized by an individual it becomes a standard for guiding his actions, for developing and maintaining attitudes toward situations and objects, and for judging and justifying his own actions and the actions of others. Values are often thought of as existing with a hierarchial structure; those values that are primary such as freedom and equality having the broadest application and importance while others such as punctuality or neatness being less crucial to the total value pattern of the individual.[30]

According to Hurd, "Science has a value dimension any time it induces conflicts in our thinking, modifies the culture, or makes demands on society, and this is most of the time."[31] Science creates conditions which demand the

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[30] Knowledge Processes and Values in the New Social Studies, Wisconsin Department of Public Instruction, 1968.

[31] Paul Dehart Hurd, "Science, Technology, and Society," The Science Teacher, February, 1975, p. 28.

reinterpretation of old values or the formation of new ones. The values clarification process enables students to develop skills in valuing and in establishing a value system.

Valuing is employed in the sense that a thing, event, or behavior has worth. This worth implies being internalized or accepted. Values develop through experiences. One of the areas necessary for modification of human values is choice. Normally one is advised first to determine his values, then act. The object is to find a consistent set of preferences with implications that are acceptable to the individual.

Values can be looked at as a rank ordering of moral preferences, arrived at through a combination of logic and emotion, and strongly influenced by the context of the problem and the background of the individual making the choice. The emphasis is on individual involvement in arriving at values.

Consideration of social issues is important but it can be effective for responsible decision making and action only if the underlying value system is being established. Effective societal values are dependent on individual values. A strong value system leaves one free to maintain personal integrity while overcoming pressures from other value bases.

Moral Judgment. Moral judgment is a practical power of the mind that includes discernment and insight to arrive at conclusions as to the relations and value of things

on a moral basis. It creates independent decisions and courses of action based on what the other elements of the model have previously discovered and compared. Responsible social action is built upon social choice by moral judgment. The individual arrives at conclusions about the conditions he thinks ought to exist in moral judgment.

A child generally comes to school with what R. J. Havighurst calls an authoritarian conscience acquired from his parents through a progression of punishments and rewards. All of us go through a stage in which we get our moral judgments made for us. If we are to grow morally, we have to reach the stage where we make them ourselves. Mature moral judgment is necessary for mature moral action. An individual cannot follow moral principles if he does not possess moral principles.

The cognitive-developmental approach to moral education focuses heavily on moral judgment for the following reasons:[32]

1. Moral judgment is the single most important factor discovered in moral behavior.

2. While other factors influence moral behavior, moral judgment is the only distinctively moral factor in moral behavior.

This model is striving for moral judgments that are consistent with principles of justice and human dignity and

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[32]Lawrence Kohlberg, "The Cognitive-Developmental Approach to Moral Education," Phi Delta Kappan, June, 1975, p. 672.

that constitute the most reasonable choices among alternatives. According to Kohlberg the most important conditions leading to principled moral judgment are exposure to the next higher stage of reasoning and exposure to situations posing problems and contradictions for one's current moral structure. The atmosphere should encourage interactions in which conflicting moral views are compared in an open manner.[33]

Commitment to Action and Reflection

In the initial model action was defined as purposeful behavior in which a person attempts to exert influence in the environment. It was pointed out that action includes the processes of initiation, planning, execution, and evaluation as well as presupposing reflection. An individual with environmental competence is continually involved in self-reflection.

Kohlberg has presented additional factors to moral judgment necessary for principled moral reasoning to be transferred into moral action. These include:[34]

1. the situation and its pressures
2. the individual's motives and emotions
3. the reality that what the individual does depends upon a general sense of will, purpose, or ego-strength

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[33] Ibid.

[34] Ibid.

An attempt to deal with and provide experiences for each of these points has occurred within the revised model.

When one makes a commitment to some form of action, a promise or pledge is made to one's self. This commitment is a desired end of the revised model and depends upon the total model of science education for responsible social action. It is now time to examine more closely action and the presupposed reflection.

Action. As stated above, action refers to behavior directed toward exerting influence in an issue. Action is necessary to increase one's ability to exert influence. Learning to exert influence in an issue, by definition, requires involvement in attempts to exert influence toward the resolution of an issue. This involvement is necessary for responsbilbe social action. It is assumed that one who gains increased ability to exert influence will be better able to cope with and affect society.

School settings require focusing on group action. Participation in action offers a setting in which one can apply skills previously introduced and provides opportunities to develop new skills. The fresh challenges may demand learning new skills or building psychological strength to cope with new sources of stress. Newmann has pointed out that unless one's personal "agenda" is responded to in the group, one's attachment to the group will diminish and with it one's commitment to action goals. He elaborates with the following analysis:

> We encourage action groups not to focus exclusively on efficient accomplishment of their political tasks, but in addition to contribut to the "educational lives" of their members. Within a group, students should have an opportunity to teach and counsel each other, to develop a culture of sharing and caring in the process of trying to make some public impact.[35]

Meaningful action in a school setting appears to be dependent on opportunities for individual impact and recognition. Action is an attempt to exert influence. If feasible after an individual or group reaches a decision on a social issue, some degree of action should be taken. After reaching a defensible decision, the next step is to work toward its implementation.

Reflection. Reflection refers to a process leading to the formation of an idea or opinion after attentive consideration. Self-reflections, as opposed to group reflection, is the focus and involves mental consideration of an idea or purpose with a view to understanding and accepting or rejecting it. It involves the contemplation of one's own mental processes leading to a dialectic of the inner and outer self.

A goal is to attain reflection as a state of mind: a reflective consciousness. This would involve weighing and examining the reasons for and against a choice or measure. This internalized careful consideration should lead to mature reflection.

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[35]Fred M. Newmann, Thomas A. Bertocci, and Ruthane M. Landsness, Skills in Citizen Action (Madison, Wisconsin: Citizen Participation Curriculum Project, 1977), p. 61.

This model requires one to deliberate on fairness and justice. This introspection can provide "feedback" that promotes further learning. If the curriculum is to help students exert effective influence, it is assumed that there should be an increase in reflective behavior. In order to be effective, it appears that one should inquire and reflect upon a variety of questions and defend one's conclusions based on these processes. Effective reflection would appear to allow one to evaluate more systematically the way in which one wishes to participate.

This model of science education is designed to provide experiences that may enable one to develop competence in dealing with social issues. Responsible social action is the major thrust. The ultimate long-term measure of the effectiveness of such a model appears to be participatory principled action by citizens.

The Revised Model in Practice

All types of procedures can be described, but they should be applied in order to determine their usefulness. This concept directly correlates with the action and reflection aspects of the model. This section will present a broad practical summary of the model. The goal is to examine the applied model as it might look in practice. The revised model will be summarized and some of the element interactions will be examined. At this time it is necessary to reiterate that the model is not a finished product but a

genesis that might stimulate one to adequately deal with social issues in science education.

Critical Thinking. The critical thinking element guides an inquiry into the social issue. Exploration, interaction, problem solving, and creative rationality experiences can lead to discriminating critical thinking. This end includes recognition of assumptions behind an argument, identification of logical inconsistency, and providing support for one's generalization through reason and evidence. It is very important that the teacher be a model of discriminating critical thinking.

Opportunities to acquire data are very important. The teacher can provide data to stimulate the inquiry, but the study would appear to be more effective if students are providing most of the data. Exploration on the part of students is extremely important and the resulting insights are valuable. Research skills in the collection, organization, and interpretation of data are necessary and need to be developed and taught.

An approach could be to have much of the class time spent in small group discussions and activities initiated by suggestions from the teacher, who is then free to act as consultant to individuals and groups. Occasionally, the whole class could reconvene for discussion or large group activities or for presentations by members of the small groups. The teacher could meet from time to time with each of the small groups for a special discussion or activity.

These discussions could provide opportunities for interaction and a base for more complex individual or small group activities in problem solving and creative rationality

Problem solving depends on action in that it involves testing an assumption or hypothesis. It leads to opportunities for creative rationality that enable students to react to trial ideas. It appears that problem solving is very dependent on action and creative rationality on reflection.

Discriminating critical thinking can emerge from these activities, but in order for one to think critically one must be personally involved. The interaction of knowledge gain and personal involvement appears to be vital to a model dealing with social issues. A personal involvement approach to learning must be developed so that individuals can develop competencies in handling the enormous complexity of our rapidly changing, technologically based society.

A personal involvement approach utilizes experiences generated in various occurrences by the learners themselves. It induces change in the learning process by providing a particular direction for inquiry and learning. The focus is on learning how to learn and on developing critical thinking skills through thinking critically. If these skills are developed, they will help in giving the student a feeling of control over his future. He would be a knowledge-motivated person whose motivation would come from within.

One must be personally involved in order to think critically, but what of critical thinking's relationship with

moral deliberation. The cognitive activities of analysis and synthesis appear to be required before one can organize his values into a system. This value system should evolve from information and be based on logical reasoning. Students should be encouraged to use the power of knowledge, gained from the cognitive domain, to support a value system that should include compassion and love.

Knowledge is needed in order to develop a value system, but what about the reverse? If one's values are rigid, one cannot really learn new facts and will have difficulty understanding a new reason's importance. The reality of the individual's own value system will determine whether or not the desired level of human quality is attained. Relevant activities are needed in order to direct students to higher levels of activity in the cognitive and affective domains.

Personal Involvement. This element is a process by which an individual can become engaged in external ideas or events. It would appear that meaningful involvement should include will and commitment. In order for one to exercise will and reach a commitment, certain psychological needs should be met. These include psychological freedom, self-knowledge, and self-concept.

Psychological freedom is used to describe the learning environment most conducive to this model. The teacher should work to establish an atmosphere in which a student is

willing to try out ideas without being unduly criticized. The teacher should be supportive in order to prevent students from becoming immobilized by psychological concerns.

Self-knowledge and self-concept appear to be necessary for one to be a responsible decision maker. The climate should enable a student to work toward determining personal motives and coming to grips with "who one is." The teacher should also be a model and individual striving to acquire insight about himself.

An individual should feel that there is some personal responsibility for the situation being as it is so that he can participate and take action to effect desired social change. Care and involvement must be present so that a person can circumvent searching for "the answer" and strive for understanding that enables the many related alternative solutions to emerge. It entails the integration of emerging cognitive abilities and potential for action. It involves the synthesis within the self of new values and purposes.

The educator should realize that students dealing with social issues will deal with them from different perspectives. Each person will react from one space, one time, and one set of experiences. Humans understand what they are predisposed to understand. The teacher should strive toward recognizing and understanding these predispositions.

As previously discussed, one should be aware of the ways in which personal involvement and critical thinking interact. Also, the personal involvement and moral deliberation elements interact in very meaningful ways. A major realization appears to be that self-knowledge, self-concept, ego ideal and life-style choices are completely entwined with moral choices. Piaget's studies have indicated that when a person moves from one developmental stage to another, certain events must occur before the person operates at that level.[36] The individual, according to Piaget, becomes egocentric and requires personal and psychological experiences before growth can occur in the stage. Kohlberg's research has indicated that if growth experiences do not occur, the individual ceases to develop morally. It appears that in light of their research and previous discussion, that each element is dependent on the other.

As an example of will or ego-strength in moral behavior, a study by Krebs and Kohlberg illustrates that "strong-willed" conventional stage subjects resisted cheating more than "weak-willed" subjects.[37] For those at preconventional levels of moral reasoning, however, "will" had an

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[36]Jean Piaget, The Moral Judgment of the Child, 2nd ed. (Glencoe, Illinois: Free Press, 1948).

[37]Richard Krebs and Lawrence Kohlberg, "Moral Judgment and Ego Controls as Determinants of Resistance to Cheating," In Lawrence Kohlberg, ed., Recent Research, (New York: Rand McNally, 1976).

opposite effect. "Strong-willed" subjects at stages one and two cheated more, not less, than "weak-willed" subjects. "Will," then, is an important factor in moral behavior, but it is not distinctively moral; it becomes moral only when informed by mature moral judgment.

Critical thinking and personal involvement are extremely important in a model for responsible social action. The major emphasis of this research was on the moral deliberation element. It is now time to offer some practical means for moral deliberation within the parameters of this model of education.

Moral Deliberation. Moral deliberation, in this dissertation, refers to a process by which a person formulates and justifies a position on an issue. Interactions between moral deliberation and the other elements are important and have been discussed. The process of moral deliberation and the interactions can lead to statements about conditions an individual feels ought to exist. In this dissertation the investigator is advocationg that the teacher direct preliminary data collections, be attentive to psychological concerns, and lead and particpate in a rigorous examination of a social issue, primarily through discussion.

From numerous readings and some personal experiences the important conditions in terms of moral discussion appear to be:

1. Exposure to situations posing problems and contradictions for the individual's current moral structure, leading to dissatisfaction with his current level.

2. An atmosphere of interchange and dialogue in which conflicting moral views are compared in an open manner.

This type of discussion should cause cognitive conflict and a sense of disequilibrium about one's own position. Open discussion is important in order to deal adequately with the dilemma as well as aiding in lessening psychological concerns.

In working toward the resolution of the dilemma and in facilitating moral deliberation, three factors appear to be important:

1. Values clarification makes the first step in a rational a-proach to values education.

2. The desired change is in the way of reasoning rather than in the particular belief involved.

3. The teacher's own opinion enters as one of many opinions.

Values clarification provides a setting for airing opinions. It helps people to know and accept themselves and to be able to make choices freely and carefully. The values clarification strategies presented in the works of Simon, et. al.,[38] appear to prepare students for moral deliberation.

The focus in moral deliberation is on the way of reasoning rather than on the particular belief. One should be concerned with the values underlying a decision. The aim

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[38] Sidney B. Simon, Leland W. Howe, and Howard Kirschenbaum, Values Clarification (New York: Hart Publishing Company, Inc., 1972).

is to aid movement to higher or more adequate levels of moral reasoning. In moral deliberation ethical relativism must be rejected and equal respect for the life of each human being accepted. In the typical classroom setting, many moral levels will be in operation. The teacher should recognize this and allow it to aid in reasoning growth. It appears that students who reason on a higher moral basis influence those who reason on a lower moral basis.

The teacher should give and require respect for an individual's opinions and values without sanctioning these values as morally adequate. This respect without sanction is important in preventing blocks to personal involvement. Traditionally, the teacher's opinion is what has counted in the classroom, but an authoritative presentation of one's beliefs or acceptance of a student's belief may squelch other students. The teacher should model moral deliberation by justifying his or her decision by reference to general value positions.

After a decision is reached, some form of action is needed. Reflection prior to and after the action is important and may lead to generalizations that provide means and methods for responsible social action.

The most effective models for social action appear to combine personal reflection with commitment to action. In actively dealing with the world we learn about ourselves in new and powerful ways. The way one feels about himself

is apparently related to how well he learns and his ability to cope and grow. It is through new experiences and active coping that we improve the basic sense of self.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This dissertation has implications for the person who is involved in the educational process and is concerned with the quality of the human condition. It suggests that the materials for an informed citizenry are already present in our schools. What is needed is a reawakening of "higher" values and motives for positive action. These changes can be handled by the present system.

The ideas presented are not meant to lead to a specialized science curriculum. Fundamental ideas are presented so that those that may be applicable can find their way into all aspects of the learning process. We need a concerned and well-informed citizenry with skills that will enable them to act and respond to problems and potentials. A goal is moral responsibility concerning each other and the world.

This researcher has identified a significant problem and completed a modest but reasonable analysis of the problem. The need for and apparent lack of preparation for social action among graduates of our educational system is the problem. A search for possible causes led to an inquiry into social and educational problems and dilemmas. This

inquiry considered society, science and technology, education, and science education. Emerging from this inquiry was a recognition of the need for science education to examine social changes.

Change was recognized as a basic phenomenon of the universe and schools were offered as logical means for preparing for social change. A new emphasis in existing science courses on human and social concerns appeared to be a potentially effective method for science education to prepare students for inevitable change.

This new emphasis in science education requires a model as a guide. Model was defined as a symbolic representation of the interactions within a complex system. Desired goals or outcomes of education were presented so that a model could be designed that would provide necessary experiences. These outcomes were: rational decision-making, self-reflection, personal integrity, and moral responsibility.

Given these goals or outcomes, what experiences are necessary to achieve them? Competence in dealing with social issues is necessary. A model for guiding the study of social issues was designed with three elements: critical thinking, psychological concerns, and moral deliberation, leading to an intended commitment to action. This model is presented in Figure 3.

A teacher workshop was selected as a vehicle to allow movement from a theoretical domain to one of reality so that

the model could be tested and revised. A heuristic analysis concentrating on the moral deliberation element was designed to provide data, insights, and opportunities for self-reflection leading to evaluation. World hunger was chosen as the social issue to be considered during the workshop.

Willingness to ask difficult questions and to commit one's self to the need for acquiring new ways of perceiving appears to be critical when evaluating a model. Questions were asked and instruments were selected to provide answers to the questions. The workshop, "Inquiry into World Hunger," did occur and insights emerged.

Analysis of workshop results revealed successes and problems. Both were considered but detailed analysis of the problems and interactions of elements were of signal importance. These analyses combined with reflection led to a revised model that was intended to be more comprehensive.

The heuristic design concentrating on moral deliberation appeared to involve participants in moral deliberation, to guide them in significant factual and conceptual knowledge gains, to enable them to clarify values, to cause them to become aware of complex implications in social issues, to impress upon them the importance of accurate information, to provide impetus for educating others concerning the issue, and to generalize from the world hunger issue to related issues. It also indicated an apparent correlation between openness to new ideas and higher moral reasoning.

The revised model consisted of three elements -- critical thinking, personal involvement, and moral deliberation, leading to social action. Primary revisions of the initial model included placing the social issue in the center to emphasize the focus and placing commitment to action and reflection at each element symbolizing the necessity of constant reflection in such a model. The element identified as psychological concerns in the initial model was renamed personal involvement in order to define all elements as processes. The other major change in the revised model was changing the experiences necessary for critical thinking so that all are now processes. The revised model of science education for responsible social action is presented in Figure 4.

Conclusions

In the introductory chapter some difficult questions were asked to guide the analysis of relationships between science education and responsible social action. The first of these was: Can or should science education deal only with the body of knowledge within the discipline, or must it deal with values, commitment, and action?

Can science education deal only with a body of knowledge? All interactions between or among humans involve actions. Education is dependent on interactions. Looking ahead in science education, one can see that our nation and our communities are confronted with complex questions and

and challenges. These questions and challanges require the expertise of scientists and educators, but more importantly they bear upon the interests and values of our entire society. Value questions are going to arise. Teachers must deal with the issue: Are values going to be examined forthrightly and honestly?

Should science education deal only with a body of knowledge? It has been pointed out that values cannot be ignored, if only because they will inevitably be present. If one desires to work openly toward responsible social action involving values, commitment, and action, why should education serve as such a vehicle? Education is an established means for introducing learners to social issues; it can be used to work toward resolutions of issues; and it appears to be society's best means for guiding development.

How can science education deal with emphasis on responsible social action? Science teaching should be aligned with social realities, should allow students to experience science as a cause of and a method for dealing with social issues, and work for scientifically literate persons capable of using what has been learned in acting on the issues.

In teaching science one should emphasize and demonstrate that the primary goals of science are not utilitarian and materialistic but intellectual and humanistic. There

should be extensive discussion of social issues in the examination and treatment of social dilemmas. There should be teaching of skills, tools, and facts, but also exposure to the experiences that make sense out of the many sides of the issue. When possible, this includes working as an agent of constructive change.

A second question was: What is the relationship between scientific knowledge and moral values? Before answering this question it is important to reemphasize the following points:

1. The future is neither entirely inevitable nor entirely unforseeable.
2. Alternative futures exist.
3. Responsible choices can be made by increasing awareness of the consequences.
4. Actions can make more desirable futures more likely and less desirable futures less likely.

The position of "value free" scientific research and knowledge is a major problem. The concept of "dangerous knowledge" is being seriously considered. Is there certain knowledge that would be better to leave alone--such as cloning, partheogenesis, and electrical stimulation of the brain? More and more, scientists appear to be rejecting the "value free" position and attempting to project the results of their work so they may be able to determine potential effects on society. This move seems to be aimed at developing policies that are consistent with principles of

justice and human dignity and that constitute the most reasonable choices among alternatives.

Perhaps this is signaling a need for science to return to the broad and general philosophy from which it originated. It has departed from this generality into a growing number of more precise disciplines--each becoming more productive as its focus becomes more narrow. In so doing, science apparently traded off moral values for knowledge.

Today a new ecological-technological relationship is required. One should attempt to determine the effect of one's actions. Clarified values and greater education must accompany the transition to a society based on responsible social action.

A third question was: If science is to be taught with emphasis on social issues with moral implications, can an educational model be developed that lends itself to a comprehensive study of the selected issue and to possible avenues and commitments to its effective resolution? As previously alluded to, education was selected as a means for preparing citizens for responsible social action for the following reasons: 1. It is an established means for introducing learners to social issues; 2. It can be used to attack issues; and 3. It is society's best current means for guiding development.

This initial model of science education appeared to guide a comprehensive study of world hunger. It led to knowledge gain, reflection, and resolutions of action. Of course, the world hunger issue is too complex to be resolved in a workshop of this type. The initial model allowed a detailed consideration of world hunger, offered a model for further study, and provided a solid base for a revised model. The revised model of science education for responsible social action appears to have the components necessary to develop competencies in dealing with social issues in science courses.

The final question was: How can a model builder communicate what happened in such a way that the dynamic, heuristic nature of the model emerges? There appears to be an intimate and necessary relationship between the actual experiences of the model developer and the model itself. The issue considered by the model developer was whether a model could be developed that linked the best of science education with rigorous examination of social issues. Critical thinking, personal involvement, and moral deliberation were involved and necessary in the development of the model as well as being the three major elements of the model. After being immersed in the three elements, action and self-reflection occurred. A model was developed, tested in a small way, and revised.

When trying to communicate what actually happened, one must include problems and ideas in overcoming the problems. The need for consideration of social issues was examined, an initial model was developed, the initial model was tested in a practical way and then reconceptualized and revised in light of data and insights emerging from the workshop. In effect, a before and after presentation of the model is offered.

The dynamic nature of the model is communicated through the presentation of the initial and more comprehensive models, the indications of uncertainty, and the reality of struggling on the part of the model developer. Of course, there is no way to convey accurately the enormous number of new thought patterns and model revisions that occurred during this study.

It was emphasized that each element is necessary but none alone is sufficient. A balanced study attempting to deal equally with the three elements would have been ineffective because of limited time and resources. Moral deliberation in the social issue was the focus, and the heuristic nature of the study emerged.

An effort to provide an opportunity for the evolution of curriculum and learning experiences has been attempted. It resulted in some reasonable ways of looking at and attacking social issues in the curriculum.

Implications

It has been emphasized repeatedly that education should: 1. identify and meet human needs; 2. strive for decision-making ability; and 3. serve as a process for change. It appears that education has at least three responsibilities that should be met before attainment of these goals is possible.

The first responsibility of education is to recognize the need for the study of social issues. One of the major goals of the American educational system is to produce enlightened citizens. Among the attributes of an enlightened citizen is the ability to deal with issues and make responsible decisions. Concerns should be examined by thinking critically, becoming personally involved, and through deliberation on a moral basis.

Perhaps, with an honest approach to social issues, we can narrow the gap between our intentions and our actions. The next generation will be ill-prepared to engage in decision-making in social issues if such experiences are not provided.

A second responsibility of education is to train and employ teachers who can work with social issues. It is unlikely that all teachers possess the competencies necessary to deal adequately with social issues involving the inter-relationships of science, technology, and humankind.

Teachers trained in a single discipline may have difficulty broadening their perspective, but if the science curriculum is to aid in producing responsible decision-makers, it must deal with values and social issues.

Optimally the teacher should have skills in group processes and knowledge of linguistics and rhetoric. The successful teacher of social issues should have the wisdom to judge when to intervene to create new learning experiences and when to refrain from intervention because his intrusion would inhibit learning.

The social-ethical framework of the teacher will play a major role in determining which conflicts and issues are to be considered. This framework tends to predispose us to include some aspects of the issue and exclude others; although this predisposition is a reality, schools should reflect cultural pluralism and teach respect for the core values, such as justice, equality, and human dignity. Dealing with controversial topics is difficult, but one must deal with them if one is to meet the responsibility of developing citizens with competencies in handling social issues.

A third responsibility of education is to get started. We seem to know the whys and wherefores of social issues, but we need to set up some systems or sets of systems that will command our attention and demand some responsive activity. In order for this to occur, there must be efforts at forming

methods of action such as the model presented in this dissertation.

Recommendations

All teachers bring insights into their teaching from past experiences. "Good" teachers are also aware of uncertainties that they take into the classroom. They may not know how to deal with these uncertainties, but they are struggling to identify more appropriate ways of alleviating them. The curriculum developer, too, brings insights into his work as well as inevitable uncertainties. These uncertainties are especially frustrating to the novice curriculum developer.

In this dissertation, a novice curriculum developer has attempted to develop a model of science education for responsible social action. Consideration and analysis of social issues was the focus, with a better understanding of relationships of education and society being of signal importance. The intent was for the model to encompass educational strategies and aspects of curricula which would enhance the ability of individuals to deal with social issues.

As previously stated, this model is dynamic, but for dissertation purposes it must be presented as an end product representing its evolution at some point. Additional work is desirable in the continuing development of the model, and a few of these areas will be presented as recommendations

for further research.

The heuristic nature of this study leads to the first recommendation. It would be extremely difficult for a study of this type to deal adequately with all elements of the model. Education programs rarely reflect that kind of needed balance. One must presume that what we know about the nature of knowledge, the nature of society, or the nature of the individual is of greatest importance. After one decides which to emphasize, one must design a paradigm that will facilitate attaining the end result. A study concentrating on the personal involvement element should be both interesting and informative. The area of curricula represented by critical thinking in this model has been examined in much greater detail than the personal involvement element.

A second recommendation centers around the amount of contact time with workshop participants. Workshop results would probably have been more conclusive with additional discussion time. Working with the reality of public school teachers' schedules limited some experiences. Perhaps a follow-up study should be with pre-service teachers or other students.

A third recommendation is that the researcher have ample time to deal adequately with complex aspects of such a study. Uninterrupted blocks of time are essential in order to become immersed in the analysis and to establish a dialectic between inner and outer reality. Self-reflection

is extremely important in such an endeavor and it requires that one be able to concentrate solely on that task.

The final and major recommendation is the substance of the dissertation itself. Science education in particular and education in general should consider more than intellectual advancement; they should consider issues and social action.

It appears that any attempt to deal with issues and social action would require critical thinking, personal involvement, and moral deliberation. They may occur in cycles of varying dominance and emphasis, but a study of social issues apparently encompasses each element to some degree. In this dissertation the researcher offers a model to deal with social issues. It appears to provide a conceptual base for teachers and students interested in responsible social action.

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APPENDIX A

WORKSHOP ANNOUNCEMENT

INQUIRY INTO WORLD HUNGER

Coordinator: Frank Clements Dates: Each Wednesday--April 9, 1975-May 21, 1975

Time: 5 two hour sessions (3-5); 2 three hour sessions (3-6)

Purpose: The workshop is designed to sensitize participants to social issues, to aid in the development of rational positions on social issues, and to offer a model of education for rational social action.

Tentative Outline and Schedule:

April 9
1. Introduction
2. Brief history of food problems

April 16
"Causes" of the present global food crisis

April 23
1. Effects of hunger and malnutrition
2. Hunger in Alamance County: An American Paradox

April 30
Potential solutions or "mythological panaceas"

May 7
Analysis of developing countries that have moved toward "self-sufficiency"

May 14
Means of deciding who shall survive--
Dr. Paul Lutz, Professor of Biology at the University of North Carolina at Greensboro

May 21
Recapitulation

Format: Interaction utilizing values clarification to reach independent judgment: Data will emerge from guest speakers, discussions, films, and readings.

*One hour of renewal credit

APPENDIX B

PRE-WORKSHOP TEST

Multiple Choice: Write the letter of the correct response in the blank.

1. Approximately what is the world's population at this time? A. 1. billion; B. 2 billion; C. 3 billion; D. 4 billion.
2. Which of the following is most accurate? A. More people are hungry today than ever before; B. Fewer people are hungry today, but media coverage makes it seem worse; C. Hunger occurs only in a few areas of the world; D. The hunger problem has been greatly exaggerated.
3. What percent of the world's population lives in developing countries? A. less than 10%; B. about 25%; C. about 50%; D. about 75%.
4. Deaths per 1000 live births in developing countries is _____ greater than in developed countries. A. two times; B. three times; C. five times; D. seven times; E. ten times.
5. Unemployment in the developing world ranges from _____ of the labor force. A. 20-25%; B. 13-15%; C. 10-25%; D. 5-8%; E. 1-3%.
6. Which item do you think receives the biggest chunk of the U. S. budget? A. foreign aid; B. welfare programs; C. military; D. education programs; E. health programs.
7. Do you think that U. S. aid to developing countries as a percent of GNP is: A. more than that of any other developed country; B. more than most developed countries; C. about the same as other developed countries; D. less than many other developed countries; E. less than that of any other developed country.
8. If current population growth rates are maintained, the number of people in the world will _____ by the year 2000. A. remain the same; B. increase by 5%; C. increase by 50%; D. double itself.
9. What is the green revolution? A. a guerilla war; B. a back-to-the-land movement; C. a breakthrough in food productions; D. a victory for a new kind of pesticide; E. new methods of cutting back tropical overgrowths.
10. The average protein intake of each person in the U.S. is about 96 grams per day; In india it is: A. about the same; B. three-fourths as much; C. one-half as much; D. one-third as much; E. one-fifth as much.
11. During the last three years, the world fish catch has: A. increased dramatically each year; B. increased slightly each year; C. remained about the same; D. dropped each year.
12. The Russian Wheat Deal caused grain prices to rise in the U.S. and: A. helped stabilize the world market prices; B. produced lower prices on the world market; C. had no effect on the world market; D. caused a large increase on the world market as far as price is concerned.

13. Which of the following is most accurate? Massive famines: A. are a recent phenomenon; B. occurred in biblical times and not again until the last 10 years; C. have occurred periodically throughout history; D. have been very common throughout history, but not in this century.
14. It is estimated that ____people of the world die each day from malnutrition either directly or indirectly. A. 500; B. 1,000; C. 2,500; D. 5,000; E. 10,000.
15. A population growing at 1% per year doubles in: A. 70 years; B. 100 years; C. 130 years; D. 150 years; E. 200 years.
16. What range of percentages of people in the U.S. suffer from food shortages? A. 1-2%; B. 3-5%; C. 5-10%; D. 10-15%; E. 15-20%.
17. In the underdeveloped world, the population under nineteen makes up what percentage of the total population? A. approximately 10%; B. approximately 25%; C. approximately 33%; D. approximately 50%; E. approximately 75%.
18. Ecologically speaking, the least efficient food of the following is: A. pork; B. puultry; C. grains; D. beans; E. beef.
19. In order for food production to keep pace with population growth, it must rise: A. 2%/year; B. 3%/year; C. 5%/year; D. remain the same; E. 1%/year.
20. The world's reserves of grain at present are approximately enough for: A. one-half a year; B. 125 days; C. 95 days; D. 26 days.

APPENDIX C

POST-WORKSHOP TEST

1. Approximately what percentage of the world's population does the U.S. have? A. 3%; B. 5%; C. 8%; D. 12%; E. 15%;
2. Approximately what percent of the U.S. GNP goes to foreign assistance: A. 1%; B. 5%; C. 10%; D. 15%; E. 25%.
3. Triage is: A. a new kind of grain production; B. a term describing new ways of developing land; C. a method of determining what countries should receive assistance; D. a victory for a new kind of pesticide; E. an organization dedicated to the right to have as many children as one desires.
4. The current yearly percent of world population growth is: A. 1%; B. 2%; C. 5%; D. 7%; E. 10%.
5. Of the sixteen industrial nations, what is our rank in percent of GNP in aid to developing countries? A. 1st; B. 6th; C. 10th; D. 14th; E. 16th.
6. Historically, there was only one important source of growth in world demand for food; there are now two--population growth and: A. overconsumption; B. political deals; C. droughts; D. ecological disasters; E. wars.
7. The oil crisis in 1974: A. greatly affected world food production; B. had a minor effect on world food production; C. had no effect on world food production; D. caused world food production to increase.
8. The total grain consumed in the U.S. as a multiple of Indian consumption is: A. 2; B. 4; C. 5; D. 7; E. 10.
9. Of the world's food supply, America controls more than: A. one-fourth; B. one-third; C. one-half; D. two-thirds.
10. Historical records indicate that human fertility does not usually decline very much unless: A. people realize their population is outgrowing the food supply; B. their leaders emphasize the importance of birth control; C. they are firmly convinced that birth control is needed; D. people are placed under a great amount of stress; E. certain basic social needs are satisfied.
11. Approximately what percentage of the children in N.C. are malnourished? A. 5%; B. 15%; C. 40%; D. 55%; E. 75%
12. Over the long run the world's greatest reservoir of unexploited food potential appears to be in: A. the oceans; B. the developed countries; C. the polar regions; D. the U.S.; E. the less developed countries.
13. The biggest contributer to child mortality in the developing countries is: A. wars; B. severe weather; C. parasitic infection; D. communicable diseases; E. malnutrition.
14. The world's reserves of grain at present are approximately enough for: A. one-half a year; B. 125 days; C. 95 days; D. 50 days; E. 26 days.

15. Illiteracy is: A. no longer a world problem; B. an insignificant world problem; C. increasing slowly but is no threat on this planet; D. increasing as the world population increases.
16. Demographic transition refers to: A. the rate of world population growth on a yearly basis; B. a lowering of the birth rate as the standard of living increases; C. amount of food per capita; D. the right of individuals to determine family size.
17. What is the green revolution? A. guerilla wars; B. a back-to-the land movement; C. a breakthrough in food production; D. a victory for new kinds of pesticides; E. a new method of cutting back tropical overgrowth.
18. Approximately what percent of the world's wealth does the U.S. have? A. about 15%; B. about 25%; C. about 35% D. about 50%; E. about 65%.
19. Which of the following areas has a negative population growth rate? A. Pakistan; B. North America; C. Mainland China; D. Germany; E. Latin America.
20. A population growing at 2% per year doubles in approximately: A. 15 years; B. 35 years; C. 70 years; D. 100 years; E. 150 years.

APPENDIX D

PRE-WORKSHOP MORAL STORIES

Story 1:

In Europe, a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discoverd. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200.00 for the radium and charged $2,000.00 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000.00, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug, and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife.

1. Should Heinz have done that? Was it actually wrong or right? Why?
2. Is it a husband's duty to steal the drug for his wife if he can get it no other way? Would a good husband do it?
3. Did the druggist have the right to charge that much when there was no law regulating a limit to the price? Why?

Answer questions 4a and 4b only if you think Heinz should steal the drug.

4. a) If the husband does not feel very close or affectionate to his wife, should he steal the drug?
   b) Suppose it wasn't Heinz's wife who was dying of cancer, but it was Heinz's best friend. His friend didn't have any money and there was no one in his family willing to steal the drug. Should Heinz steal the drug for his friend in that case? Why?

Answer questions 5a and 5b only if you think Heinz should not steal the drug.

5. a) Would you steal the drug to save your wife's life?
   b) If you were dying of cancer but were strong enough, would you steal the drug to save your own life?
6. Heinz broke into the store and stole the drug and gave it to his wife. He was caught and brought before the judge. Should the judge send

Heinz to jail for stealing or should he let him go free? Why?

Story II:

The drug didn't work and there was no other treatment known to medicine which could save Heinz's wife, so the doctor knew that she had only about six months to live. She was in terrible pain, but she was so weak that a good dose of a pain-killer like ether or morphine would make her die sooner. She was delirious and almost crazy with pain, and in her calm periods she would ask the doctor to give her enough ether to kill her. She said she couldn't stand the pain and she was going to die in a few month anyway.

1. Should the doctor do what she asks and give her the drug that will make her die? Why?
2. When a pet animal is badly wounded and will die, it is killed to put it out of its pain. Does the same thing apply here? Why?

Answer questions 3, 4, and 5 only if you think the doctor should not give her the drug.

3. Would you blame the doctor for giving her the drug?
4. What would have been the best for the woman herself, to have had her live for six months more in great pain or to have died sooner? Why?
5. Some countries have a law that doctors can put away a suffering person who will die anyway. Should the doctor do it in that case?

Everyone should answer the remaining questions.

6. The doctor finally decided to kill the woman to put her out of her pain, so he did it without consulting the law. The police found out and the doctor was brought up on a charge of murder. The jury decided he had done it, so they found him guilty of murder even though they knew the woman had asked him. What punishment should the judge give the doctor? Why?
7. Would it be right or wrong to give the doctor the death sentence?
8. Do you believe that the death sentence should be given in some cases? Why?
9. The law prescribes the death penalty for treason against the country. Do you think the death sentence should be given for treason? Why?

APPENDIX E

POST-WORKSHOP MORAL STORIES

Story I:

Sahel is an Arabic word for Shore. Generally, it is applied to the southern belt of the Sahara Desert, stretching across the continent of Africa. For the past six years the Sahel has been the scene of a drought that is already one of the most severe and devastating in history. It has killed hundred of thousands of people, forced millions more from their homes, decimated the cattle population, and allowed the desert to swallow 12 to 50 miles of Sahelian land a year--all of this in an area about two-thirds the size of the continental United States.

The Tuaregs are a group of nomads living in the southern part of the Sahelian zone. Ibrahim Omar is a Tuareg herder, part of a proud and ancient way of life. He has a wife and three living children. During the last years of the drought, daily life has been very difficult for Ibrahim and his family. Their animals have died of hunger, and they fear they may die the same way. But they do not complain for it is not proper for a Tuareg to do so. Ibrahim was not a rich man, but he once had 100 cattle, 20 camels, and 40 goats. These animals either died or were sold to traders from a neighboring state because they would not live long.

For Ibrahim, as for all the Tuaregs, the decimation of the herds that made him and his family mobile has been a crushing blow. Like many others, he is now forced to seek some kind of job in a distant town or city where thousands of families huddle in relief camps and a noisy bustling world intrudes on the privacy of its inhabitants. For a once proud nomad, the refugee camp is a humiliating experience.

Many of the refugees die each day because of insufficient food. Ibrahim's children are getting weaker each day. Asking for additional food does no good. About ten percent of the citizens of the city are wealthy and Ibrahim has been thinking seriously about stealing food and items he could barter with from the more affluent people. This is an especially difficult decision because of the strict Tuareg social code against stealing, but Ibrahim can see no other way to save the lives of his children.

1. Should Ibrahim steal in this situation? Is it actually right or wrong? Why?
2. Is it a husband's duty to steal for his family" Would a good husband do it for his family?

Answer question 3 only if you think Ibrahim should steal food for his family .

3. If the husband does not feel very close or affectionate to his family, should he still steal for food? Why or Why not?

Answer questions 4a and 4b only if you think Ibrahim should not steal for the food.

4. a) Would you steal for food to save your family's life? Why or why not?
   b) If you were strong enough, would you steal food to save your own life?
5. Do you feel any responsibility in aiding this family in overcoming their plight?

Story II:

The world population is growing much faster than the food supply. As a result, there is mass starvation in several parts of the world. The President of the United States must decide what to do in the face of this world crisis. If he gives food away, food prices here go up or maybe even shortages will develop. If he does not give the starving people help quickly, many will die.

1. What should he do? Why?
2. Does he have the right to let the other people die? Why?
3. Does he have the right to give the starving people enough help if he knows there could be real hardship in this country? Why or Why not?

APPENDIX F

QUESTIONNAIRE RESULTING FROM "INQUIRY INTO WORLD HUNGER" WORKSHOP

This questionnaire is designed to acquire information as a follow-up to the workshop "Inquiry into World Hunger" in which you were a participant in the spring of 1975. Please respond to the questions as candidly as possible. Return the questionnaire in the enclosed envelope via the inter-school mail system. I realize that you are busy, but please return the questionnaire to me by the end of the week.

Thank you for your cooperation.

Check the appropriate blank in each of the following items. If the available responses do not accurately convey your answer, please elaborate using the comment blank.

1. Have you consciously changed your life style as a result of experiences in the "Inquiry into World Hunger" workshop?

   Yes _____ No _____ Comment _____

2. If your response to item number one is yes, please check the area or areas best describing life-style changes. If the available responses do not provide for a description of life-style changes, please describe the change or changes in the blank beside the response labeled "other".

   I have or am -

   ____ educating others about the world hunger issue.

   ____ altered my diet so that it is more efficient in using natural resources.

   ____ now more conscious of and attempt to prevent food waste.

   ____ become politically involved in working for certain positions on the issue.

   ____ attempting to become more knowledgeable on the world hunger issue by reading, media reports, etc.

   ____ raised money or provided food to fight hunger and malnutrition.

____ examining my present life-style in light of the world hunger crisis.

____ other changes in life style, please elaborate in the blanks below--

Comment: _____

_____

3. Have you taught a unit or formal lesson on world hunger since the conclusion of the workshop?

Yes ____ No ____ Comment _____

4. Since the conclusion of the workshop, have you discussed the hunger crisis informally?

Yes ____ No ____ Comment _____

If your answer to item four is yes, please check the following blanks to indicate the groups with which informal discussion occurred.

____ with students

____ with peers

____ with family

____ other, please elaborate in the blanks below--

Comment: _____

_____

_____

Thank you again,