Ph. D.

A CONCEPTUAL FRAMEWORK FOR ENVIRONMENTAL EDUCATION ADAPTED TO THE PHILIPPINE ENVIRONMENT

Dissertation for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
PAZ CONCEPCION-MEDEL
1974

This is to certify that the

thesis entitled

A CONCEPTUAL FRAMEWORK FOR ENVIRONMENTAL EDUCATION

ADAPTED TO THE PHILIPPINE ENVIRONMENT

presented by

Paz Concepcion-Medel

has been accepted towards fulfillment
of the requirements for

Ph. D. degree in Education

Martin Hetherington
Major professor

Date April 8, 1974

O-7639

A CONCE

A

The purpose

for an ecologically

lopment and impleme

The structural four

of education for na

of the country and

education; (4) th

(5) the present st

tion programs in t

A theoretic

and its contribut

tual framework co

education and gui

cesses for enviro

tegies for enviro

Guidelines for i

ABSTRACT

A CONCEPTUAL FRAMEWORK FOR ENVIRONMENTAL EDUCATION
ADAPTED TO THE PHILIPPINE ENVIRONMENT

By

Paz Concepcion-Medel

The purpose of this study was to develop a conceptual framework for an ecologically-oriented science curriculum, as basis for the development and implementation of environmental education in the Philippines. The structural foundations were derived from: (1) the goals and purposes of education for national development; (2) the socio-economic conditions of the country and its physical environment; (3) the role of science education; (4) the environmental concerns of a developing country; and (5) the present status, organization and content of environmental education programs in the United States and some countries.

A theoretical conception of the goals of environmental education and its contribution to aims of national development led to the conceptual framework consisting of four parts: I. Approaches to environmental education and guidelines for its implementation; II. Concepts and processes for environmental education; III. Some suggested teaching strategies for environmental literacy and ecological conscience; and IV. Guidelines for in-service education of teachers and suggested program

of activities.

The conceptua

ecological elements

processes derived fr

the environmental pr

as motivating force

of the conceptual s

has finite resource

learn to harmonize

nities and ecosyste

Within the c

following conclusio

1. Environm

toward community d

improvement of the

2. The nee

the learners and t

of the community a

environmental educ

3. Scienc

curriculum wherei

tary and secondar

4. The mu

ter divisions all

of activities.

The conceptual framework developed in this study integrates the ecological elements in the existing science curriculum, the learning processes derived from first-hand experiences with the environment and the environmental problems of the community, and the affective objectives as motivating force for an environmental ethic. The scope and sequence of the conceptual scheme is based on the ecological theme: The earth has finite resources and all life depends on how successfully man can learn to harmonize his use of the earth's resources with natural communities and ecosystems.

Within the context of the thesis developed in this study, the following conclusions are made:

1. Environmental education for development goals is directed toward community development, growth of environmental ethic and the improvement of the environment.

2. The needs of the community, psychological characteristics of the learners and the socio-economic conditions and bio-physical aspects of the community are important foundations for curricular programs in environmental education.

3. Science teaching can provide the core element in the existing curriculum wherein ecological concepts can be integrated in all elementary and secondary levels.

4. The multidisciplinary approach that cuts across subject matter divisions allows for learning experiences within educational schemes

of rural and agricul

cation and community

5. The strat

size experiences out

inquiry processes, m

tion.

6. "Awarene

development and "ac

ronmental issues pe

7. Teachers

concepts, processe

ness, improve thei

curriculum develop

8. Coopera

dents, parents, t

tives of governme

lems will enhance

9. There

mental education

enable teachers

tive umbrella of

The imper

search regarding

action, evaluat

of rural and agricultural education, conservation education, value education and community education.

5. The strategies that are found in the program designs emphasize experiences outside the classroom, the use of community resources, inquiry processes, multidisciplinary applications and value clarification.

6. "Awareness-oriented" teaching must progress toward "attitude" development and "action-oriented" strategies from a broad base of environmental issues pertinent to the community.

7. Teachers need extensive in-service education in environmental concepts, processes and values to increase their understanding and awareness, improve their teaching skills and expand their participation in curriculum development.

8. Cooperative efforts and close working relationship among students, parents, teachers, businessmen, community leaders and representatives of governmental agencies in the confrontation of environmental problems will enhance the goals of environmental education.

9. There is no single curriculum and no easy answer to environmental education; instead this study provides curricular options to enable teachers in developing countries to operate within some descriptive umbrella of environmental education.

The imperatives developed in this study have implications for research regarding effective experiences for attitude change and social action, evaluative instruments, instructional materials and resources as it relates to th

several actions to

directed to the Dep

sions in the count

as it relates to the Philippine environment. It also indicates several actions to be considered for the implementation of this study directed to the Department of Education and Culture; the school divisions in the country and the Environmental Center of the Philippines.

A CONCE

A

in

Depa

A CONCEPTUAL FRAMEWORK FOR ENVIRONMENTAL EDUCATION ADAPTED TO THE PHILIPPINE ENVIRONMENT

By

Paz Concepcion-Medel

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Secondary Education and Curriculum

1974

To

DEDICATION

To Armand, who in his own way
inspired this study, and

To Joy, Carol, Alberto, Cherie and Gina,
for a better environment in their
lifetime.

I am part
national Educati
my doctoral stud
not have been po

To Dr. M
committee, who
of this study w
cern and friend

To Dr. R
Berkheimer, mem
of my thinking
deeply grateful

To Dr. J
advice and enco
and Mathematics
ciation.

I also
tion, particul
extended to me
tional Foundat
pletion of thi

And to
standing, sacr
enable me to f
special way.

ACKNOWLEDGEMENTS

I am particularly grateful to the Institute of International Education for the scholarship and travel grant for my doctoral studies, without whose support, this study would not have been possible.

To Dr. Martin Hetherington, chairman of my doctoral committee, who have guided my efforts toward the preparation of this study with his helpful suggestions, professional concern and friendship, I am most grateful.

To Dr. Robert George, Dr. Peggy Miller and Dr. Glenn Berkheimer, members of the committee, who have influenced some of my thinking in my courses and interactions with them, I am deeply grateful for their guidance and friendly assistance.

To Dr. Julian Brandou and Dr. Richard McCleod, for their advice and encouragement in developing my program with the Science and Mathematics Teaching Center, I am extending my sincere appreciation.

I also thank the Philippine-American Educational Foundation, particularly, Dr. Vitaliano Bernardino, for the support extended to me as a "Fulbrighter", and to the Altrusa International Foundation, Inc. for their grant-in-aid toward the completion of this dissertation.

And to my husband, children and family, for their understanding, sacrifices and moral support during my stay abroad, to enable me to fulfill a dearest wish, I thank them in a very special way.

CHAPTER

I. INTRODUCT

The Pr
Backgr
Purpos
Signif
Proced
Assump
Defini
Delimi
Organi

II. REVIEW OF

Concep
His
Def
Guidel
Approa
Cur
Int
Dev
One
Instru
De
Le
In-se
Envir
Pr
Pr
Pr

TABLE OF CONTENTS

CHAPTER		Page
I.	INTRODUCTION	1
	The Problem	1
	Background of the Study	2
	Purpose of the Study	9
	Significance of the Study	10
	Procedure and Sources of Data	11
	Assumptions of the Study	14
	Definition of the Terms	15
	Delimitations of the Study	18
	Organization of the Study	19
II.	REVIEW OF RELATED LITERATURE	21
	Concept of Environmental Education	21
	Historical Perspective	21
	Definition of Environmental Education	29
	Guidelines for Curriculum Development	31
	Approaches to Environmental Education	34
	Curriculum Reform	35
	Integration of Environmental Education into Existing Curricula	37
	Development of Special Units of Study	40
	One-semester Credit Courses	43
	Instructional Concerns	44
	Development and Organization of Concepts	44
	Learning Techniques and Teaching Strategies	48
	Outdoor Education	50
	Environmental Investigations and Studies	52
	Facilities and Resources	55
	Academic Simulation Games	57
	Value Education	59
	Multimedia Approach	61
	Multidisciplinary Approach	62
	In-service Education of Teachers	64
	Environmental Concerns of Developing Countries	66
	Problems of Human Settlements	68
	Problems of Management and Use of Natural Resources	69
	Problems from Industrial Development	71

III. THE PHILIPPINE SET

Physical Enviro
Socio-economic
The Constitutio
Objectives of
Science in Gen
Environmental

IV. DEVELOPMENT AND I
ENVIRONMENTAL

Perspective.
Environmental
Environmental

Part I. Appr
anc

Science E
Conservat
Rural anc
Value Edu
Youth Org
Guideline
Envir

Part II. Co
Ed

Concepts
Understa
Understa
Process

Part III.

Teacher
Educ
Where t
Educ
The
Comm
Eco
Env

III. THE PHILIPPINE SETTING 73

Physical Environment. 73
Socio-economic Conditions 75
The Constitution and Patrimony of the Nation. . . . 81
Objectives of Elementary and Secondary Education . . 83
Science in General Education 86
Environmental Issues in the Philippines 91

IV. DEVELOPMENT AND IMPLEMENTATION OF ENVIRONMENTAL EDUCATION 99

Perspective. 99
Environmental Education for Developing Countries . . 100
Environmental Education and Goals of Development . . 102

Part I. Approaches to Environmental Education and Guidelines for its Implementation . . . 106

Science Education 106
Conservation Education. 110
Rural and Agricultural Education 111
Value Education 113
Youth Organizations. 116
Guidelines for Development and Implementation Environmental Education 119

Part II. Concepts and Processes for Environmental Education 125

Concepts for Environmental Education 126
Understandings for Elementary Levels 127
Understandings for Lower Secondary Levels . . . 137
Process Skills 143

Part III. Some Suggested Teaching Strategies for Environmental Literacy and Ecological Conscience 148

Teacher's Changing Role in Environmental Education 148
Where to Teach -- Places for Environmental Education 153
The School Site 155
Community Resources and Facilities. 156
Ecological Study Areas. 157
Environmental Education Centers. 159

Strategy I.
Concept De
Topic Web
Objectives
Area Discu
Area Studi
Strategy II.
Concept De
Objective
Topic Web
Pre-trip
Field Act
Post- Fie
Teacher's
Strategy III
Dam and W
Concept D
Objective
Pre-field
Field Tr
Post-Fie
The Role
Strategy IV
Inquiry
Objectiv
General
Suggeste
Post-act
Strategy V.
The Role
Activity
Activity
Activity

Part IV. Some
of T
and

Plan # 1
Sensiti
Suggest
Plan # 2
Sessio
Plan # 3

Summary . .

Strategy I. Explorations in the School Grounds. . 160
Concept Development 161
Topic Web 161
Objectives of the Outdoor Activity 162
Area Discussions 162
Area Studies 163
Strategy II. The Seashore Along the Bay 164
Concept Development 165
Objectives of the Field Trip 165
Topic Web 166
Pre-trip Discussions. 166
Field Activities 167
Post- Field Trip Activities 167
Teacher's Role 169
Strategy III. Ecosystem Analysis of La Mesa Dam and Watershed. 170
Concept Development 171
Objectives of the Field Trip 171
Pre-field Trip Discussions. 171
Field Trip Activity 172
Post-Field Trip Activities. 172
The Role of the Teacher. 172
Strategy IV. A Lesson in Question and Answer Inquiry 173
Objectives 174
General Procedures 174
Suggested Activity for the Demonstration . . . 175
Post-activity Discussions 176
Strategy V. Value Clarification. 176
The Role of the Teacher. 178
Activity # 1 Rank Order Technique 178
Activity # 2 Values Continuum 179
Activity # 3 Counter Attitudinal Role Playing . 179

Part IV. Some Guidelines for In-service Education of Teachers for Environmental Education and Suggested Program of Activities. . . . 181

Plan # 1 Seminar-Workshop in Environmental Sensitivity. 185
Suggested Program of Activities for Three Days . 188
Plan # 2 An In-service Institute with a One-Week Session and Bi-monthly Meetings 189
Plan # 3 A Two-week In-residence Summer Institute. 191

Summary 192

V. SUMMARY, CONCLUSIO

Introduction
Summary . .
Conclusions .
Implications ar
Recommendat
Recommendat
of the St

BIBLIOGRAPHY . . . .

APPENDICES .

A. List of Sources
Fundamental
Conservation

B. Score Sheet for

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 194

Introduction 194
Summary 195
Conclusions 197
Implications and Recommendations 200
Recommendations for Further Research. 200
Recommendations for the Implementation of the Study. 202

BIBLIOGRAPHY 204

APPENDICES

A. List of Sources Used for the Development of Fundamental Concepts for Environmental Conservation Education. 223

B. Score Sheet for Ecosystem Analysis. 225

LIST

Figure

1. An Input-Output Mod
Environmental E
Development .

2. A "Total" Educatio
tion Showing th
Of Each Scheme
mic and Scienti
Environment .

3. Vertical Developme
is the product

4. A Horizontal Devel
things are int
environment.

5. A Multidisciplina
the school are

6. A Content/Process
(or population
their heredity

7. Grid Suggesting S
Conceptual The
of its heredit

LIST OF ILLUSTRATIONS

Figure		Page
1.	An Input-Output Model to Illustrate the Contribution of Environmental Education to the Goals of National Development	105
2.	A "Total" Education Approach to Environmental Education Showing the Contribution and Interrelations Of Each Scheme Toward a Social, Political, Economic and Scientific Outlook of Man Towards His Environment	107
3.	Vertical Development of the Concept: A living thing is the product of its heredity and environment. . .	140
4.	A Horizontal Development of a Subconcept under: Living things are interdependent with one another and their environment.	141
5.	A Multidisciplinary Approach to the Subconcept: Around the school are many kinds of plants and animals.. .	142
6.	A Content/Process Design for the Concept: Organisms (or population of organisms) are the product of their heredity and environment.	146
7.	Grid Suggesting Some Areas of Objectives for the Conceptual Theme: A living thing is the product of its heredity and environment.	147

Environmental quali
issue not only in industri
and Japan, but also in und
Problems of high industria
of land and water resource
lized or pre-technological
populations, scientific kn
gress, has brought about
economic development usua

The world faces an
in many instances in the
tions in the face of soci
gers to the environment w
veloped into a global con
wide environmental educat

A program of envi
relevant to its socio-ec
environmental problems a
economic successes, ther
work towards the improve

CHAPTER I

INTRODUCTION

Environmental quality is fast emerging as a social and political issue not only in industrial societies like the United States, England and Japan, but also in underdeveloped and developing countries as well. Problems of high industrial concentration, pollution and mismanagement of land and water resources affect all economies, whether industrialized or pre-technological societies. The converging of exploding populations, scientific knowledge and pursuit of what is called progress, has brought about consequences of environmental change. With economic development usually comes environmental deterioration.

The world faces an environmental crisis of its own making. As in many instances in the past, societies turn to education for solutions in the face of social crises. The awareness of threatening dangers to the environment which gained momentum in the 60's has now developed into a global concern for environmental quality and a worldwide environmental education movement for the 70's.

The Problem

A program of environmental education in the Philippines must be relevant to its socio-economic goals as a developing country. Since environmental problems are a result of a nation's technological and economic successes, there is a need to reorient the curricular framework towards the improvement of the environment, towards environmental survival and change in va

fundamental problem of th

of a conceptual framework

the relationships between

curricular development an

The awareness of t

the last decade or so sp

who are alert. The Conf

in 1968, recognized the

tion concerning resource

quality. It had suggest

and strengthened with re

on the problem of man a

governmental and non-gov

non-governmental intern

In 1970, an unpr

taken place in the Unit

for dealing with envi

action turned its atte

[1]United Nations
of the Biosphere. Nat

[2]Ibid., p. 211.

survival and change in values towards community social action. The fundamental problem of this study is the identification of the elements of a conceptual framework for environmental education and to indicate the relationships between those elements that will guide and direct curricular development and implementation.

Background of the Study

The awareness of threatening dangers to the environment has in the last decade or so spread to many countries where there are persons who are alert. The Conference on Resources of the Biosphere in Paris,[1] in 1968, recognized the need for improved education and public information concerning resource management problems and loss of environmental quality. It had suggested that international programmes be expanded and strengthened with regard to research, education and implementation on the problem of man and his biosphere.[2] This would involve intergovernmental and non-governmental support and participation of relevant non-governmental international scientific organizations.

In 1970, an unprecedented concern with environmental quality had taken place in the United States. Federal organizational structure for dealing with environmental problems was reshaped and congressional action turned its attention to environmental issues through significant

---

[1]United Nations Economic and Social Council, Use and Conservation of the Biosphere. Natural Resources Report No. 10, 1970, p. 197.

[2]*Ibid.*, p. 211.

laws and fact-finding hear

strengthened with increase

environmental insults, ec

and pollution control tec

By 1971, citizens

tional nature of their co

nations realized they nee

grams to deal more effec

Canada, France, Germany,

land, Singapore, Switzer

mented or planned reorga

grams.[4] In the Philippi

establishing basic polic

to bring about social ar

planning.[5]

Recently, this a

under the influence of

ronment in Stockholm.

---

[3] U.S. Department
Education, Education Th
Printing Office, 1971)

[4] Council of Env
mental Quality (Washin

[5] Committee on N
Report. The Philippin
tion Center, 1972)m p.

laws and fact-finding hearings. Federal environmental programs were strengthened with increased research and development on the effects of environmental insults, ecological relationships and natural processess and pollution control technology.[3]

By 1971, citizens of many nations had awakened to the international nature of their common concern - - a polluted environment. Many nations realized they needed to upgrade their domestic environmental programs to deal more effectively with environmental decay. Australia, Canada, France, Germany, Japan, Great Britain, India, Kenya, New Zealand, Singapore, Switzerland and the United States all had either implemented or planned reorganization of their environmental protection programs.[4] In the Philippines, Congress had approved a joint resolution establishing basic policies which shall guide the country in its efforts to bring about social and economic development through environmental planning.[5]

Recently, this awareness expanded to global intensity, partly under the influence of the 1972 United Nations Conference on Human Environment in Stockholm. This conference brought about new perspectives

---

[3]U.S. Department of Health, Education and Welfare, Environmental Education, Education That Cannot Wait (Washington, D.C.: Government Printing Office, 1971), p. 3.

[4]Council of Environmental Quality, Second Annual Report, Environmental Quality (Washington, D.C.: Government Printing Office, 1971), p. 28.

[5]Committee on Natural Resources, Senate of the Philippines, A Report. The Philippine Environment (Manila: National Media and Production Center, 1972)m p. 21.

on environmental issues in

The Stockholm Conference r

do the developing countrie

of the industrialized soci

deal with them, but in add

flect the poverty and the

The evolution of s

should seek different sol

growth with the requireme

plain the value of consid

developed and developing

their economic and social

income below $500 per cap

fast as those of wealthi

liable climates than tho

gical risks and damage f

Due to difference

---

[6] United Nations
ent, Stockholm, 5-16 J
A/Conf./ 48/5. p. 12.

[7] United Nations
ent, Stockholm, 5-16 J
Cultural Aspects of Env

[8] Barbara Ward ar
and Company, Inc., 197

on environmental issues in the basic concerns of developing countries. The Stockholm Conference recognized the inescapable reality that not only do the developing countries face many of the same environmental problems of the industrialized societies without having the resources with which to deal with them, but in addition, their major environmental concerns reflect the poverty and the very lack of development of their societies.[6]

The evolution of societies show that the developing countries should seek different solutions designed to reconcile swift economic growth with the requirements of good environment.[7] Ward and Dubos[8] explain the value of considering differently environmental issues between developed and developing countries because of sharp contrasts between their economic and social pressures. Countries with a level of national income below $500 per capita, have population growing almost twice as fast as those of wealthier countries. Their fragile soils and less reliable climates than those in temperate zones result in different ecological risks and damage from expanding outputs in farming.

Due to difference between developed and developing countries in

---

[6] United Nations General Assembly. Conference on the Human Environment, Stockholm, 5-16 June 1972. An Action Plan for the Human Environment. A/Conf./ 48/5. p. 12.

[7] United Nations General Assembly, Conference on the Human Environment, Stockholm, 5-16 June, 1972. Educational, Informational, Social and Cultural Aspects of Environmental Issues. A/Conf. 48/9, p. 23.

[8] Barbara Ward and Rene Dubos, Only One Earth (New York: W.W. Norton and Company, Inc., 1972), pp. 47-48.

conditions and opportuni

any educational approach

low-income countries fro

phic and educational set

an approach:[9]

There is no
ing to the foref
of the environme
term, entails ch
will, of course,
tion and the cha

One gap asserted

tional programs in scho

gical balance, or as on

As clearly underlined b

the Biosphere, educatio

not properly designed

of the very nature of

material suited to the

yet available in this

national Union for the

---

[9]United Nations

[10]"Elements of a
of the 13th National
UNESCO, Nov. 23-25, 1
ton, D.C.: Office of
fare, 1970), pp. 31-3

[11]United Nation
Human Environment, E/

conditions and opportunities which affect their environmental outlook, any educational approach needs to view the environmental concerns of low-income countries from a separate base of social, economic, geographic and educational setting. The Stockholm Conference underscores such an approach:[9]

> There is no disguising the fact that such a course, bringing to the forefront the need to preserve and develop the quality of the environment through education, in the broad sense of the term, entails changes in the educational systems. These changes, will, of course, be based on the individual outlook of each nation and the characteristics of its educational systems.

One gap asserted by environmentalists is a lack of adequate educational programs in schools dealing with environmental quality and ecological balance, or as one puts it, there is a need for "green studies".[10] As clearly underlined by the 1968 UNESCO Conference on the Resources of the Biosphere, education at all levels and in all countries at present is not properly designed to produce adequate understanding and appreciation of the very nature of environmental problems.[11] They add that very little material suited to the actual requirements of developing countries is as yet available in this field, although efforts by the UNESCO and the International Union for the Conservation of Nature are in progress to produce

---

[9]United Nations General Assembly, Environmental Issues, p. 20.

[10]"Elements of a New Environmental Ethic," from Summary Statement of the 13th National Conference of the U.S. National Commission for UNESCO, Nov. 23-25, 1969, The Case for Environmental Education (Washington, D.C.: Office of Education, U.S. Dept. of Health, Education and Welfare, 1970), pp. 31-32.

[11]United Nations Economic and Social Council, Problems of the Human Environment, E/4667. p. 12.

such materials.

Today's science cu

according to Glass[12] have

role of science in the ma

present world and the fai

vide a strong curriculum

National Science Teachers

Science Education for the

That science
tion that interrel
science, technolog
and economic consi

It is vital that s

mental problems. The NS

ing actions:[14]

1. That significa
included in th

2. That multidis
which the sci
developed and

3. That teachers

---

[12]Bentley Glass,
letter, No. 37, Novembe

[13]National Scien
tion for the 70's," T

[14]NSTA Committee
Confronting the Scienc
XXXVII (October, 1970)

such materials.

Today's science curricula, even the newest and the best of them, according to Glass[12] have in part failed to deal sufficiently with the role of science in the making of human culture, with the problems of the present world and the fair or dread vision of the future of man. To provide a strong curriculum more in tune with the needs of the times, the National Science Teachers Association, in its position statement on School Science Education for the 70's, makes the recommendation:[13]

> That science education programs include environmental education that interrelates natural phenomena, environmental influences, science, technology, social implications of science and technology and economic considerations.

It is vital that science educators concern themselves with environmental problems. The NSTA Committee on Issues strongly urges the following actions:[14]

1. That significant components of environmental education be included in the science learning activities of all students.

2. That multidisciplinary approaches to environmental studies in which the science teacher contributes his unique talents be developed and implemented at all levels of education.

3. That teachers seek out and sieze upon the opportunities

---

[12]Bentley Glass, "The Philosophy of a Curriculum Study," BSCS Newsletter, No. 37, November, 1969, p. 5.

[13]National Science Teachers Association, "School Science and Education for the 70's," The Science Teacher, XXXVIII (November, 1971), p.49.

[14]NSTA Committee on Issues, "NSTA Positions on Critical Issues Confronting the Science Teaching Profession," The Science Teacher, XXXVII (October, 1970), pp. 55-56.

to exert a lea
ing environmen
priate behavic

Environmental iss
tion alone. Admitting t
rooted in living organis
ronment, Hurd[15] points o
science, one that focuse
bringing concepts togeth
understanding human beh

The 1972 Stockho
ples of the Declaration
environmental matters,
in order to broaden the
duct by individuals, e
the environment.[16] Ha
tary and secondary lev
to infuse environmenta
themselves to changing

---

[15] Paul deHart H
Program in the Middle

[16] United Natio
ment, Stockholm, June
A/Conf. 48/4.

[17] Garrett Hard
cation 1970, ed. by E
Institute for Public

[18] U.S. Departm
Cannot Wait, p. 24.

to exert a leadership role in community action toward solving environmental problems and that they exemplify appropriate behaviors in relation to the environment.

Environmental issues are not mainly the concern of biology education alone. Admitting that the problems that concern us the most are rooted in living organisms, particularly man and the quality of his environment, Hurd[15] points out the need for a new curriculum base for teaching science, one that focuses upon man and his existence in the broadest sense, bringing concepts together from related disciplines which are useful for understanding human behavior.

The 1972 Stockholm Conference on Human Environment in its principles of the Declaration of the Human Environment state that education in environmental matters, especially for the younger generaltions is essential in order to broaden the basis for enlightened opinion and respectable conduct by individuals, enterprises and communities in protecting and enhancing the environment.[16] Hardin[17] believes that science teaching in the elementary and secondary levels need to be radically ecologized. The approach is to infuse environmental and ecological concepts in all studies which lend themselves to changing man's life style to one in harmony with his world.[18]

---

[15] Paul deHart Hurd, "Guidelines for Development of a Life Science Program in the Middle School," BSCS Newsletter, No. 34, April, 1969, p.2.

[16] United Nations General Assembly, Conference on the Human Environment, Stockholm, June 5-16, 1972, Draft Declaration on Human Environment. A/Conf. 48/4.

[17] Garrett Hardin, "Education for Tommorrow," Environmental Education 1970, ed. by Everett Hafner and others. (new York: Scientists' Institute for Public Information, 1970), p. 10.

[18] U.S. Department of Health, Education and Welfare, Education That Cannot Wait, p. 24.

There is now an exp

standing of the environmen

of the environment. Our r

lenging problems in basic

tion as valuable as the t

challenge to science educ

fronting societies today

ecological content.

A social adaptive

to the inevitable danger

man becomes fully consci

is incumbent upon those

tent concern for the env

requires attitude of tr

motivation toward impro

action throughout the t

of recommendations for

the Philippine Senate C

public environment cons

---

[19]United Nation

[20]William B. St
Education: A Sourceboo
(New York: John Wiley

[21]Committee on

There is now an explosion of knowledge regarding our understanding of the environment, especially the relationships between parts of the environment. Our natural environment offers some of the most challenging problems in basic science. It is in itself a source of instruction as valuable as the traditional subjects in educating mankind.[19] The challenge to science education in the midst of environmental crises confronting societies today is the establishment of curricula with relevant ecological content.

A social adaptive process is needed with the sense of alertness to the inevitable dangers of technological advance. Increasingly, as man becomes fully conscious of his reponsibilities to the environment, it is incumbent upon those in education to instill in the students a persistent concern for the environment. This cannot be accomplished easily but requires attitude of trusteeship toward land and other natural resources, motivation toward improving the environment through concerted effort and action throughout the total experience of the individual.[20] In its list of recommendations for a well-balanced program of environmental welfare, the Philippine Senate Committee on Natural Resources[21] sought for general public environment consciousness and involvement campaign. The long range

---

[19]United Nations General Assembly, Environmental Issues, p. 20.

[20]William B. Stapp, "Environmental Encounters," Environmental Education: A Sourcebook, Ed. by Cornelius Troost and Harold Altman (New York: John Wiley and Sons, 1972), p. 235.

[21]Committee on Natural Resources, Philippine Environment, p. 6.

component of the campaign

relevant courses on the e

The Philippines ha

United Nations to strive

nated expressed the impe

> . . . Economic
> between technolog
> In other words, p
> be bought at the
> of the environmen

The Philippine e

the development of a ne

teaching and learning s

ronmental education.

This study was

environmental educatio

1. Goals of environme

and implementation II

tion for integration i

strategies for enviro

Guidelines and progra

It is aimed at

scope of environmenta

levels and with the h

encouraged to use ec

22 Ibid., p. 3

component of the campaign called for the inclusion of the needed and relevant courses on the environment in the educational curricula.

The Philippines has a common effort with other countries of the United Nations to strive for environmental quality. The Philippine Senated expressed the imperative that:[22]

> . . . Economic planning and ventures should strike a balance between technological utilization and environmental breakdown. In other words, progress and a standard should living should not be bought at the cost of certain and inevitable deterioration of the environment and the quality of life of the future.

The Philippine educational system, therefore, should undertake the development of a new curriculum design applicable to nearly all teaching and learning situations that would enhance the goals of environmental education.

Purpose of the Study

This study was undertaken to develop a conceptual framework for environmental education for Philippine schools consisting of four parts: I. Goals of environmental education and guidelines for its development and implementation II. Concepts and processes in environmental education for integration into the existing science curriculum III. Teaching strategies for environmental literacy and ecological conscience and IV. Guidelines and programs for in-service education of teachers.

It is aimed at providing a broad perspective of the field and scope of environmental education at the elementary and lower secondary levels and with the hope, that teachers in developing countries will be encouraged to use ecological education concepts and materials as they

---

[22] *Ibid.*, p. 3.

teach toward goals of nat

Si

This study is an a

ideas which may be helpfu

instructional conditions

lowing:

1. The identific

education;

2. The developme

mentation of

3. The organiza

concepts, pr

4. The construc

teaching; an

5. The developm

suggested p

In particular,

1. It will cla

tion for developing co

2. It will pro

cation concepts as sug

3. It will pi

culum in environmenta

4. It will pr

tions for an in-servi

education.

teach toward goals of national development.

Significance of the Study

This study is an attempt to provide a structure of important ideas which may be helpful to educators at all levels in developing instructional conditions in environmental education through the following:

1. The identification of the needs and goals of environmental education;
2. The development of criteria for the development and implementation of environmental education in the schools;
3. The organization of important environmental conservation concepts, processes and values;
4. The construction of suggested strategies for meaningful teaching; and
5. The development of guidelines for in-service education and suggested programs of activities.

In particular, this research is important because:

1. It will clarify goals and objectives of environmental education for developing countries, its processes and social implications.

2. It will provide an organized structure of environmental education concepts as suggested base for instructional purposes.

3. It will pinpoint the wide range of approaches vital to curriculum in environmental education.

4. It will provide guidelines for its implementation and suggestions for an in-service training program for teachers of environmental education.

5. It will provid

environmental education p

The conceptual fra

With the basic framework

ing experiences, it will

nel in organizing and con

workshops; for classroom

curricular experiences;

ing a structure in which

and for school committee

better basis upon which

that any enterprise as

kind of theoretical or

Hopefully, this

work that will stimulat

give direction to the i

This study is de

1. Examining t

[23]Science Educa
Elementary School Scie
1972), p. 14.

[24]Charles Roth,
for Quality Environmen
Bay: Wis.: University

[25]Hilda Taba,
Harcourt, Brace and W

5. It will provide baseline information for the evaluation of environmental education programs and materials.

The conceptual framework generally is not only an overview scheme. With the basic framework and the tangible models for teaching and learning experiences, it will serve as a common fountainhead for school personnel in organizing and conducting environmental education conferences and workshops; for classroom teachers in developing materials and selecting curricular experiences; for learners as "curricular options" in developing a structure in which to categorize ideas, concepts and experiences;[23] and for school committees, administrators and other clients to have a better basis upon which to judge scope and intent.[24] Taba[25] suggests that any enterprise as complex as curriculum development requires some kind of theoretical or conceptual framework to guide it.

Hopefully, this study would meet the need for a conceptual framework that will stimulate and direct general curriculum development and give direction to the ideas taught in environmental education programs.

Procedure and Sources of Data

This study is descriptive and it involved the following procedures:

1. Examining the foundations for curriculum development in

---

[23]Science Education Center, Oklahoma University, "Evaluating Elementary School Science Curriculum," Science and Children, X (December, 1972), p. 14.

[24]Charles Roth, "A Massachusetts Audubon Society Program," Processes for Quality Environment, ed. by Robert S. Cook and George T. O'Hearn (Green Bay: Wis.: University of Wisconsin-Green Bay, 1971), p. 108.

[25]Hilda Taba, Curriculum Development, Theory and Practice (New York: Harcourt, Brace and World, Inc., 1962), p. 413.

environmental education.

The areas considere

lution of environmental ed

needs of minimizing and s

point of a developing cou

goals and purposes of env

2. Describing the

The more significa

ronment and aspects of Ph

and negative influence up

of the Philippine educati

Educational schemes havi

mental education are con

3. Determining t

This involved an

as core of the structure

concerned and the proces

4. Adapting gui

tation.

A synthesis of p

taken in so far as they

tem, with regard to the

education.

5. Translating

tional program designs

6. Developing

environmental education.

The areas considered were (a) the historical perspective and evolution of environmental education as response to societal need (b) the needs of minimizing and solving environmental problems from the standpoint of a developing country striving for economic growth and (c) the goals and purposes of environmental education.

2. Describing the Philippine environment and educational setting.

The more significant geo-economic resources of the Philippine environment and aspects of Philippine society which exert direct positive and negative influence upon curriculum development are identified. Goals of the Philippine educational system from different sources are described. Educational schemes having implications for the implementation of environmental education are considered.

3. Determining the approach toward curriculum structure.

This involved an analysis of the general areas of science teaching as core of the structure, its scope and sequence appropriate for levels concerned and the processes and teaching strategies useful for the goals.

4. Adapting guidelines for curriculum development and implementation.

A synthesis of principles available from literature was undertaken in so far as they are applicable to the Philippine educational system, with regard to the development and implementation of environmental education.

5. Translating the conceptual structure into suggested intructional program designs for some levels.

6. Developing guidelines for in-service teacher education

programs and suggested ac

The major sources

the United Nations (2) p

Education and Welfare (Of

of Agriculture and others

Michigan; Cooperative Ex

Educational Resources In

concerning environmental

education (4) articles

pine origin pertinent to

and (5) selected litera

environmental education

Several textbook

studies[26] on principles

were reviewed to develo

riculum goals. This li

to the members of the

revision. A revised l

developed and sequence

lowing criteria:[27]

The content use

---

[26]See Appendix
Concepts.

[27]John I. Good
Curriculum and Instru
the Study of Instruct
ciation, 1967), p. 13

programs and suggested activities.

The major sources of this research consist of (1) documents of the United Nations (2) publications of the U. S. Department of Health, Education and Welfare (Office of Environmental Education); Department of Agriculture and others; Department of Natural Resources, State of Michigan; Cooperative Extension Service, Michigan State University; and Educational Resources Information Center (ERIC) (3) some literature concerning environmental quality and various aspects of environmental education (4) articles in newspapers, magazines and journals of Philippine origin pertinent to its environmental problems and relevant topics and (5) selected literature on curriculum development in general, and environmental education, in particular.

Several textbooks and teachers' study guides as well as related studies[26] on principles on conservation, ecology and environmental science were reviewed to develop a list of concepts important to the defined curriculum goals. This list obtained from thirteen sources was submitted to the members of the researcher's doctoral committee for comments and/or revision. A revised list of conservation-related concepts was finally developed and sequenced horizontally and vertically according to the following criteria:[27]

The content used in the organizing center - -

---

[26]See Appendix A. List of Sources for Conservation-related Concepts.

[27]John I. Goodlad, "The Curriculum," Rational Planning in Curriculum and Instruction, National Education Association Center for the Study of Instruction (Washington, D.C.: National Education Association, 1967), p. 13.

(a) . . . must be

determined by

(b) . . . must ha

to other poss

rienced.

(c) . . . Should

student full

thinking and

(d) . . . should

ing books, v

so on; and

(e) . . . should

Some information

national conferences c

Teaching, Detroit, Ma

tion, Detroit, March

ciation, August 12-16

shops, conversations

ronmental education.

1. Man's attr

the kind and quality

cational experiences

2. The aims

curriculum must be s

society.

(a) . . . must be authentic and important to the field, as determined by leading scholars in it;

(b) . . . must have linkage value; that is, it should relate to other possiblities already experienced or to be experienced.

(c) . . . Should have great potentiality for involving the student fully, for assuring that he will become active in thinking and doing;

(d) . . . should present alternative avenues of approach - - reading books, viewing films, experimenting in the laboratory and so on; and

(e) . . . should lead the student to discover for himself.

Some information were also gathered from attendance in relevant national conferences of the National Association of Research in Science Teaching, Detroit, March 27-29, 1973; National Science Teachers Association, Detroit, March 30- April 2, 1973; and Conservation Education Association, August 12-16, 1973, Murray, Kentucky; and from seminars, workshops, conversations and dialogues with educators in the field of environmental education.

Assumptions of the Study

1. Man's attributes and attitudes will depend increasingly on the kind and quality of his socio-economic environment and on his educational experiences.

2. The aims of education change with social changes and the curriculum must be sensitive to the changing conditions and needs of society.

3. Literature re

environmental concerns a

ronmental education prog

in the United States can

Conservation may

natural resources. It

dependence with his env

lopment of a culture wh

and practices necessary

Conservation edu

attitudes in human bei

to conservation.[29]

Ecology is the

ganized, how the creat

function. It is the s

tionship to their envi

of things.[30]

Environmental

---

[28]Paul F. Bran
(April, 1967), p. 13.

[29]Julian W. Sm
Education (Englewood

[30]Raymond F. D
(New Yrodk: John Wile

3. Literature related to problems of human settlements, global environmental concerns and the development and implementation of environmental education programs in the school systems, which are available in the United States can be used as a guide in this study.

Definition of Terms

Conservation may be defined as the protection and wise use of the natural resources. It consists in the recognition by man of his interdependence with his environment and with life everywhere, and the development of a culture which maintains that relationship through policies and practices necessary to secure the future of a sanative environment.[28]

Conservation education refers to the development of concepts and attitudes in human beings which is reflected in their behavior relative to conservation.[29]

Ecology is the study of ecosystems to determine how they are organized, how the creatures within them interact, and how total systems function. It is the science involved in the study of organisms in relationship to their environment; it is concerned with the relationship of of things.[30]

Environmental literacy refers to a new understanding and new

---

[28] Paul F. Brandwein, "Conservation," The Science Teacher, XXXIV (April, 1967), p. 13.

[29] Julian W. Smith, Reynold E. Carlson and others, Outdoor Education (Englewood Cliffs, N.J.: Prentice Hall, Inc, 1963), p. 26.

[30] Raymond F. Dassman, Environmental Conservation, 3rd ed. (New Yrodk: John Wiley and Sons, Inc., 1972), p. 12.

awareness of man's relati

our surroundings and on

awareness that is couple

to alter these condition

Environmental man

lopment of an area or in

yield in improved qualit

Environmental qua

sible or tolerable -- o

tion of the atmosphere

up euthrophication of b

areas, damage to animal

and herbicides, destruc

sound pollution, therma

environmental quality.

Environmental s

It is concerned with a

of systems approach to

ment.[34]

---

[31] Larry L. Sale
Elementary School (New

[32] Dassman, Envi

[33] Sale and Lee

[34] Philips W. F
Ill.: Learning System

awareness of man's relation to his environment. . . of our dependence on our surroundings and on the natural systems which support life, but awareness that is coupled with full realization of man's enormous capacity to alter these conditions.[31]

Environmental management means an ecological approach in the development of an area or in its protection in order to provide the greatest yield in improved quality of living for mankind.[32]

Environmental quality refers to the conditions that make life possible or tolerable -- or the contrary.[33] Solid waste disposal, contamination of the atmosphere through the proposed supersonic transport, stepped-up euthrophication of bodies of water, overcrowding of people in urban areas, damage to animal life through DDT and other residual insecticides and herbicides, destruction of animal and plant life through oil spillage, sound pollution, thermal pollution are only few of the factors that affect environmental quality.

Environmental science is another name given for general ecology. It is concerned with all aspects of environmental quality and is a kind of systems approach to nature and the way man interacts with his environment.[34]

---

[31] Larry L. Sale and Ernest W. Lee, Environmental Education in the Elementary School (New York: Holt, Rinehart and Winston, Inc., 1972), p. 83.

[32] Dassman, Environmental Conservation, p. 101.

[33] Sale and Lee, Environmental Education, p. 83.

[34] Philips W. Foster, Introduction to Environmental Science (Homewood: Ill.: Learning Systems Company, 1972), p. 1.

Human environment

attention is drawn to t

ther this environment i

tions. In another appr

his total relation to h

ders the natural enviro

action.[35]

Integrated appro

topics at appropriate

developed horizontally

the contributions of i

environmental problems

Integrated scie

concepts and principle

damental unity of scie

on the distinctions be

Organizing eler

as threads from which

[35]UNESCO, Prob

[36]Irwin L. Sle
Problem," The Scienc

[37]P. E. Richmo
Vol. I (Paris: UNESCO

[38]Ralph W. Tyl
Educational Experienc
of Education, Part I
pp. 112-14.

Human environment may be interpreted in many ways. In one approach, attention is drawn to the biological environment which surrounds man, whether this environment is "natural" or whether is is the result of man's actions. In another approach, attention is directed towards man himself in his total relation to his environment. In other words, it primarily considers the natural environments as well as those profoundly modified by human action.[35]

Integrated approach is a term which refers to the teaching of core topics at appropriate grade levels in schools where curriculum is organized, developed horizontally as well as vertically, so that students can utilize the contributions of interdisciplinary studies in understanding and solving environmental problems.[36]

Integrated science is defined by UNESCO as those approaches in which concepts and principles of science are presented so as to express the fundamental unity of scientific thought and to avoid undue or premature stress on the distinctions between the various scientific fields.[37]

Organizing elements refer to the concepts, skills or values serving as threads from which specific learning stimuli are to be organized.[38]

---

[35]UNESCO, Problems of the Human Environment, p. 26.

[36]Irwin L. Slesnick, "Population Education -- a Response to a Social Problem," The Science Teacher, XXXVIII (February, 1971), p. 22.

[37]P. E. Richmond, editor. New Trends in Integrated Science Teaching Vol. I (Paris: UNESCO, 1971), p. 52.

[38]Ralph W. Tyler, "Curriculum Organization," The Integration of Educational Experiences. The 57th Yearbook, National Society for the Study of Education, Part III (Chicago: The University of Chicago Press, 1958), pp. 112-14.

Organizing center

time and place, through

damental organizing ele

Outdoor educatio

It is a learning climat

riences that take place

tions and attitudes nee

and activities.[40]

Multidisciplinar

to infuse instructional

areas.[41] It also mean

the environment so tha

understanding and solv

1. The curricu

only to environmental

of the elementary (gra

levels.

---

[39]Virgil E. He
by James B. MacDonald
Books, 1965), p. 87.

[40]Smith and ot

[41]Slesnick, "P

[42]William B. S
of Environmental Educ
(Mimeographed.) p. 9.

Organizing centers refer to those stimuli for learning, points in time and place, through which the student is guided toward the more fundamental organizing elements underlying the curriculum.[39]

Outdoor education means learning _in_, _about_ and _for_ the outdoors. It is a learning climate which applies to a wide variety of learning experiences that take place in an outdoor setting and to the skills, appreciations and attitudes needed for maximum satisfaction in outdoor recreation and activities.[40]

Multidisciplinary approach is used in a subject-centered structure to infuse instructional activities appropriately placed in other subject areas.[41] It also means linking subject areas that relate most closely to the environment so that both social and scientific knowledge important to understanding and solving environmental problems are properly developed.[42]

Delimitations of the Study

1. The curriculum development model developed in this study refers only to environmental education integrated into science teaching programs of the elementary (grades I-VI) and lower secondary (1st and 2nd year) levels.

---

[39] Virgil E. Herrick, _Strategies for Curriculum Development_, edited by James B. MacDonald and others (Columbus, Ohio: Charles E. Merrill Books, 1965), p. 87.

[40] Smith and others, _Outdoor Education_, p. 24.

[41] Slesnick, "Population Education", p. 22.

[42] William B. Stapp, "Development, Implementation and Evaluation of Environmental Education Programs (K-12)". University of Michigan, 1973. (Mimeographed.) p. 9.

2. There is no a

tics of the Filipino chi

tion.

3. Evaluation as

vered in this study.

4. The study do

culum development and i

Philippines.

5. The projecte

conditions and were not

6. The adminis

of environmental educa

study.

Presented in th

study, the significanc

assumptions of the stu

and organization of th

Chapter II con

briefly with a histor

education, guidelines

mental education, the

teachers for environm

loping countries.

Chapter III de

2. There is no attempt to describe the psychological characteristics of the Filipino child as related to learning for environmental education.

3. Evaluation as an element in the curriculum design was not covered in this study.

4. The study does not discuss the particular constraints to curriculum development and implementation of environmental education in the Philippines.

5. The projected program designs have not been tried under field conditions and were not the products of experiments in the Philippines.

6. The administrative and political aspects in the implementation of environmental education in the Philippines were not considered in this study.

Organization of the Study

Presented in this chapter were the problem, background of the study, the significance of the study, the procedures and sources of data, assumptions of the study, definition of terms, delimitations of the study and organization of the study.

Chapter II consists of a review of selected literature, dealing briefly with a historical perspective to the goals of environmental education, guidelines for curriculum development, approaches to environmental education, the instructional concerns, in-service education of teachers for environmental education and environmental concerns of developing countries.

Chapter III describes the Philippine setting -- its physical environment, the socio-e

elementary and secondary

its environmental proble

Chapter IV preser

developing countries, gu

followed by a developme

education, its concepts

for learning and sugges

guidelines and plans fo

Chapter V concl

cations of the research

for the implementation

environment, the socio-economic conditions, legal foundations, goals for elementary and secondary education and science in general education and its environmental problems.

Chapter IV presents a perspective of environmental education for developing countries, guidelines for its development and implementation, followed by a development of the conceptual structure for environmental education, its concepts and processes, the teachers' changing role, places for learning and suggested teaching strategies. Also in the chapter are guidelines and plans for in-service education of teachers.

Chapter V concludes the study with a summary, suggesting implications of the research for future study and specific recommendations for the implementation of the study.

REVIEW

There is consider
aspects of environmenta
of the world. Some rep
ties, trends and innova
of this study. The are
cation (b) guidelines
ronmental education (c
tion of teachers for e
lems of developing cou

Conce

Historical Perspective

Various terms a
In order to provide a
education in today's
growth and evolutiona

The need for l
cation, at times refe
of the century. Natu
associates at Cornel

CHAPTER II

REVIEW OF RELATED LITERATURE

There is considerable amount of literature dealing with various aspects of environmental education in the United States and in some parts of the world. Some representative literature showed certain commonalities, trends and innovations which were extremely helpful for the purposes of this study. The areas considered were (a) concept of environmental education (b) guidelines for curriculum development (c) approaches to environmental education (d) instructional concerns (e) the in-service education of teachers for environmental education and (f) environmental problems of developing countries.

Concept of Environmental Education

Historical Perspective

Various terms are being used in relation to environmental education. In order to provide a better understanding of the role of environmental education in today's society, it is necessary to review its historical growth and evolutionary characteristics.

The need for learning in environmental science or environmental education, at times referred to, as nature study, dates back to the beginning of the century. Nature study was initiated by Liberty Hyde Bailey and associates at Cornell University and its major purpose was to get children to know and love their e

In 1904, W. Jackman[2] in

study requires that stu

their immediate environ

ple, truthful observati

ture study movement was

and William James who e

rience.[3]

As the nature st

loping a rising concer

wildlife, water, soil

Theodore Roosevelt, Gi

tionists' philosophy t

> Conservat
> advance and gov
> minds and thei

Many agencies s

agriculture, park boa

through the years. P

---

[1]LeVon Balzer,
mental Education, A S
Altman (New York: Joh

[2]W. S. Jackman
Scientific Study of E
p. 11.

[3]Musa Y. Qutub
Ohio: Charles E. Merr

[4]Douglas H. S
Wesley Publishing Co.

to know and love their environment by observing their surroundings.[1] In 1904, W. Jackman[2] in Nature Study stated that the spirit of nature study requires that students be intelligently directed in the study of their immediate environment, in its relation to themselves based on simple, truthful observation. The mental discipline theory used in the nature study movement was in opposition with the influence of John Dewey and William James who emphasized that learning can best be done by experience.[3]

As the nature study movement started to fade away, there was developing a rising concern for the depletion of natural resources, such as wildlife, water, soil and forests. Individual leaders such as President Theodore Roosevelt, Gifford Pinchot and Aldo Leopold spurred the conservationists' philosophy that:[4]

> Conservation cannot be achieved solely by technological advance and government control; it must work through the men's minds and their attitudes toward the world they live in.

Many agencies such as state departments of natural resources, agriculture, park boards and commissions became involved in conservation through the years. Parallel to this federal interest, educational leaders

---

[1]LeVon Balzer, "Environmental Education in the K-12 Span," Environmental Education, A Sourcebook, edited by Cornelius J. Troost and Harold Altman (New York: John Wiley and Sons, Inc., 1972), p. 242.

[2]W. S. Jackman, Nature Study, 3rd Yearbook. National Society of the Scientific Study of Education (Chicago, University of Chicago Press, 1904), p. 11.

[3]Musa Y. Qutub, Secondary Environmental Science Methods (Columbus, Ohio: Charles E. Merrill Publishing Co., 1973), p. 2.

[4]Douglas H. Strong, The Conservationists (Menlo Park, Calif: Addison-Wesley Publishing Co., 1971), p. 140.

such as Charles R. Van

curriculum of few colle

the public schools.[5] A

were found in high scho

Aware that erode

stock and non-creative

rural people to make e

schools had for one of

natural resources.[7] A

Strang[8] if it helps al

resources, use their l

and produce the food a

Bathurst[9] repor

sity has for nearly ha

schools and were desi

ment along the lines

man and the teachers

developed or exhauste

---

[5]American Asso
Education in America
American Association

[6]Qutub, Secon

[7]National Soc
Communities, The Fif
Press, 1952), p. 46.

[8]Ibid., p. 50

[9]Effie G. Bat
(Washington, D.C.: N

such as Charles R. Van Hise, introduced conservation education into the curriculum of few colleges and eventually into the programs of some of the public schools.[5] According to Qutub,[6] principles of conservation were found in high school curriculum as far back in 1921 in Tennessee.

Aware that eroded soil, absence of home gardens, inferior livestock and non-creative use of leisure were evidences of failure of the rural people to make effective use of land and natural resources, rural schools had for one of its objectives the development and conservation of natural resources.[7] Accordingly, a rural school is successful, wrote Strang[8] if it helps all the people to make the best use of their natural resources, use their land appropriately, maintain and improve its fertility, and produce the food and fiber needed by society.

Bathurst[9] reports that the College of Agriculture at Cornell University has for nearly half-century published literature for use in rural schools and were designed to help in the interpretation of the rural environment along the lines of good conservation. These were helpful for the layman and the teachers who live and work where natural resources are being developed or exhausted.

---

[5]American Association of School Administrators, Conservation Education in American Schools. Twenty-ninth Yearbook (Washington, D.C.: American Association of School Administrators, 1951), p. 37.

[6]Qutub, Secondary Environmental Science Methods, p. 3.

[7]National Society for the Study of Education, Education in Rural Communities, The Fifty-first Yearbook. (Chicago: The University of Chicago Press, 1952), p. 46.

[8]*Ibid.*, p. 50.

[9]Effie G. Bathurst, editor, Conservation Education in Rural Schools (Washington, D.C.: National Education Association, 1943), pp. 33-34.

In 1944, the impo

tion of natural resourc

in the curriculum: (1)

ditions; (3) survival

in their environment.

Study of Education, wi

tion, noted:[11]

Probably n
his ideas and a
ship or conserv

Alongside the d

ing and outdoor educat

that the development

socio-economic forces

that the trend toward

tary satisfaction ari

assessed camping educ

---

[10]Gerald S. Cr
of Publications, Tea
Qutub, Secondary Env

[11]The National
Education in America
University of Chicag

[12]Donald R. Ha
Factors that Influe
Microfilms, Ann Arb
L. Hegelson, A Revi
(Columbus, Ohio: Th

[13]L. B. Sharp
of Camping," Outdoo
man and William M.
1973), p. 59.

In 1944, the importance of and some of the methods for conservation of natural resourceswere suggested by Craig[10] into four major areas in the curriculum: (1) kinds of living things; (2) changing earth conditions; (3) survival of plants and (4) interdependence of living things in their environment. By 1946, the National Society for the Scientific Study of Education, with regard to the use of natural resources in education, noted:[11]

> Probably no child will study science without having his ideas and attitudes on such matters as health, citizenship or conservation, modified.

Alongside the development of conservation education, school camping and outdoor education started and grew rapidly. Hammerman[12] reported that the development of camping education was a natural outgrowth of the socio-economic forces at work in America during 1930-1960. He explained that the trend towards urbanization necessitated the return to the elementary satisfaction arising from outdoor living. Sharp and Partridge[13] assessed camping education as a movement toward realism and naturalism

---

[10]Gerald S. Craig, Science in Childhood Education (New York: Bureau of Publications, Teachers College, Columbia University, 1944), cited by Qutub, Secondary Environmental Science Methods, p. 2.

[11]The National Society for the Scientific Study of Education, Science Education in American Schools, Forty-sixth Yearbook, Part I. (Chicago: The University of Chicago Press, 1947, pp. 35-39.

[12]Donald R. Hammerman, "A Historical Analysis of the Socio-Cultural Factors that Influenced the Development of Camping Education," University Microfilms, Ann Arbor, Michigan, 1961, cited by Robert Roth and Stanley L. Hegelson, A Review of Research Related to Environmental Education (Columbus, Ohio: The Ohio State University, 1972), p. 4.

[13]L. B. Sharp and E. DeAlton Partridge, "Some Historical Backgrounds of Camping," Outdoor Education, A Book of Readings, ed. by Donald R. Hammerman and William M. Hammerman (Minneapolis, Minn.: Burgess Publishing Co., 1973), p. 59.

which met a latent need

squalor and artificiali

tion was viewed as an i

school.

A significant ac

lopment of a broadened

of the outdoors as a la

and skills necessary fo

suits conducted in clo

school.[14] In the midd

educational method whi

ing to a greater appre

natural environment in

New thrusts tow

60's due to the increa

lization, exploding p

to environmental degr

In his State of the U

said: "The great que

roundings or shall we

for the damage we ha

[14]Smith, "A D

[15]Smith and o

[16]Sale and Le
Record, p. H187.

which met a latent need in society to break away from the ills of poverty, squalor and artificiality. The total living experience of camping education was viewed as an ideal laboratory for expanding the function of the school.

A significant achievement during the period 1955-1965 was the development of a broadened concept of outdoor education which includes the use of the outdoors as a laboratory for learning and acquisition of knowledge and skills necessary for the wise and satisfying outdoor interests and pursuits conducted in close alliance with the subject matter areas of the school.[14] In the middle 50's outdoor education had become recognized as an educational method which offers an opportunity for direct experiences leading to a greater appreciation, a clearer interpretation and wiser use of the natural environment in achieving the purposes of education.[15]

New thrusts toward environmental education came about in the late 60's due to the increased concern for environmental problems. Industrialization, exploding populations and depleted natural resources contributed to environmental degradations and provided new imperatives for education. In his State of the Union message in 1970, President Richard M. Nixon said: "The great question of the 70's is, shall we surrender to our surroundings or shall we make peace with nature and begin to make reparations for the damage we have done to our air, to our land and to water?"[16]

---

[14]Smith, "A Decade of Progress", p. 107.

[15]Smith and others, Outdoor Education, p. 19.

[16]Sale and Lee, Environmental Education, p. 61, citing Congressional Record, p. H187.

Faced with an environm

to participate in a ba

and makes decisions.

must develop a new und

to his environment, an

literacy".[17]

An educational

ing environmental qua

the only living thing

use, preserve or dest

actions - - and their

formal education.[18]

ronmental education"

"outdoor education" a

ted that to use this

to include interdisci

vations and institut

The impetus f

on a nationwide basi

---

[17]U. S. Depar
Environmental Educat

[18]U. S. Depa
That Cannot Wait, p

[19]U. S. Depa
for American Educat
1970), p. 6.

Faced with an environmental crisis, the American nation was called upon to participate in a basic reform in the way society looks at problems and makes decisions. To bring about this reform, the entire society must develop a new understanding and a new awareness of man's relation to his environment, and which, President Nixon calls "environmental literacy".[17]

An educational response had to be made to the problem of maintaining environmental quality. It was vital for man to recognize that he is the only living thing which can consciously manipulate, control, wisely use, preserve or destroy his environment, and to gain a knowledge of his actions - - and their environmental consequences, from his formal and non-formal education.[18] Thus, concerned educators began to use the term "environmental education" in lieu of the long standing "conservation education", "outdoor education" and "resource management". The Office of Education stated that to use this new term is to take a holistic or integrated approach, to include interdisciplinary or multidisciplinary concepts, methods, innovations and institutions.[19]

The impetus for curriculum improvement in environmental education on a nationwide basis was brought about by the Environmental Education Act

---

[17]U. S. Department of Health, Education and Welfare, <u>The Case for Environmental Education</u>, p. 4.

[18]U. S. Department of Health, Education and Welfare, <u>Education That Cannot Wait</u>, p. 6.

[19]U. S. Department of Health, Education and Welfare, <u>A New Role for American Education</u> (Washington, D.C.: Government Printing Office, 1970), p. 6.

of 1970.[20] Educating

this Act. With federa

lenged to establish cu

relate learning experi

lem-solving in the com

Conservation ed

tion, all have a commo

natural world.[21] The

either outdoor or con

> Environme
> with involving
> no claims to m
> dents exposed
> interested in
> a primary aim.

Stapp[23] states

primarily oriented to

environment and its a

are the characterist

---

[20]Advisory Co
(Washington, D.C. Go

[21]"Definition
mental Education". A
Education Associatio

[22]James Swan
Delta Kappan, LI (S

[23]Stapp, "En
Sourcebook, p. 233.

of 1970.[20] Educating man to live with his environment is the goal of this Act. With federal funding and support, school systems were challenged to establish curricula with relevant ecological content, and to relate learning experiences to actual environment improvement and problem-solving in the community.

Conservation education, outdoor education and environmental education, all have a common goal -- the understanding and appreciation of the natural world.[21] The difference between environmental education from either outdoor or conservation education is explained by Swan:[22]

> Environmental education is different in that it is concerned with involving people in environmental problem-solving. It makes no claims to making people naturalists. Undoubtedly, many students exposed to an environmental education program would become interested in nature, but this is a secondary benefit, rather than a primary aim.

Stapp[23] states that current programs in conservation education are primarily oriented to basic resources; they do not focus on the community environment and its associated problems. He added that what are stressed are the characteristics, interrelationships and uses of natural resources

---

[20]Advisory Council on Environmental Education. Second Annual Report. (Washington, D.C. Government Printing Office, 1973), p. 7.

[21]"Definition: Conservation Education, Outdoor Education, Environmental Education". A paper from the National Conference of the Conservation Education Association, Lafayette.Louisiana, August, 1970.

[22]James Swan, " The Challenge of Environmental Education," Phi Delta Kappan, LI (September, 1969), pp. 27-28.

[23]Stapp, "Environmental Encounters," Environmental Education: A Sourcebook, p. 233.

in the elementary grade

dary level. In another

cation is an educationa

in working individually

that affect their well

environment, an awaren

tions to work toward t

Today's current

the unique roles of c

Donaldson and Donalds

environmental/conserv

the environment. The

conservation, outdoor

may be included in an

The significan

Hawkins and Vinton:[26]

> Of prim
> of attitudes
> ing of educat
> to the world
> realize that

---

[24] William B.
Education," The Ame

[25] George W.
Its Promising Futur

[26] Donald E.
Outdoor Education:

in the elementary grades and levels of management and policy in the secondary level. In another instance, Stapp[24] explains that environmental education is an educational approach which emphasizes the role of the citizen in working individually or collectively toward the solution of problems that affect their well-being, based on knowledge concerning the bio-physical environment, an awareness of how to solve these problems and with motivations to work toward their solution.

Today's current environmental push has resulted in an awareness of the unique roles of outdoor education. As an on-going educational method, Donaldson and Donaldson[25] describe it as precisely tailored for community environmental/conservation objectives, peculiarly useful in learning about the environment. The consensus is that, environmental education is not -- conservation, outdoor resource management or nature study, although these may be included in an environmental education program.

The significance of environmental education today is summarized by Hawkins and Vinton:[26]

> Of prime importance in the world today is a re-evaluation of attitudes toward the environment and a subsequent restructuring of educational programs concerned with man's relationship to the world around him. In fact, educators are beginning to realize that the environment is an ideal classroom.

---

[24] William B. Stapp and others, "The Concept of Environmental Education," The American Biology Teacher, XXXII (January, 1970), p. 15.

[25] George W. Donaldson and Alan D. Donaldson, "Outdoor Education: Its Promising Future," Outdoor Education: A Book of Readings, pp. 130-31.

[26] Donald E. Hawkins and Dennis A. Vinton, "Environmental Education," Outdoor Education: A Book of Readings, p. 193.

Definition of Environ

The Environmen
education as the "edu
with his natural and
of population, pollut
tion, transportation,
total human environme
tal education may be
process, attitude an
expands the federal
tional process of de
priate to fostering
dence with the natur
tical, cultural, eco
environment. Likewi
tal education as the
relationship of man
vironment".[29]

---

[27]Advisory C
p. 7.

[28]Wisconsin
National Conference
16, 1973, Murray, K

[29]State of N
69. April 28, 1971,

Definition of Environmental Education

The Environmental Education Act of 1970 defined environmental education as the "educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology and urban and rural planning to the total human environment."[27] While many educators claim that environmental education may be an undefinable term because it contains elements of process, attitude and orientation, the Wisconsin Environmental Council[28] expands the federal definition by stating that it also means the educational process of developing concepts, attitudes, values and actions appropriate to fostering man's harmonious relationship with man and interdependence with the natural and man-made surroundings including the social, political, cultural, economic, esthetic and bio-physical dimensions of the total environment. Likewise, the Michigan Legislature has referred to environmental education as the "teaching . . . of attitudes and skills involving the relationship of man with the quality of his cultural and bio-physical environment".[29]

---

[27] Advisory Council on Environmental Education, Second Annual Report, p. 7.

[28] Wisconsin Environmental Education Plan. A handout during the National Conference of the Conservation Education Association, August 12-16, 1973, Murray, Kentucky.

[29] State of Michigan Legislature, Senate Concurrent Resolution No. 69. April 28, 1971.

Vivian,[30] Benn

that environmental ed

<u>knowledgeable</u> concern

problems, <u>aware</u> of ho

work toward their sol

was modified by Roth,

ted "to work toward

environments that ar

that the aim of envi

human and physical r

contribute to the le

dents' awareness of

and above all, to ma

needs, both immedia

Kormondy[35] w

not only saving man

---

[30]New Jersey
for Environmental E
U. S. O fice of Edu

[31]Dean B. Be
tion of a K-12 Envi
Education Project,

[32]Stapp and

[33]Robert E.
ment Education (K-

[34]New Jerse

[35]Edward J.
Revisited," <u>The Am</u>

Vivian,[30] Bennett and Willinck,[31] and Stapp and others[32] concur that environmental education is aimed at producing a citizenry that is knowledgeable concerning the bio-physical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution. The last clause of the preceding statement was modified by Roth,[33] who intended that the citizenry would be motivated "to work toward the maintenance and further development of diverse environments that are optimum for living". Further, Ambrey[34] indicates that the aim of environmental education is to make use of the wealth of human and physical resources in every community, which can reinforce and contribute to the learning process. . . to add understanding to the students' awareness of the variety and complexity of life around them. . . and above all, to make the educational process relevant to the students' needs, both immediate and the future.

Kormondy[35] wrote that environmental education has the mission of not only saving man but of improving the quality of his future. He adds

---

[30]New Jersey Environmental Education Council. "The Master Plan for Environmental Education: A Proposal for New Jersey". Washington, D.C.: U. S. O fice of Education, 1971.

[31]Dean B. Bennett and Wesley H. Willinck, "Organization and Operation of a K-12 Environmental Education Program". Maine Environmental Education Project, Yarmouth, Maine, 1973. p. 1.

[32]Stapp and others,"Concept of Environmental Education," p. 15.

[33]Robert E. Roth, "Fundamental Concepts for Environmental Management Education (K-16)," Environmental Education, I (Spring, 1970), p. 65.

[34]New Jersey Environmental Education Council, Master Plan, p. 2.

[35]Edward J. Kormondy, "Environmental Education: the Whole Man Revisited," The American Biology Teacher, XXXIII (January, 1971), p. 16.

that the alteration of

and appreciation of ma

in agreement with the

> Environmen
> values and cla
> and attitudes
> relatedness am
> roundings. En
> decision makin
> about issues c

<u>Guide</u>

The foremost s

today is the need for

this end, Fischer[37] p

organizing principle

gests that the first

disciplinary approac

that the educational

vironment and since

presently in the cur

fication for such cu

---

[36]"Unesco De
People, VII (March,

[37]John Fisch
Schwartz (Englewood

[38]John Passm
Canada Education As

[39]Paul Stude
The Journal of Envi

that the alteration of man's attitudes must be based on an understanding and appreciation of man's place in the nature of things. His views are in agreement with the UNESCO definition which states:[36]

> Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among Man, his culture and his bio-physical surroundings. Environmental education also entails practice in decision making and self-formulation of a code of behavior about issues concerning environmental quality.

Guidelines for Curriculum Development

The foremost social need which should guide the educational system today is the need for a viable relationship to the environment. Toward this end, Fischer[37] proposed that the concept of survival becomes the organizing principle for many fields of scholarly inquiry. Huxley[38] suggests that the first thing is to reform the curriculum towards a multi-disciplinary approach with ecology as key subject. Studebaker[39] indicates that the educational response must be commensurate with the concept of environment and since environment is everything, this means that no subject presently in the curriculum can escape revision. He reasons that justification for such curricular revision is derived from all sources of

---

[36]"Unesco Defines E.E.," Environmental Education News for School People, VII (March, 1973), p. 3.

[37]John Fischer,"Survival U," Affirmative Education, ed. by Barry Schwartz (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972), p. 148.

[38]John Passmore, Outdoor Education in Canada - 1972 (Toronto: Canada Education Association, 1972), outer back cover.

[39]Paul Studebaker, "The Justification for Environmental Education," The Journal of Environmental Education, IV (Summer, 1973), p. 48.

authority - - scienti

social, political and

Environmental

segment of the popula

children and be relev

> The affec
> experience wit
> grams should b
> ronmental educ
> tent and must
> without being

Basic to the

knowledgeable of env

of the type of end p

Charles Roth[42] descr

individual, about wh

process to achieve c

illiterates are the

the inhumane. The b

shows one who is cap

humanly successful

---

[40]Richard Ka
cation Agency", A l
p. 2.

[41]*Ibid*.

[42]Charles Ro
for Quality Enviro

authority - - scientific, historical, philosophical, religious, ethical, social, political and legal sources.

Environmental education, according to Kay,[40] must involve every segment of the population, and should start as early as possible with children and be relevant to the child's real world. He states:[41]

> The affective goals are best brought about through direct experience with the environment. Environmental education programs should be built upon the conceptual tool -- ecology. Environmental education is interdisciplinary in subject matter content and must be sequentially developed yet remain evolutionary without being revolutionary.

Basic to the task of school systems in helping citizens become knowledgeable of environmental issues and problems is the identification of the type of end product we are seeking from our educational efforts. Charles Roth[42] describes the end product as the environmentally literate individual, about which curriculum developers could design content and process to achieve desired behaviors. Accordingly, the environmentally illiterates are the polluters, overconsumers, the careless destroyers, the inhumane. The behavioral description of the environmentally literate shows one who is capable of developing and living a life style that is humanly successful yet ecologically sound.

---

[40] Richard Kay, "Environmental Education Through the State Education Agency", A lecture presented at Idaho State University, 1970., p. 2.

[41] Ibid.

[42] Charles Roth, "A Massachusetts Audubon Society Program," Processes for Quality Environment, p. 108.

Stapp,[43] and

and function of an en

students with a more

problems listed the f

1. Emphasize
   and issue

2. Stress th
   skills.

3. Develop
   social r

4. Develop
   human ec

5. Involve
   evaluati

6. Span the
   viding f

7. Arrange
   and lear

8. Integrat

9. Link sub
   activit

The New Jer

for a modification

that would involve

---

[43]William St
Existing Curriculum
Outdoor Education:

[44]Bennett an
Environmental Educa

[45]The Maste
New Jersey, p. 1.

Stapp,[43] and Bennett and Willinck,[44] in describing the structure and function of an environmental education program that would provide students with a more than peripheral acquaintance with environmental problems listed the following considerations for designing a curriculum:

1. Emphasize and relate to local environmental topics, problems and issues.

2. Stress the development of attitudes, values and behavioral skills.

3. Develop basic affective concepts including the self-concept, social responsibility and environmental sensitivity.

4. Develop basic cognitive concepts related to the natural and human ecosystems.

5. Involve the learner in the process of discovery-inquiry, evaluation-problem identification, and problem-solving.

6. Span the curriculum, kindergarten through grade twelve, providing for the revisiting and reinforcement of concepts.

7. Arrange the curriculum sequence according to developmental and learning patterns.

8. Integrate the program with existing curricula.

9. Link subject areas through interdisciplinary studies and activities.

The New Jersey State Plan for Environmental Education[45] called for a modification of the curriculum for elementary and secondary levels that would involve students with real environmental problems in the

---

[43]William Stapp, "Integrating Conservation Education Into the Existing Curriculum of the Ann Arbor Public School System (K-12)," Outdoor Education: A Book of Readings, pp. 152-53.

[44]Bennett and Willinck, "Organization and Operation of a K-12 Environmental Education Program", p. 18.

[45]The Master Plan for Environmental Education: A Proposal for New Jersey, p. 1.

community or region a

and its possible solu

for curriculum develo

sis on the role of th

the development of sp

responsibilities.[48]

Ap

As a broad fi

possible approaches

Stapp[49] submits at

secondary curriculum

of environmental edu

(3) development of s

gest that the introd

consider the three a

---

[46]Kentucky De
ment, "Kentucky's E

[47]Governor's
Future (Lansing, Mi
1973), p. 59.

[48]New Hampsh
for New Hampshire E
Department of Educa

[49]William B.
culum Development (

[50]V. M. Galu
mental Education in
IV (Summer, 1973),

community or region and provide field experiences with the consequences and its possible solutions. Other state plans which provide guidelines for curriculum development in environmental education also include emphasis on the role of the outdoor laboratory and school site development,[46] the development of specific behavioral objectives,[47] and school system responsibilities.[48]

Approaches to Environmental Education

As a broad field, environmental education offers a variety of possible approaches toward curriculum development and implementation. Stapp [49] submits at least three major strategies for the elementary and secondary curriculum: (1) complete curriculum reform; (2) integration of environmental education concepts into the existing curriculum; and (3) development of special study units. Galushim and Doraiswami[50] suggest that the introduction of environmental education in schools should consider the three approaches as successive stages, rather than

---

[46]Kentucky Department of Education, Division of Program Development, "Kentucky's Environmental Education Program." A Brochure.

[47]Governor's Environmental Task Force, Michigan's Environmental Future (Lansing, Michigan: Office of the Governor, State of Michigan, 1973), p. 59.

[48]New Hampshire Division of Instruction, "Environmental Education for New Hampshire Elementary and Secondary Schools," New Hampshire State Department of Education, Concord, New Hampshire, 1971, p. 5.

[49]William B. Stapp, "Environmental Education: Approaches to Curriculum Development (K-12)," Processes for a Quality Environment, pp. 82-83.

[50]V. M. Galushim and S. Doraiswami, "Three Approaches to Environmental Education in the Schools," The Journal of Environmental Education, IV (Summer, 1973), pp. 10-11.

alternatives. Thus, t
second stage, the "cha
geography curricula a
be the third and fina
education. Another a
courses in the second
the special units clu

Curriculum Reform

There are two
grated science teach
and Gardner[52] sugges
in at least four app
relevance and (4) pr
mental science and a
approaches are signi
of their relationsh

> It rela
> of basic ped
> tion in the
> practical ap
> wards proble

---

[51] Jan Cerovsk
in Science Teachin
by P. E. Richmond,

[52] James Ruth
ing," New Trends i
Vol. I (Paris: UNE

[53] Cerovsky,
p. 127.

alternatives. Thus, the first stage, is the "topics" approach; the second stage, the "chapter: or "unit" approach, mainly in biology and geography curricula and the most complete "integrated" approach should be the third and final stage of implementation of school environmental education. Another approach is the development of one-semester credit courses in the secondary level which may be considered an extension of the special units clustered for unified study.

Curriculum Reform

There are two major trends in science education today: (1) integrated science teaching and (2) concern for the environment.[51] Rutherford and Gardner[52] suggest that an integrated science course can be designed in at least four approaches: (1) conceptual schemes (2) inquiry (3) relevance and (4) process. The relevance approach focuses on environmental science and applied science. But Cerovsky[53] argues that all four approaches are significant to environmental education and gives the values of their relationship as follows:

> It relates actively to a wide range of general objectives of basic pedagogical importance, for example, active participation in the teaching process, the training of a critical mind, practical application of theoretical knowledge, education towards problem-solving and decision-making, etc.

---

[51] Jan Cerovsky, "Environmental Education as an Integrating Concept in Science Teaching," New Trends in Integrated Science Teaching, edited by P. E. Richmond, Vol. II (Paris: UNESCO, 1973), p. 127.

[52] James Rutherford and Marjorie Gardner, "Integrated Science Teaching," New Trends in Integrated Science Teaching, edited by P. E. Richmond, Vol. I (Paris: UNESCO, 1970), pp. 52-53.

[53] Cerovsky, "Environmental Education as an Integrating Concept", p. 127.

A real curricul

accomplish an environm

the Swedish National

ronmental Education i

ising the curriculum

cation at all school

cial subject in its o

One of the first resu

vities. An interesti

working teams from pu

fully in the open ai

Restructuring

disciplinary study t

would alter the stru

school to make possi

cooperation between

According to

latest theories of

[54]Sten Forse
cula: The Swedish E

[55]Mark Terry
1971), pp. 186-87.

[56]Stapp, "Ap
Quality Environment

A real curriculum reform was recently undertaken in Sweden to accomplish an environmentally oriented curriculum in schools. In 1968, the Swedish National Board of Education appointed a Committee on Environmental Education in Schools, so called SMIL, with the task of "reising the curriculum to provide a basis for efficient environmental education at all school levels".[54] The Swedish concept is not one of a special subject in its own right, but of incorporation into several subjects. One of the first results was the tremendous development in outdoor activities. An interesting project involved the formation of non-graded working teams from pupils of grades 7 - 9 working happily and successfully in the open air.

Restructuring of the school can greatly assist students' interdisciplinary study that can contribute to environmental education. Terry[55] would alter the structure of department and subject divisions within the school to make possible real interdisciplinary education, and stimulate cooperation between teachers and students.

According to Stapp[56] curriculum reform normally incorporates the latest theories of learning, possesses a well-thought out conceptual

---

[54]Sten Forselius, "Environmental Education in the School Curricula: The Swedish Example," Prospects, II (Winter, 1972), pp. 477-84.

[55]Mark Terry, Teaching for Survival (New York: Ballantine Books, 1971), pp. 186-87.

[56]Stapp, "Approaches to Curriculum Development", Processes for A Quality Environment, p. 82.

design and focuses on

interests of the lear

reform as follows:[57]

> The first
> Committee on E
> is to design a
> phase might co
> environmental
> instructional
> education prog
> as environment
> be to activate
> grams in sele
> National Prof
> Committee sho
> materials and
> luating the p

Marland[58] see

but the long range c

education into virtu

but as a new approac

Integration of Envi

The approach

grades and most cou

school system. Sta

education into the

---

[57] Ibid.

[58] S. P. Marl
VII (May, 1971), p.

[59] Stapp, "En
Sourcebook, p. 233.

design and focuses on problem-solving skills, conceptual thinking and interests of the learner. He describes the approach to curriculum reform as follows:[57]

> The first phase is the creation of a National Advisory Committee on Environmental Education whose foremost function is to design a curriculum model for school systems. The second phase might consist of developing guidelines for establishing environmental education programs, develop content material and instructional aids, evaluate experiences of the environmental education programs and communicate with individuals being trained as environmental education consultants. The third phase might be to activate and evaluate model environmental education programs in selected school systems and during this time, the National Professional Staff working with the National Advisory Committee should continue to develop and disseminate content materials and instructional aids and assist consultants in evaluating the program.

Marland[58] sees the need for the preparation of curriculum materials but the long range objectives must be to bring concepts of environmental education into virtually every aspect of learning not as a new subject but as a new approach.

Integration of Environmental Education into Existing Curricula

The approach that would integrate environmental education into all grades and most courses in a school system get its direction within the school system. Stapp[59] provides a strategy for integrating environmental education into the existing curriculum through the committee, which

---

[57] Ibid.

[58] S. P. Marland, Jr., "Environmental Education," American Education, VII (May, 1971), p. 8.

[59] Stapp, "Environmental Encounters," Environmental Education: A Sourcebook, p. 233.

develops, implements

most important impac

sources and citizens

The National

<u>tion in Public Schoo</u>

determine such progr

sons prepared by the

(4) by the school sy

by other means. The

education program,

ing in emphasis, sc

financing. The stu

systems with progra

the title, "outdoor

condary schools, jun

of "environmental e

vation education".6

of study make up th

(a) Educati
(b) Man and

---

60 National
<u>Public Schools</u> (Wa
p. 36.

61 <u>Ibid.</u>, pp

62 <u>Ibid.</u>

develops, implements the program and facilitates communication. The most important impact of such an approach is the use of community resources and citizens.

The National Education Association study on Environmental Education in Public Schools,[60] reported on the different methods utilized to determine such programs: (1) by an instructional team (2) by field lessons prepared by the teacher for each field trip (3) by student interests (4) by the school system and (5) by the state department of education and by other means. Their data points to no general type of environmental education program, but the existence of a wide variety of programs differing in emphasis, scope, curriculum, types of sites utilized, personnel and financing. The study also reports that over three-quarters of the school systems with programs restricted to pupils in the elementary grades, used the title, "outdoor education", more than half of the programs in the secondary schools,junior-senior high levels use the more sophisticated title of "environmental education" or the more specialized approach of "conservation education".[61] The nature of the experiences, activities and areas of study make up the content of the program, based on the following:[62]

(a) Education for and in the outdoors
(b) Man and his relationship to his cultural, natural and

---

[60] National Education Association, Environmental Education in the Public Schools (Washington, D.C.: National Education Association, 1972), p. 36.

[61] Ibid., pp. 13-14.

[62] Ibid.

(c) Developme
(d) Conservat
(e) Rational
(f) Pollution
(g) Nature st

Another repo

indicated that most

origins in science,

flect this orientat

integration with va

materials would not

present two problem

> In the
> decisions ab
> to place a p
> Secondly, mo
> rials lack p
> to include.

The Nationa

produced by the Na

National Park Serv

as a process to be

strands represent

---

[63]Putting R
Environmental Educ
ment Printing Offi

[64]*Ibid.*, pp

[65]National
ronment, Teachers'
pp. iii-iv.

(c) Development of environmental awareness and ethics
(d) Conservation of the natural resources
(e) Rational utilization of the environment
(f) Pollution control education
(g) Nature study and interpretation.

Another report, Environmental Education Programs and Materials[63] indicated that most existing environmental education programs had their origins in science, conservation, or outdoor education and tend to reflect this orientation in both materials and processes which restricted integration with various disciplines. It was also found that most of the materials would not fit easily into the ongoing curricular programs which present two problems:[64]

> In the first case, administrators and teachers must make decisions about where within an ongoing program it is appropriate to place a particular unit dealing with a particular problem. Secondly, most administrators and teachers will find that materials lack particular components which they feel are essential to include.

The National Environmental Education Development (NEED) program[65] produced by the National Park Foundation with the cooperation of the National Park Service was developed not as a subject to be taught but as a process to be integrated in teaching any or all subjects. The NEED strands represent a logical sequence of learning: variety and similarity,

---

[63]Putting Research into Educational Practice (PREP) Report No. 33, Environmental Education Programs and Materials (Washington, D.C.: Government Printing Office, 1972), p. 17.

[64]Ibid., pp. 7-8.

[65]National Environmental Education Development, Adventure in Environment, Teachers' Guide (Morristown, N.J.: Silver Burdett Company, 1971), pp. iii-iv.

patterns, interactio

tation and evolution

clude: cross-discipl

room and bringing th

Development of Spec

The third ap

nal committee, stat

produce a series of

traditional courses

ronmental education

and correct the def

With regard

that there is a nee

ter extent the thr

science, social sc

rials are being de

in style, ungraded

Some exampl

a. Environ

to create instruct

---

[66]PREP Rep
rials, p.11.

[67]Ibid., p

[68]Robert E
XXXVIII (October,

patterns, interaction and interdependence, continuity and change, adaptation and evolution. The strategies that are found in the lessons include: cross-discipline thinking, using experiments outside the classroom and bringing the outside environment into the classroom environment.

Development of Special Units of Study

The third approach to environmental education would have a national committee, state agency, non-profit organization or publishing house produce a series of environmental education units to be incorporated into traditional courses, to be utilized independently or along with other environmental education programs.[66] These units may supplement the curriculum and correct the deficiency of broad survey approach of many textbooks.

With regard to materials reviewed by the PREP Committee, they state that there is a need for materials which balance and synthesize to a greater extent the three basic elements of environmental education: natural science, social science and values.[67] They however, noted that more materials are being developed which are interdisciplinary, flexible, modular in style, ungraded and which make use of a variety of media.

Some examples are presented here.

a. Environmental Studies.[68] The job of Environmental Studies is to create instructional tactics and strategies which will enable students

---

[66]PREP Report No. 33, Environmental Education Programs and Materials, p.11.

[67]Ibid., p. 18.

[68]Robert E. Samples, "Environmental Studies," The Science Teacher, XXXVIII (October, 1971), pp. 36-37.

to use their immedi

assignment cards.

tigation strategies

environment. It is

can be used from ki

studies, math, art,

b. Intermed

lems in the ISCS' F

from the biological

series of separate

dividual experimen

course for the 7th

learning, providin

and to help each s

da State Universit

cess orientation a

c. Science

University of Cali

physical and life

of two series of

---

[69]Intermed
World, Level 3 (N

[70]Chester A
culum Improvement
pp. 185-90.

to use their immediate environment as resource. ES kit contains 75 assignment cards. They are invitations to develop awareness and investigation strategies to be applied to particular aspects of self and the environment. It is sponsored by the American Geological Institute and can be used from kindergaten through graduate school in science, social studies, math, art, language arts and other disciplines.

b. Intermediate Science Curriculum Study (ISCS).[69] The problems in the ISCS' Probing the Natural World, Level 3 are largely drawn from the biological and earth sciences. The program is organized as a series of separate units or "minicourses". It can be implemented for individual experimentation according to the student's choice. Like the course for the 7th and 8th grade levels, it is designed for self-paced learning, providing for individual differences in student's learning rate and to help each student to evaluate his own progress. Developed at Florida State University, it has interdisciplinary content, a structure and process orientation and an emphasis on active inquiry.

c. Science Curriculum Improvement Study (SCIS).[70] Developed at the University of California at Berkeley, the SCIS is an ungraded, sequential, physical and life science program for the elementary school. It consists of two series of related and sequential units, one unit in life science and

---

[69] Intermediate Science Curriculum Study, Probing the Natural World, Level 3 (Morristown, N.J.: Silver Burdett Company, 1973).

[70] Chester A. Lawson, "The Life Science Program of the Science Curriculum Improvement Study," The American Biology Teacher, XXIX (March, 1967), pp. 185-90.

another in physical

life science progra

Populations, Enviro

centered and concep

teaching strategy

d. People

developed by Brenna

three major princi

are interdependent

are the products o

and environments c

approach to the te

ject matter areas

relationship of ma

social studies, ho

e. Examini

Canada published a

program of a schoo

cess approach to

[71]Robert K
School Science (Ch

[72]Matthew
Curriculum Guide
Publishing Compan

[73]D. F. We
ment. (12 Units)(

another in physical science paired off for each of the six levels. The life science program is composed of six units: Organisms, Life Cycles, Populations, Environments, Communities and Ecosystem. They are materials-centered and conceptually-oriented units of instruction in ecology. The teaching strategy is based on Piaget's theories on how children learn.[71]

d. People and Their Environment.[72] The interdisciplinary program developed by Brennan and the South Carolina State Board of Education uses three major principles in the heart of the program: that living things are interdependent with one another and their environment; that organisms are the products of their heredity and environment; and that organisms and environments constantly change. As teachers' guides,they suggest an approach to the teaching of conservation as integral part of various subject matter areas at all levels of education. The central theme of the relationship of man to resources and environment is developed in biology, social studies, home economics, science and outdoor education.

e. Examining Your Environment.[73] Holt, Rinehart and Winston of Canada published a series of units for use in the environmental education program of a school system. Activity-oriented, with emphasis on the process approach to learning, the investigations are adaptable to different

---

[71]Robert Karplus and Herbert D. Thier, A New Look at Elementary School Science (Chicago: Rand McNally and Company, 1967), p. 21.

[72]Matthew J. Brennan, editor, People and Their Environment: Teachers' Curriculum Guide to Conservation Education. 8 Volumes (Chicago: Ferguson Publishing Company, 1969).

[73]D. F. Wentworth, J.K. Couchman and others, Examining Your Environment. (12 Units)(Minneapolis, Minn: Winston Press, 1972).

grade levels. Unit

Ecology, Mapping Sma

Small Creatures, Sn

duct their own inve

nity resources.

One-semester Credit

While semest

are not expected to

of environmental ed

"action" courses.

tion,"or P^3 was of

for grades 10 and

concerning the pro

magazines, newspap

Another cou

senior and junior

It also emphasized

basic ecological c

community projects

speakers from age

---

[74]National

Education (Washin

pp. 16-17.

[75]Ibid., p

grade levels. Unit titles are: Astronomy, Birds, The Dandelions, Ecology, Mapping Small Places, Mini-climates, Pollution, Running Water, Small Creatures, Snow and Ice, Trees and Your Senses. The students conduct their own investigations in their immediate environment with community resources.

One-semester Credit Courses

While semestral or summer courses for secondary level students are not expected to provide for the attainment of the long-range goals of environmental education, they are desired either as "awareness" or "action" courses. A semestral course"Problems of Population and Pollution,"or P^3 was offered at University High School, University of Iowa, for grades 10 and 11.[74] Students were involved in individual activities concerning the problems which were kept current from readings taken from magazines, newspapers or books concerning ecological problems.

Another course, "Science and Survival" was similarly offered for senior and junior students in Shawnee Mission South High School, Kansas.[75] It also emphasized current environmental problems, citizen action and basic ecological concepts. Students planned and executed environmental community projects in all media, went on field trips and involved guest speakers from agencies, industry and research institutions.

---

[74]National Science Teachers Association, Programs in Environmental Education (Washington, D.C.: National Science Teach rs Association, 1970), pp. 16-17.

[75]Ibid., p. 17.

Literature s

following categorie

environmental educa

ties and resources

of "what to teach,"

goals.

Development and Or

The America

tance of several w

vation, compiled s

tant to a sound pr

arbitrary arrangem

significance of th

in an attempt to a

sources in specifi

study of Visher[78]

and the quality of

---

[76]American A
Education in Ameri

[77]Roy C. Wh
standings with Ava
Twelve," Universi
Roth and Hegelson

[78]Halene H.
and Concepts Desi
Microfilms, Ann A
Review of Researc

Instructional Concerns

Literature selected for review in this section fall under the following categories: the development and organization of concepts for environmental education; methods and teaching strategies; and the facilities and resources for environmental education. They answer the questions of "what to teach," "how to teach," and "where to teach," for environmental goals.

Development and Organization of Concepts

The American Association of School Administrators[76] with the assistance of several widely known writers and thinkers in the field of conservation, compiled some basic scientific and social concepts which are important to a sound program in conservation education. It was, however, an arbitrary arrangement, dictated by an apparent logic rather than by the significance of the items. White[77] developed a list of 274 understandings in an attempt to associate "conservation understandings with community resources in specific geographic region" for grades 4 through 12, while the study of Visher[78] resulted in a considerable expansion of both the number and the quality of concepts appropriate for secondary students. In order

---

[76] American Association of School Administrators, Conservation Education in American Schools, pp. 72-74.

[77] Roy C. White, "A Study Associating Selected Conservation Understandings with Available Community Resources from Grades Four Through Twelve," University Microfilms, Ann Arbor, Michigan, 1967, as cited by Roth and Hegelson, Review of Research, p. 8.

[78] Halene H. Visher, " A Determination of Conservation Principles and Concepts Desirable for Use in the Secondary Schools", University Microfilms, Ann Arbor, Michigan, 1960, as cited by Roth and Hegelson, Review of Research, p. 7.

to avoid a fragment

developed a listing

concepts considered

suggested list of c

Mouser[80] as teachin

niques and methods

The developm

in the Ann Arbor P

nization of themes

level that pertain

social studies cur

and supplementary

nuity and progress

The Interna

School Curriculum[8

tion of the conte

to be adapted to

ways. The conten

---

[79] Joseph J
(New York: Nation

[80] Robert E
Conservation Educ
1964), pp. 1-7.

[81] William
into the Curricu
1965), pp. 6-14.

[82] Cerovsk
pp. 132-33.

to avoid a fragmentary approach to outdoor conservation education, Shomon[79] developed a listing of general conservation principles as well as specific concepts considered important by most conservationists and educators. A suggested list of conservation principles was also prepared by Brown and Mouser[80] as teaching guides with general comments proposing various techniques and methods relevant to the particular area of study.

The development of an outdoor and conservation education program in the Ann Arbor Public Schools, Michigan by Stapp[81] involved the organization of themes, understandings and subunderstandings for each grade level that pertained to outdoor and conservation education. Science and social studies curriculum guides for each grade level were the sources and supplementary materials were also used to provide the desired continuity and progression of the total program.

The International Working Meeting on Environmental Education in the School Curriculum[82] in Nevada in 1970, prepared a chart to give an indication of the content and objectives of an environmentally-oriented curriculum to be adapted to different national and local situations in a variety of ways. The content and objectives are arranged according to the nine

---

[79] Joseph J. Shomon, Manual for Outdoor Conservation Education (New York: National Audubon Society, 1968), pp. 44-53.

[80] Robert E. Brown and G. W. Mouser, Techniques for Teaching Conservation Education (Minneapolis, Minn.: Burgess Publishing Co. Inc., 1964), pp. 1-7.

[81] William B. Stapp, Integrating Conservation and Outdoor Education into the Curriculum (K-12) (Minneapolis, Minn.: Burgess Publishing Co., 1965), pp. 6-14.

[82] Cerovsky, "Environmental Education as an Integrating Concept", pp. 132-33.

categories of envi

established in the

learning (the hori

Yoganzen an

ronmental educatio

ronmental topics t

secondary schools.

and objectives amo

tions between disc

Utilizing a

mental management

of conceptual obje

ted to environmen

organization used

cepts than do the

existing in many

Brandwein

prepared a concep

affective schemes

affective schemes

[83] Ibid., p

[84] Robert E

pp. 65-74.

[85] PREP Re

categories of environmental concepts (the vertical component) and established in the three curricular stages of developmental process of learning (the horizontal component) in the chart.

Yoganzen and his colleagues[83] in one of the USSR centers of environmental education methodology in Tomsk, thoroughly elaborated on environmental topics to be allocated to existing teaching subjects in Soviet secondary schools. Its present stage involved distribution of concepts and objectives among all subjects without emphasizing the cooperative relations between disciplines.

Utilizing a survey technique, Roth[84] obtained and validated environmental management education concepts and attempted to develop a taxonomy of conceptual objectives for use in planning programs of instruction related to environmental management for K-16. He suggested that the topical organization used represents a more useful and appropriate structure of concepts than do the agrarian focused conservation concepts and organization existing in many school curricula and educational materials.

Brandwein and his team[85] in developing a program called "Ekistics" prepared a conceptual guide for elementary grades involving three cognitive-affective schemes, moving on to junior high level with four other cognitive-affective schemes. These are included in the traditional subject matter

---

[83]Ibid., p. 135.

[84]Robert E. Roth,"Fundamental Concepts for Environmental Management", pp. 65-74.

[85]PREP Report No. 33, pp. 50-51.

areas of (1) scienc

(3) the arts and hu

Still in its

studies developed

Delaware,[86] is bas

of a natural syste

of the system. Ea

tributed according

Arnsdorf,[87] co-dir

a discrete course

which to select ma

Howlett[88] c

framework for the

considered include

water supply, cle

fluencing land us

sion making and l

If environ

---

[86]Populati
Environment Studi
versity of Delawa

[87]*Ibid*., p

[88]George H
Rationale," Proje
Wisconsin. (Mimeo

areas of (1) science, resource technology and health (2) social sciences (3) the arts and humanities.

Still in its experimental stage, the population-environmental studies developed by the Population Curriculum Study, University of Delaware,[86] is based on one comprehensive conceptual scheme: Man is part of a natural system, the Earth, and is ultimately subject to the limits of the system. Each of the six major concepts have been expanded and distributed according to grade levels in the K-12 school system. Stegner and Arnsdorf,[87] co-directors of the PCS recommend the scheme as a syllabus for a discrete course in population-environment studies or as a system from which to select materials for mini-courses.

Howlett[88] developed twelve major concept categories that provide the framework for the K-12 integrated environmental education program. Topics considered include: energy, ecosystems, limiting environmental factors, water supply, clean air, distribution of natural resources, factors influencing land use, values and attitudes, the power of man, economics, decision making and land stewardship.

If environmental education is to become effective in changing

---

[86] Population Curriculum Study, A Conceptual Scheme for Population-Environment Studies. Experimental Edition Revised (Newark, Delaware: University of Delaware, 1973), pp. 7-10.

[87] Ibid., p. 6.

[88] George Howlett, "Twelve Major Concept Categories and the Rationale," Project I-C-E (Instruction-Curriculum-Evaluation), Green Bay, Wisconsin. (Mimeographed.)

behavior, objectiv

Balzer[89] designed

jectives in enviro

ties and experienc

A given experience

components in eac

nitive dimension,

in the skills dim

considerations as

and significance

attitude developm

However, Balzer b

mental education

tual structure mu

Learning and Tea

Pestalloz

riences which ar

hand scrutiny, q

tive avenues thr

natural environm

teachers not onl

a change in the

---

[89]Balzer

Sourcebook, pp.

[90]Ibid.,

[91]Ibid.

behavior, objectives with behavioral basis have to be developed. Balzer[89] designed a curricular grid suggesting some major areas of objectives in environmental education and illustrates with some activities and experiences which would constitute the volume of the grid. A given experience (visualized as being in a box) would normally have components in each of the three dimensions: unifying themes in the cognitive dimension, attitudes in the affective dimension and process goals in the skills dimension. The basis of these selections include such considerations as goals, student interest, appropriateness, validity and significance of content, child development, nature of learning, attitude development, facilities, social context and teacher preparation.[90] However, Balzer believes that defining concepts appropriate for environmental education appears to be a complex task, inasmuch as their conceptual structure must be interrelated to other areas.

Learning and Teaching Strategies

Pestallozi, Herbart and Froebel have emphasized that learning experiences which are real, life-like and available to the learner for first-hand scrutiny, questioning and cognition are likely to be the most effective avenues through which children become informed about their social and natural environment.[91] The nature of environmental education requires the teachers not only to use a variety of human and natural resources but also a change in the methods of education.

---

[89] Balzer, "Environmental Education", Environmental Education: A Sourcebook, pp. 244-45.

[90] Ibid., p. 244.

[91] Ibid.

If we are

emphasized that we

two covers of the

in a day. He sta

> Relev
> and studen
> and listen

The inquir

teaching have imp

write that if we

the structure of

school environmen

explained that th

centered experie

lems, imagine ex

powers. In addi

tions can foster

children in the

---

[92] John K

Children, VII (N

[93] Ibid.

[94] Sale a

[95] John W

dary School (N

[96] Karplu

If we are to teach effectively about the environment, Klimas[92] emphasized that we must get away from the 2 x 4 x 6 education - - the two covers of the book, the four walls of a classroom, the six periods in a day. He states further:[93]

> Relevant environmental education calls for flexibility and student-centered activity. Students should not be sitting and listening - - they should be doing and discussing.

The inquiry and discovery or investigatory schemes in science teaching have important roles in environmental education. Sale and Lee[94] write that if we want children to develop rational powers and to learn the structure of ecology and related disciplines, their classrooms and school environments must encourage investigation. Renner and Stafford[95] explained that the exploration-invention-discovery sequence in inquiry-centered experiences provide learners with opportunities to analyze problems, imagine experiments, classify, compare results and develop rational powers. In addition, Karplus and Thier[96] maintain that wise use of questions can foster the kind of inquiry that would deepen interest of the children in the topic under study.

---

[92] John Klimas, "Education and the Ecological Crisis," Science and Children, VII (March, 1970), p. 31.

[93] Ibid.

[94] Sale and Lee, Environmental Education in Elementary School, p. 163.

[95] John W. Renner and Don G. Stafford, Teaching Science in the Secondary School (New York: Harper and Row, 1972), pp. 106, 112.

[96] Karplus and Thier, A New Look at Elementary School Science, p. 86.

To enable

the varying needs

as lecture and se

dactic and proces

Outdoor Ec

is premised on th

can best be taug

the natural envi

full sensory rat

According

when an individu

that startles or

interaction betw

Mand,[101]

---

[97]Musa Qu
LVI (April-June,

[98]Donalds

[99]Glen O
Really Know How
p. 164.

[100]Phylli
door Environmen
p. 11.

[101]Charle
Merrill Publish

[102]Smith

[103]Brenna

[104]Shirle
room (Columbus,

To enable the teacher to communicate with more students and meet the varying needs of students, Qutub[97] suggests a combination of methods as lecture and self-directed; process-managerial and self-directed; didactic and process-managerial techniques applicable to secondary students.

Outdoor Education. The growth and interest in outdoor education is premised on that famous statement of L. B. Sharp:[98] "Those things which can best be taught outdoors should there be taught." Blough[99] state that the natural environment as a living laboratory porvides an opportunity for full sensory rather than an abstract approach to subject matter.

According to Gross and Railton,[100] significant questions are raised when an individual is confronted in a natural environment with a situation that startles or intrigues him and there is an immediate involvement and interaction between the individual and the event.

Mand,[101] Smith and others,[102] Brennan,[103] and Brehm[104] have

---

[97] Musa Qutub, "How to Make Science Interesting," Science Education, LVI (April-June, 1972), p. 231.

[98] Donaldson and Donaldson, "Outdoor Education -- A Definition", p. 7.

[99] Glen O. Blough, "Science and Outdoor Education or Nobody Can Really Know How I Feel," Outdoor Education ed. by Hammerman and Hammerman, p. 164.

[100] Phyllis Gross and Esther P. Railton, Teaching Science in an Outdoor Environment (Berkeley, Calif.: University of California Press, 1972), p. 11.

[101] Charles E. Mand, Outdoor Education (Columbus, Ohio: Charles E. Merrill Publishing Company, 1972), pp. 36-101.

[102] Smith and Others, Outdoor Education, pp. 25-28.

[103] Brennan, People and their Environment,

[104] Shirley R. Brehm, A Teacher's Handbook for Study Outside the Classroom (Columbus, Ohio: Charles E. Merrill Publishing Co., 1969). pp.

suggested multidis

various subject ar

creative skills, w

themselves and the

quality of the env

An inquiry

in 1968,[105] recei

of the environmen

local circumstanc

countries to expl

tries, there is a

lem is not so muc

signed to the st

one country to a

(a) ensur
vatio
(b) basin
(c) an in
tion,
resea
(d) provi
(e) devel
(f) facil
(g) provi
(h) helpi
hygie
(i) encou
educa

---

[105]Intern
in School (Pari

[106]*Ibid.*,

suggested multidisciplinary activities in the out-of-doors to enhance various subject area goals, i.e. constructive use of leisure time, creative skills, wise use of natural resources, understandings about themselves and the world they live in, together with concerns about the quality of the environment.

An inquiry taken by the International Bureau of Education, Geneva, in 1968,[105] received replies from 79 countries which showed that the study of the environment is rich with opportunities, but that lack of resources, local circumstances and other difficulties make it impossible for certain countries to exploit them as fully as they would wish. In developing countries, there is a need of adapting teaching to the surroundings. The problem is not so much one of syllabuses, as of methods. Among the aims assigned to the study of the environment which are more of less similar from one country to another are:[106]

(a) ensuring pupils' active participation in teaching by observation and by experiment;
(b) basing teaching on concrete ideas;
(c) an introduction to intellectual work, training in observation, encouragement to think, compare, analyze, synthesize, research;
(d) providing a better introduction to certain ideas;
(e) developing love and respect for nature;
(f) facilitating children's adjustment to their surroundings;
(g) providing a link between home and school backgrounds;
(h) helping to improve living conitions later on, housing, hygiene, nutrition;
(i) encouraging collective work and thereby beginning of social education.

---

[105] International Bureau of Education, The Study of the Environment in School (Paris: UNESCO, 1968), p.v.

[106] Ibid., p. xxii.

Environmen

tation, students

suggest teachers

proach in which s

to environmental

Brehm[108] cl

tigation as (1) v

tigations or fiel

Lambert and Goodm

should be taught

and (3) how it i

field trip" can

child acquaintan

than a "whole lo

a park or forest

Harris[111]

---

[107] Troost

[108] Brehm,

[109] J.M. La
of Ecology," Th
Blackwell Scient

[110] Matthew
Children, VII (M

[111] Melvil
Press, 1971), p

Environmental Investigations and Experiments. Through experimentation, students gain insight into relevant concepts. Troost and Altman[107] suggest teachers plan exercises and investigations, using the inquiry approach in which students manipulate concrete materials to discover answers to environmental problems.

Brehm[108] classified the teacher-planned outside the classroom investigation as (1) visiting trips (2) collecting trips and (3) field investigations or field studies. In teaching ecology through field studies, Lambert and Goodman,[109] state that the problems concerned are: (1) what should be taught at any given level, (2) where it is to be carried out, and (3) how it is to be presented. Brennan[110] suggests that a "conceptual field trip" can be used effectively, lasting 5 to 10 minutes, offering the child acquaintanceship with a single concept of the environment, rather than a "whole load" experience that teachers attempt during a trip through a park or forest.

Harris[111] would plan environmental studies on a framework requiring

---

[107]Troost and Altman, Environmental Education, p. 398.

[108]Brehm, Study Outside the Classroom, pp. 9-18.

[109]J.M. Lambert and G. T. Goodman, "Basic Problems in the Teaching of Ecology," The Teaching of Ecology, edited by J.M. Lambert (Oxford: Blackwell Scientific Publications, 1967), p. 7.

[110]Matthew J. Brennan, "The Conceptual Field Trip," Science and Children, VII (March, 1970), pp. 34-35.

[111]Melville Harris, Environmental Studies (New York: Citation Press, 1971), p. 31.

three major elem

a clarification

gesting starting

tainment of the

Outdoor i

rewarding than a

logical exercise

cant lot communi

for elementary s

soil which organ

should form the

gested activitie

problem solving

proach, individu

games, and inves

to analyze parti

the operations c

Overcash[1

[112]Michael
The American Bic

[113]Robert
tary Science Dis
and Bacon, 1970)

[114]Thomas
and Projects for
Inc., 1973).

[115]J. Ross
Science Teacher,

three major elements: the examination of the potential of the environment; a clarification of the educational objectives of the approach; and suggesting starting points in the environment that can be utilized in the attainment of the objectives.

Outdoor investigations, according to Fall,[112] can often be more rewarding than a "discovery" in the laboratory and he recommends such ecological exercises as habitat survey, productivity of a garbage can, the vacant lot community and so on. Sund and others[113] designed some experiments for elementary students which focus on the pollution of air, water and soil which organized activities under the principle that conceptual schemes should form the controlling ideas for the study of science. Brehman[114] suggested activities with strong emphasis on an interdisciplinary approach to problem solving for secondary students. They utilize the case study approach, individual student projects, role playing and other simulation games, and investigations of ecological problems. Students were encouraged to analyze particular problems of interest and to relate their findings to the operations of basic eco-principles.

Overcash[115] illustrates that with moderate effort, the teacher can

---

[112]Michael W. Fall, "Teaching Ecology in the Urban Environment," The American Biology Teacher, XXXI (December, 1969), pp. 572-73.

[113]Robert E. Sund, Bill W. Tillery and Leslie Trowbridge, Elementary Science Discovery Lessons: The Biological Sciences (New York: Allyn and Bacon, 1970), p.3.

[114]Thomas R. Brehman, Environmental Demonstrations, Experiments and Projects for Secondary Schools (New York: Parker Publishing Company, Inc., 1973).

[115]J. Rosson Overcash, "Environmental Studies in the City," The Science Teacher, XXXVIII (February, 1971), p. 18.

begin the develo

through studies

insects or flora

cated studies of

cation of the en

Environme

core of an envir

they expose the

formed about the

lop a plan of ac

be utilized to t

ment and to expo

As a proc

type of field in

tion programs.

process, the stu

knowledgeable o

serve as basis

---

116 Stapp,
Sourcebook, p.

117
in a Seminar-Wo
Lake, Michigan,
(Mimeographed.)

118 Dean B
mental Inventor
1972. (Mimeogra

begin the development of an environmental ethic in the urban student through studies of old buildings, trees in the mini-park, colonies of insects or flora and fauna in an old cemetery or to the more sophisticated studies of water and air pollution to show extent of man's modification of the environment.

Environmental study or "environmental encounters" can form the core of an environmental education program. Stapp[116] points out that they expose the learner to an environmental problem or issue, become informed about the problem, are encouraged to suggest solutions and develop a plan of action and implement that plan. For lower grades, they can be utilized to bring out basic awareness and appreciation of the environment and to expose the children to ecological principles.

As a process and product, the community survey or inventory is a type of field investigation that is significant to environmental education programs. Stapp,[117] and Bennett and MacGown[118] state that as a process, the students become aware of local environmental problems and knowledgeable of the means to solve these porblems; as a product, it can serve as basis for determining needs and goals of the community.

---

[116] Stapp, "Environmental Encounters," Environmental Education: A Sourcebook, p. 233.

[117] ________, "Community Profile and Life-style Survey," A Handout in a Seminar-Workshop on Problems of the Human Environment," at Higgins Lake, Michigan, Teachers' Environmental School, July 15-19, 1973. (Mimeographed.)

[118] Dean B. Bennett and Richard H. MacGown, "The Community Environmental Inventory," Maine Environmental Education Project, Yarmouth, Maine, 1972. (Mimeographed.) pp. 3-4.

An environ

tem analysis. It

tors that compris

a checklist as ba

site ecosystem wh

concepts and skil

Facilitie

mum utilization

community resour

ficant role for

School si

more than just a

bute to the tota

Department of Ag

a conservation p

ces, it gives de

and understandin

described the co

of 18 school sit

---

[119] Coopera
Bulletin E-763.

[120] Soil Co
Outdoor Classroo
ing Office, 1972

[121] Jerry S
Conservation, XX

An environmental education program can be built about an ecosystem analysis. It involves an on-the-spot evaluation of the various factors that comprise the existing ecosystem. George and others[119] developed a checklist as basis for an in-depth study and assessment of the total site ecosystem which provides the means for teaching basic environmental concepts and skills.

Facilities and Resources. While outdoor education suggests maximum utilization of the out-of-door, out-of-school environment, including community resources, specially developed learning facility have a significant role for environmental education.

School site development rests on the philosophy that the site is more than just a place to house the physical facilities; it must contribute to the total education process. The Soil Conservation Service, U.S. Department of Agriculture,[120] in assisting the school site development on a conservation plan, state that as a place for creative learning experiences, it gives depth, meaning, and new dimensions to generalizations about and understandings of relationships of man to his environment. Schwien[121] described the community interest and participation in changing the face of 18 school sites in Pueblo, Colorado, as outdoor classrooms for

---

[119] Cooperative Extension Service, Ecosystem Analysis. Extension Bulletin E-763. Michigan State University, April, 1973.

[120] Soil Conservation Service, U.S. Department of Agriculture, Outdoor Classrooms on School Sites (Washington, D.C.: Government Printing Office, 1972), p. 1.

[121] Jerry Schwien, "Changing the Face of School Sites," Soil Conservation, XXXIX (August, 1973), pp. 10-11.

environmental stu

a school site can

tal management la

a multiple-use sc

The report

trates the use of

as essential reso

general types of

or rural communi

cial and industr

tion.

Regional

ted level of exp

around a unique

lists guidelines

ter, oriented to

study opportunit

Menesini[125]

---

122 Richard
Maine Environmen
pp. 1 - 2.

123 Educati

124 Places
Facilities Labor
tories, Inc., 1

125 Mario
Educational Con

environmental studies. MacGown[122] presents the important roles that a school site can provide: as an ecological laboratory, an environmental management laboratory, a natural history interpretative area, and a multiple-use school and community recreation area.

The report on Environmental Education/Facility Resources[123] illustrates the use of community facilities, its people, places and processes as essential resources for environmental education. It classifies four general types of resources and facilities applicable to urban, suburban or rural communities as natural sites, public works facilities, commercial and industrial resources, and historical sites and tourist attraction.

Regional environmental education centers afford a more sophisticated level of experiences by providing facilities for effective learning, around a unique outdoor setting. Places for Environmental Education[124] lists guidelines for developing a resident environmental education center, oriented to directing, coordinating and interrelating a multitude of study opportunities available throughout the environment.

Menesini[125] would categorize environmental awareness sites into

---

[122] Richard H. MacGown, "The School Site in Environmental Education," Maine Environmental Education Project, Yarmouth, Maine, 1972. (Mimeographed) pp. 1 - 2.

[123] Educational Facilities Laboratories, Inc., pp. 18-31.

[124] Places for Environmental Education, A Report from Educational Facilities Laboratories, Inc. (New York: Educational Facilities Laboratories, Inc., 1971).

[125] Mario M. Menesini, The Environmental School (Orinda: Calif.: Educational Consulting Service, 1970).

four environmenta

order to assist

awareness site,

tions for identi

multidisciplinar

Academic S

environmental ed

students assume

adds that under

judgments, inter

Rasmussen

low students to

cal of the phys

the author of a

tion game as an

fectively grasp

Games ca

trated by Doran

[126] E. Nel
Journal of Envi

[127] Fred A
The American Bi

[128] David
Science Teacher

[129] Rodney
room," The Sc

four environmental divisions of Earth, Air, Water and Populations. In order to assist teachers to utilize unique elements of any environmental awareness site, he provides guidelines to its development; classifications for identifying characteristics of the site and suggestions for a multidisciplinary approach.

Academic Simulation Games. To achieve a flexible curriculum in environmental education, Swinerton[126] recommends gaming simulations, where students assume decision-making roles and respond to game conditions. He adds that under simulations, a student faces situations calling for value judgments, inter-active decision-making and actual problem-solving.

Rasmussen[127] indicates that simulation games as a teaching tool allow students to gain insight into attitudes, concepts, and processes typical of the physical or social phenomena being simulated. Kuhn,[128] who is the author of a simulation game on natural selection considers the simulation game as an important pedagogic device to understand processes not effectively grasped through fragmentary classroom exercises.

Games can help achieve objectives in the affective domain as demonstrated by Doran and Watson[129] who reviewed such games as Extinction,

---

[126]E. Nelson Swinerton, "Environmental Gaming Simulations," The Journal of Environmental Education, III (Summer, 1972), p. 50.

[127]Fred A. Rasmussen, "Science Teaching and Academic Gaming," The American Biology Teacher, XXXI (December, 1969), p. 560.

[128]David J. Kuhn, " A Simulation Game on Natural Selection," The Science Teacher, XXXVI (January, 1969), p. 68.

[129]Rodney L. Doran and William Watson, "Games for the Science Classroom," The Science Teacher, XL (April, 1973), p. 32.

Natural Selectio

with purposeful

and relevance of

lize the effect

ments. They als

games through a

niques.

Commercia

by Holobinko an

students discove

cant success an

get involved in

standard of liv

students unders

the water resou

Romey,[13

topic in his sc

in the sciences

other, but tha

impersonal nat

---

[130] Paul
the Commercial
mental Educati

[131] Willi
wood Cliffs, N
son,"Games for

[132] Clark
Sciences,"The

Natural Selection, Elements, and Disaster. The authors stated that with purposeful interaction, prompt and intrinsic feedback, realism and relevance of games, students can become motivated to learn, realize the effect of value judgements and analyze the basis of such judgements. They also recommend that teachers should avoid the overuse of games through a schedule of games and a variety of other classroom techniques.

Commercially produced games for the life sciences were described by Holobinko and others.[130] According to the writers, in Pollution Game, students discover that there is a positive correlation between significant success and being a polluter. In Plant Management Game, the students get involved in many concerns such as population expansion, food supply, standard of living and environmental quality. Thermal Pollution helps students understand the origin and perpetuation of thermal pollution in the water resources.

Romey,[131] recognizing the importance of games has included the topic in his science methods book. According to Abt and Cogger,[132] games in the sciences are not designed for students to compete against each other, but that students are privately testing their ability to understand impersonal natural forces.

---

[130]Paul Hobinko and others, "Synopsis of Games and Simulations in the Commercial Edition of ERC Life Science," Troost and Altman, Environmental Education, pp. 394-95.

[131]William D. Romey, Inquiry Techniques for Teaching Science, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968), as cited by Doran and Watson,"Games for the Science Classroom,", p. 32.

[132]Clark C. Abt and Virginia H. Cogger, "Educational Games for the Sciences,"The Science Teacher, XXXVI (January, 1969), p. 36.

Value Educ

tion and clarifi

choices and deci

issues concernin

that value educa

in school and mu

about societal

size the role o

with environmen

Linsky[13

for inculcating

students throug

and others[137] e

behavior and th

dards which inf

[133]David
Concepts and Pr
graphed.)

[134]James
Environmental E

[135]Cliffo
tion," The Jou

[136]Ronal
The Science Tea

[137]Louis
Teaching (Col

Value Education. Environmental education involves the recognition and clarification of the beliefs and attitudes that determine the choices and decisions which enable students to deal intelligently with issues concerning the use or abuse of the environment. Kuhn[133] indicates that value education should be part of the student's science experiences in school and must provide opportunities to explore the student's values about societal concerns. Other writers like Shaver[134] and Knapp[135] emphasize the role of the social studies teacher in focusing on values dealing with environmental issues in the context of citizenship education.

Linsky[136] states that to stimulate and motivate attitudinal changes for inculcating the concept of environmental ethic, the teacher must guide students through exploration of values which are basic to all men. Raths and others[137] explain that out of experiences may come general guides to behavior and these guides tend to give direction to life and become standards which influence people's activities.

---

[133]David J. Kuhn, "Value Education in the Sciences: The Step Beyond Concepts and Processes," University of Wisconsin-Parkside, 1972. (Mimeographed.)

[134]James P. Shaver, "Environmentalism and Values," The Journal of Environmental Education, IV (Fall, 1972), pp. 49-51.

[135]Clifford E. Knapp, "Attitudes and Values in Environmental Education," The Journal of Environmental Education, III (Summer, 1972), pp.26-27.

[136]Ronald B. Linsky, "Educational Strategies for Environmental Ethic," The Science Teacher, XXXVIII (January, 1971), p. 18.

[137]Louis E. Raths, Merrill Harmin, and Sidney B. Simon, Values and Teaching (Columbus, Ohio: Charles Merrill Books, 1966), p. 27.

Harmin an

matter beyond th

value-oriented i

rification techn

of strategies wh

calues. Some ex

also in displayi

of the values cl

nitive and affec

Genge anc

values clarifyi

is to provide a

of certain conc

work and patter

his feelings ab

willing, or mig

In all t

examination, ex

---

[138]Merril
Science with a
1970), pp. 17-2

[139]Sidney
(New York: Hart

[140]Virgin
rification Appr
disseration, Mi

[141]Betty
Ecology," The

Harmin and others[138] suggest that teachers approach the subject matter beyond the facts and concepts level to the values level or use the value-oriented inquiry to motivate subject matter study. The values clarification technique is discussed by Simon and others[139] in their handbook of strategies which suggests some seventy-nine strategies for clarifying calues. Some exercises not only aid students in identifying values but also in displaying their values. Chamberlain,[140] in describing her use of the values clarification technique, illustrated the integration of cognitive and affective objectives in a course in earth science.

Genge and Santosuosso[141] presented some exercises which utilize the values clarifying technique of rank-order. The purpose of the exercises is to provide an opportunity for the student to display (1) the knowledge of certain concepts regarding pollution; (2) the organizational framework and patterns significant to this knowledge; (3) the awareness and his feelings about pollution; and (4) the exploration of what he might be willing, or might not be willing, to do about the problem.

In all the value clarification techniques, there are involved self-examination, exciting teaching-learning experience and practical curriculum

---

[138]Merrill Harmin, Howard Kirschenbaum and Sidney B. Simon, "Teaching Science with a Focus on Values," The Science Teacher, XXXVII (January, 1970), pp. 17-20.

[139]Sidney B. Simon, L. Howe and H. Kirschenbaum, Values Clarification (New York: Hart Publishing Co., 1972).

[140]Virginia M. Chamberlain, "A Description of the Use of a Values Clarification Approach in the Teaching of Earth Science Classes." A Ph.D. disseration, Michigan State University, 1971.

[141]Betty Ann Genge and John J. Santosuosso, "Values Clarification for Ecology," The Science Teacher, XL (February, 1974), pp. 37-39.

development.

Multimedia

the need for book

tant as available

information. Pro

tal concept, as i

effective means

Various of

Postlethwaite[144]

observations with

background. Nov

to students for

in comparatively

areas that might

resources. The

observed to have

learning.

---

[142]Harris,

[143]Foster,

[144]Joseph
Instruction, Lik
National Science

[145]Ibid.

[146]D. H. M
the Secondary Sc

development.

Multimedia Approach. Study of the environment does not remove the need for books, rather, Harris[142] state that it becomes more important as available references for children in their search for additional information. Programmed instruction materials to develop some environmental concept, as illustrated by Foster[143] would be a quick, efficient and effective means for students to grasp the essential subject matter.

Various other methods are needed to individualize instruction. Postlethwaite[144] first utilized the audio-tape to guide students through observations with botanical materials, as well as present some necessary background. Novak[145] considers the audio-tutorial approach as beneficial to students for allowing them to explore a variety of natural phenomena in comparatively undirected fashion, and permitting instruction in some areas that might otherwise be curtailed by the available teacher skills or resources. The audio-tutorial system described by McGaw and others[146] was observed to have fostered more positive attitudes toward the science of learning.

---

[142]Harris, Environmental Studies, p. 20.

[143]Foster, Introduction to Environmental Science, p. v.

[144]Joseph D. Novak, "Audio-Tutorial Techniques," Individualized Instruction, Like It Is, edited by Henry J. Triezenberg (Washington, D.C.: National Science Teachers Association, 1972), p. 14.

[145]Ibid.

[146]D. H. McGaw, C.A. McGaw and others, "Audio-Tutorial Learning in the Secondary School," Individualized Instruction, p. 81.

Richard[147]

newspapers, maga

programmed learn

trigger more ins

<u>Multidisc</u>

subject or sett

environmental a

and values are

education. Acc

disciplinary be

> The
> that rea
> hended b

Hardy[151]

should be full-

dimensions of H

humanistic-ethi

dimensions of h

theme in a part

---

147 Paul V
<u>Teacher</u>, XXXI

148 James
ness," <u>Proces</u>

149 Josep
ments," <u>The Jo</u>

150 <u>Ibid</u>.

151 Cliff
ronmental Educ
1973), p. 15.

Richard[147] cites that enrichment activities through the use of newspapers, magazines, television, film loops, slides, unit booklets and programmed learning units and the student's interaction with them may trigger more insight and result in behavioral changes.

Multidisciplinary Approach. There is not a single educational subject or setting which does not have an effect on the development of environmental attitudes and values. Swan[148] states that such attitudes and values are strengthened by continual reinforcement in all areas of education. According to Meeker,[149] environmental studies must be interdisciplinary because the environment is interdisciplinary. He states:[150]

> The profound truth of the heart of ecological insight is that reality is indivisible, and therefore cannot be comprehended by studying isolated fragments.

Hardy[151] indicates that any approach to environmental education should be full-dimensional in design and should be based on the various dimensions of human experience including the scientist-quantitative, the humanistic-ethical, creative-aesthetic and the vocational-utilitarian dimensions of human experience. For example, to develop a population theme in a particular grade level, the program should involve not only

---

[147] Paul W. Richard, "Enrichment in Biology," The American Biology Teacher, XXXI (October, 1969), pp. 444-47.

[148] James Swan, "Formation of Environmental Values A Social Awareness," Processes for a Quality Environment, ed. by Cook and O'Hearn, p. 47.

[149] Joseph W. Meeker, "Academic Fields and other Polluted Environments," The Journal of Environmental Education, IV (Spring, 1973), p. 37.

[150] Ibid.

[151] Clifford A. Hardy, "Training Social Studies Teachers in Environmental Education," The Journal of Environmental Education, IV (Summer, 1973), p. 15.

science but ever

core or traditio

Osborn an

day trip, which

tain activities

form models were

geography, meteo

the concept of i

solving activiti

drama, literatur

goals.

The Natio

of programs in e

where the ecolog

ecology in liter

Hegelson and oth

---

152 Slesnic

153 Ron Osb
Environmental Fi
pp. 73-74.

154 Thomas
Problem Solving,

155 Jean C.
for a Quality En

156 Nationa
p. 39.

157 PREP Re

science but every subject area, whether the curriculum is an integrated core or traditionally subject-centered.[152]

Osborn and Spofford[153] utilized an outdoor laboratory for a full day trip, which although aimed primarily toward science, arranged certain activities in mathematics, reading, social studies and English. Landform models were used by Brehman and Qutub[154] to correlate materials in geography, meteorology, biology and earth science for an understanding of the concept of interrelationship and to be used as a basis for problem-solving activities of the students. Hoem[155] suggested activities in music, drama, literature and art that can help develop environmental education goals.

The National Science Teachers Association,[156] in their compilation of programs in environmental education described a program in Washington, where the ecological conscience is explored not only in science but the ecology in literature, psychology and sociology, social studies and art. Hegelson and others[157] in their review of environmental education programs

---

[152]Slesnick, "Population Education -- A Social Response,'" pp. 22-23.

[153]Ron Osborn and Roger Spofford, "Interdisciplinary Involvement in Environmental Field Trips," The Science Teacher, XXXVII (April, 1970), pp. 73-74.

[154]Thomas Brehman and Musa Qutub, "Environmental Activities and Problem Solving," The Science Teacher, XXXVIII (April, 1971),pp. 55-56.

[155]Jean C. Hoem, "Environmental Education in the Arts," Processes for a Quality Environment, pp. 119-28.

[156]National Science Teachers Association, Environmental Education, p. 39.

[157]PREP Report No. 33, Environmental Education Programs, p. 11.

and materials re

rials are inter

the concepts an

science discipl

The effe

upon the sensit

submits that if

in the school p

teachers must b

informed citize

tribute to the

ples of in-serv

cannot be separ

and supervision

instructional c

gram as the "tr

program.

158Stapp,

159Harol
(Englewood Cli

160Mary
Programs to Di
Research in Sc

and materials reported that much of the environmental education materials are interdisciplinary in scope to the extent that they draw upon the concepts and generalizations from most of the social science and science disciplines.

In-service Education of Teachers

The effectiveness of the environmental education program depends upon the sensitivity and the responsiveness of the teacher. Stapp[158] submits that if we are to initiate and implement environmental education in the school program, a comprehensive in-service education program for teachers must be developed. It should consider the "tools" required for informed citizen action in helping solve environmental problems and contribute to the improvement of the environment. In laying out the principles of in-service training, Spears[159] states that the in-service program cannot be separated either in spirit or function from curriculum planning and supervision, the three representing the features of the program for instructional development. Rowe and Hurd[160] consider the in-service program as the "translating device" to get the new curriculum into the action program.

---

[158] Stapp, "Environmental Encounters," Environmental Education, p.228.

[159] Harold Spears, Curriculum Planning Through In-service Programs (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1957), p. 315.

[160] Mary Budd Rowe and Paul deHart Hurd, "The Use of In-service Programs to Diagnose Sources of Resistance to Innovation," Journal of Research in Science Teaching, IV, no. 1. 1966, pp. 3-13.

The Biol

for a reorienta

break away from

they need less

ledge; they nee

in responding s

needs and in or

To intro

mends more emph

and techniques

much as educato

that they be as

to the communi

Lerner[16

visor as their

---

[161] BSCS
School, edited
Colorado, 1969

[162] Abrah
ing," New Tren
Vol. II, p. 33

[163] Marti
College of Edu

[164] Marjo
Elementary Sch
tary School, e
Macmillan Comp

The Biological Science Curriculum Study[161] emphasized the need for a reorientation and reeducation for teachers now in service, to break away from the teaching-as-you-were-taught cycle. Accordingly, they need less training as givers of information and imparters of knowledge; they need more training in diagnosing, prescribing and counseling; in responding sensitively to students' needs; in being aware of society's needs and in ordering the environment where learning can take place.

To introduce changes in the training of teachers, Blum[162] recommends more emphasis to the investigation of integrated issues, problems and techniques of interdisciplinary research and decision-making. Inasmuch as educators are potential agents of change, Hetherington[163] suggests that they be assisted to acquire proper knowledge about bringing change to the community and the effective means to correct environmental problems.

Lerner[164] indicates the proper use of the teachers' science supervisor as their most immediate source for a wide range of in-service

---

[161]BSCS Special Publication No. 7, Life Sciences in the Middle School, edited by George M. Clark. (Boulder, Colorado: University of Colorado, 1969), p. 20.

[162]Abraham Blum, "Towards Rationale for Integrated Science Teaching," New Trends in Integrated Science Teaching, edited by P. Richmond, Vol. II, p. 33.

[163]Martin Hetherington, "Teaching Aids For Environmental Science," College of Education, Michigan State University, January, 1971., p.i.

[164]Marjorie S. Lerner, "In-service Science Activities for the Elementary School Teacher," Readings in Science Education for the Elementary School, edited by Edward Victor and Marjorie S. Lerner (New York: Macmillan Company, 1967), pp. 275-77.

activities and
adds that throu
as in-service t
and conferences
tion and provis

Env

The term
accounts for mo
all Central and
Japan and Asian
(except Austra

Accordi
in ". . . elec
all aspects of
tries have div
great majority
a common purpo
health and hou
by the nation

Populat

[165] A.C.
for Science Su
National Scien

[166] Herbe
UNESCO, 1973),

activities and for their professional growth while teaching. Brewer[165] adds that through the supervisor, the teachers can receive such service as in-service training opportunities, awareness of available institutes and conferences, the demonstration of proper use of materials of instruction and provision of opportunities for leadership development.

Environmental Concerns of Developing Countries

The term "developing countries" refer to about 100 nations and accounts for more than two-thirds of the world's population. They include all Central and South America, Africa (except South Africa), Asia (except Japan and Asian Republics of U.S.S.R.), and lands in the Pacific Ocean (except Australia and New Zealand).

According to Abraham,[166] the developing countries lag far behind in ". . . electric power, roads, sanitation, water supply, sewerage. . . all aspects of social and economic development". While developing countries have diverse economic potential, political and value systems, a great majority are overwhelmingly dependent on agriculture. They all have a common purpose: to reduce poverty, to insure adequate levels of education, health and housing, food for every citizen; to increase control over nature by the nation and the individual and to broaden the opportunity for choice.

Population is growing rapidly, generating social and economic

---

[165] A.C. Brewer, "The Role of Science Supervision," A Sourcebook for Science Supervisors, edited by Mary B. Harbeck (Washington, D.C.: National Science Teachers Association, 1967), p. 13.

[166] Herbert J. Abraham, World Problems in the Classroom (Paris: UNESCO, 1973), pp. 96-96.

problems, wider

quality of envi

example, the ra

tantamount to

parts of the wo

rished or starv

L. Mala

ristics of eco

national envir

separation of

agricultural e

of training an

The 197

considering th

cognizance of

tations and br

verty or the i

arise our of

The Nat

the environmen

---

167 Jan
Dell Publishi

168 L. M
Education (P

169 Unit

170 UN G
National Repo
Xerox-Univers

problems, widening the gap of food production, living standards and quality of environment. In some countries, Mexico and Philippines, for example, the rate of population increase of 3.5 per cent per year is tantamount to doubling the figure in every twenty-one years.[167] In many parts of the world, millions of people in the rural areas are under nourished or starving.

L. Malassis[168] states that in addition to the general characteristics of economic underdevelopment, there are others connected with the national environment or the faulty jointing of production systems (e.g. separation of agriculture and livestock), resulting in low efficiency agricultural economy, not achieving goals of adequate production of food, of training and information and of medical care and emancipation.

The 1972 UN Conference on Human Environment in Stockholm,[169] in considering the environmental problems of developing countries, took cognizance of the social and cultural dimensions of its general manifestations and broadly categorized them as (1) problems arising out of poverty or the inadequacy of development itself, and (2) problems that arise our of the very process of development.

The National Reports on Environmental Problems[170] revealed that the environmental problems of developing countries are predominantly

---

[167] Jan Lenica and Alfred Sauvy, Population Explosion (New York: Dell Publishing Co., 1962), p. 52.

[168] L. Malassis, <u>Economic Development and the Programming of Rural Education</u> (Paris: UNESCO, 1966), p. 15.

[169] United Nations General Assembly, <u>An Action Plan</u>, p. 12.

[170] UN General Assembly, U.N. Conference on the Human Environment, <u>National Reports on Environmental Problems</u>. (Ann Arbor, Michigan: Xerox-University Microfilms, 1973).

those that refl

rural and urban

development ge

trialization,

sing problems.

Majority

problems of hu

and use of nat

Pollution come

industrial, co

be great overl

Problems of Hu

Rural a

ter mass of ma

life itself is

vironmental sa

tural disaster

Rural a

of concentrati

ciency in food

[171]Count
Ceylon, Egypt,
Malaysia, Mala
Arabia and Uga

those that reflect their poverty and very lack of development in both rural and urban societies. It is also apparent that as the process of development gets under way, environmental issues associated with industrialization, urbanization and use of natural resources emerge as pressing problems.

Majority of the country reports[171] indicate their problems as (1) problems of human settlements, rural or urban (2) problems of management and use of natural resources and (3) problems from industrial development. Pollution comes in under any of the above groupings, mainly as domestic, industrial, commercial and agricultural, although in approach, there may be great overlapping.

Problems of Human Settlements

Rural areas. The problems that arise due to poverty of the greater mass of mankind does not merely affect the "quality of life", but life itself is endangered by poor quality housing, unsafe water, poor environmental sanitation and nutrition, by sickness and disease, and by natural disasters.

Rural areas need to sustain a growing population. The high degree of concentration in Kenya, for example, heightens the need for self-sufficiency in food and aggravates malnutrition as a ranking environmental

[171] Country reports reviewed were of: Afghanistan, Botswana, Burma, Ceylon, Egypt, Ghana, India, Indonesia, Iran, Jamaica, Kenya, Kuwait, Malaysia, Malawi, Nepal, Philippines, Singapore, Sudan, Swaziland, Saudi Arabia and Uganda.

problem, along

Urban a

developing cou

urban planning

facilities. O

wedged in amon

in Singapore o

Social

not only by un

gains of touri

also led to de

lated problems

Problems of Ma

Primiti

highly degrade

the bane of Ce

pidly increasi

difficult to b

vere soil wash

valence of mou

cover due to d

tive managemen

Irrigati

172UNESC

problem, along with its rapidly expanding population.

Urban areas. Urbanization is already a pressing problem in most developing countries, because it has been rarely possible to pro ide for urban planning or enough housing, water and sewerage disposal and health facilities. Overcrowding in major cities has led to shanty-type homes wedged in among modern edifices, devoid of social amenities, such as those in Singapore or Rio de Janeiro.

Social problems linked with environmental factors are aggravated not only by unemployment but also by increased incomes. The economic gains of tourism, such as reported in Jamaica led to urbanization, but also led to deterioration of family and other social structures with related problems of crime, delinquency and drug dependency.

Problems of Management and Use of Natural Resources

Primitive exploitation of natural resources has resulted in a highly degraded environment in many countries. Shifting cultivation is the bane of Central and Northern South America and land hunger with rapidly increasing human populations is a vicious cycle from which it is difficult to break.[172] Improper flooding and furrow has resulted in severe soil washing in Afghanistan. Soil erosion in Burma is due to prevalence of mountains and hilly relief, reduction of natural vegetation cover due to destruction of forests and low standard soil and ameliorative management.

Irrigation, intended for improvement of the fertility of the soil

---

[172]UNESCO, Use and Conservation of the Biosphere, p. 33.

has on the oth

health problem

contributed to

soil which res

The exp

tained yield m

countries. Po

residential la

to the rapidly

Diminis

life are major

portant resour

reports that t

use and misuse

resources that

trial and agr

Water

safe water sup

counts for the

Ghana. The b

ted human com

soil and as v

Mining

potential of

from tailings

dust in the p

has on the other hand, contributed to the spread of bilharzia, the main health problem in Egyptian and African irrigation systems. It has also contributed to the migration of clay particles that develop into a subsoil which restricts water infiltration and root penetration.

The exploitation of forest resources without provision of sustained yield management resulted in widespread deforestation in many countries. Population pressure in cultivable land and for industrial and residential lands, coupled by the demand for timber products contribute to the rapidly decreasing forest areas in Indonesia.

Diminishing flora and fauna and the eradication of species of wildlife are major problems in several developing countries. Wildlife, an important resource in Kenya is disrupted by settlement and cultivation. Iran reports that the natural flora and fauna have suffered destruction from the use and misuse by man and his grazing animals through the ages. Fishery resources that used to abound in rivers in India are threatened by industrial and agricultural pollutants.

Water resources in many countries of the tropics are abundant, but safe water supply is a great and difficult problem. Water pollution accounts for the prevalence of deaths from bowel diseases in Ceylon and Ghana. The building of reservoirs and dams have in some cases disrupted human communities, contributed to the salinity and alkalinity of the soil and as vectors of infective and parasitic diseases.

Mining activities, although restricted in some countries have the potential of degrading the environment although siltation and pollution from tailings, fumes and effluents from smelters and plants. Cement dust in the Philippines and arsenites in the smoke of gold processing in Ghana are ex

and Kuwait rank

oil exploitatio

Problems from

The deve

now experienci

country report

of development

(a) re
mi

(b) bi
of

(c) ch
tr
an

(d) ph
po

(e) so
mu

The sid

ing upon the s

volved, and th

For example, c

countries expe

in larger cit

in Manila. Ne

[173] Unit

in Ghana are examples of environmental hazards. The seas of Indonesia and Kuwait rank high as potential areas of marine pollution from the oil exploitations in the regions.

Problems from Industrial Development

The developing countries in the process of industrialization are now experiencing the environmental consequences as indicated in their country reports. The side effects that can arise out of the processes of development may be grouped as follows:[173]

(a) resource deterioration: the deterioration, for example of mineral, soil and forest resources;

(b) biological pollution: the pollution represented by agents of human disease and by animal and plant pests;

(c) chemical pollution: arising out of air pollutants, industrial effluents,pesticides, metal and detergent compounds and similar agents;

(d) physical disruption: as reflected for example by thermal pollution, silting and noise; and

(e) social disruption: of which congestion and loss of community are examples.

The side effects manifest themselves in varying degrees depending upon the sectors concerned, the particular geographical regions involved, and the stages of development attained by different countries. For example, certain forms of pollution become a problem that developing countries experience with unequal severity, but of increasing importance in larger cities. Industrial effluents have all but killed Pasig River in Manila. Nearly all industrial centers in India have become foci of

---

[173] United Nations General Assembly, Development and Environment, p. 11.

pollution. Sol

cities.

The repo

problems:

On
the gene
urgent d
general
in India
its qual
ment ter
of contr
seemingl
rance, r

The obv

concerns, plus

be assessed as

countries.[175]

[174]Nati

[175]Unit
p. 11.

pollution. Solid waste disposal is a problem in Bangkok and other cities.

The report of India[174] exemplifies an outlook toward environmental problems:

> On account of dire poverty of the masses, lack of education, the general physical debility, the extreme preoccupation with urgent demands of sheer existence, there is often an apathy, a general lack of popular concern about the quality of environment in India. This attitude of mind is undoubtedly a hindrance to its quality. On the other hand, continuous neglect of environment tends to make people accustomed to accept it. The problem of control or environmental degradation is thus compounded to seemingly unmanageable proportions by poverty, squalor and ignorance, not easy for an affluent country to comprehend.

The obvious differences in national and regional environmental concerns, plus the peculiar conditions of a developing country must all be assessed as integral to the developmental strategy of developing countries.[175]

---

174 National Reports on Environmental Problems, India, p. 6.

175 United Nations General Assembly, Development and Environment, p. 11.

The more

rest upon its ph

rural scene has

impact on its pa

setting and educ

tal education ar

The Phil

emerged from the

of faulting, fo

land mass means

importance. The

land seas stret

line of the Uni

square miles or

The elev

Visayas and Min

with pockets of

[1]T. M. B
Geography (Lond

CHAPTER III

THE PHILIPPINE SETTING

The more fundamental or dynamic aspects of the Filipino nation rest upon its physical environment. As an agricultural country, its rural scene has influenced the social attitudes and with considerable impact on its patterns of life. The dimensions of the socio-economic setting and educational factors which have implications for environmental education are all considered in this chapter.

Physical Environment

The Philippines is an archipelago of 7,100 islands, which have emerged from the sea as a consequence of an extremely complex pattern of faulting, folding and volcanic activity.[1] The fragmentation of the land mass means that coastal and offshore environments are of special importance. The irregular coastline, marked by bays, straits and inland seas stretch for 11,000 miles, almost twice as long as the coastline of the United States. The country's total land area is 115,600 square miles or 296,000 square kilometers.

The eleven major islands are divided into three regions: Luzon, Visayas and Mindanao. The larger islands are marked by mountain peaks, with pockets of lowlands watered by small streams which plunge from

---

[1] T. M. Burley, The Philippines: An Economic and Social Geography (London: G. Bell and Sons, Ltd., 1973), p. 95.

deep slopes and

along the shore.

yan Valley and

and Cotabato Va

plains, plateau

Rainfall

Southeast Asia,

wettest, and pr

divided into th

cember to Febru

ly pass through

Formosa.

The Phi

forests with l

states of expl

resources are

distribution o

many parts of

area, while th

land surface.[3]

---

[2]Anton
(Manila: Cent

[3]Burle

deep slopes and create tiny alluvial deltas at irregular intervals along the shore. While Luzon has two inter-montane valleys, the Cagayan Valley and the Central Plain of Luzon, and Mindanao has the Agusan and Cotabato Valleys, the greater land areas form complex patterns of plains, plateaux and volcanoes.

Rainfall is the most important climactic factor. Like most of Southeast Asia, the Philippines belong to the wet tropics - the warmest, wettest, and probably the richest portion of earth. The climate may be divided into the rainy season (June to November), cool dry season (December to February), and hot dry season (March to May). Typhoons annually pass through the archipelago on their way to North China Sea or to Formosa.

The Philippines is richly endowed with agricultural lands, lush forests with luxuriant vegetation, untold mineral wealth, in various states of exploitation. Based upon size and population, the natural resources are excessively extensive and incalculably potential.[2] The distribution of Philippine soils, however, highlights the fact that in many parts of the islands inferior soils occupy one-fifth of the total area, while the most productive soils, cover a respectable 15% of the land surface.[3] Nevertheless, in comparison with other tropical areas

---

[2]Antonio H. Noblejas, Philippine Law on Natural Resources (Manila: Central Book Supply, Inc., 1961), p. 1.

[3]Burley, The Philippines, p. 112.

Philippine so

extensive vol

prise the off

arable farmla

as non-commer

sified as mar

are still wid

primary fores

and in genera

transition be

inaccessible

Volcan

Taal Lake, wh

volcano; Moun

dominates the

which compris

of the thirty

Agricu

most importan

of the total

thirds of the

[4]Ibid.

[5]Ibid.

Philippine soils rank among the more fertile due to the occurrence of extensive volcanic materials.[4] Of the 29,710,000 hectares which comprise the official land area of the country, an estimated 33.4% are arable farmlands; 30% comprise commercial forest; 24.8% is classified as non-commercial forest; 10.4% is open and grassland, with .6% classified as marshes.[5] The forest lands, despite the influence of man are still widespread, including substantial areas of largely untouched primary forest. The grasslands are in no marked area of concentration, and in general, occupying the rolling uplands which form an area of transition between the intensively cultivated lowlands and the rugged inaccessible mountains.

Volcanoes are among the wonders and terrors of the Philippines: Taal Lake, which is the most active, occupies the crater of an older volcano; Mount Mayon, in southern Luzon with its near perfect cone, dominates the village and bay below it; and a series of six others which comprise Camiguin Island, north of Mindanao. At least a dozen of the thirty odd volcanoes are still active.

Socio-economic Conditions

Agriculture, including forestry and fishing is the largest and most important sector of the Philippine economy. It provides over half of the total employment opportunities, indirectly supports about two-thirds of the population, and accounts for over three-quarters of the

---

[4] Ibid.

[5] Ibid., citing Philippine Forestry Statistics, 1968.

total exports.

Exports

ports, the Phi

wood and wood

derdeveloped,

Philippines li

Mining

mited in areal

and gold, in t

tion at preser

'mineral of th

are among the

mineral resou

surveyed and

Indust

since 1946, w

American rule

assembly oper

rages, tobacc

ceutical, et

---

[6]Ibid

[7]Ibid

[8]Ibid

total exports.[6]

Exports of forest products earned about 23% of the total exports, the Philippines being one of thw world's leading producers of wood and wood products. The domestic fishing industry has remained underdeveloped, contributing to 5% of domestic production, although the Philippines lie in a fertile fishing belt.

Mining activities, like those associated with forestry are limited in areal extent, but are concentrated in impact. Copper, iron and gold, in that order, are the minerals attracting the greatest attention at present, with nickel the leading contender for the title of 'mineral of the future'.[7] The chromite, nickel and copper deposits are among the largest in the world. Although the country is rich in mineral resources, only a small portion of the area has been adequately surveyed and actively exploited.

Industrial production has steadily expanded and diversified since 1946, when the country became independent after 48 years of American rule. Industrial growth remains centered upon processing and assembly operations.[8] Thus, production is concentrated in foods, beverages, tobacco products, textiles, clothing, plywood and veneer, pharmaceuticals, etc.

---

[6] Ibid., pp. 251-52.

[7] Ibid., p. 89.

[8] Ibid., p. 261.

In 1971

estimated leve

such a per cap

country".

The 197

million. Popu

million, the c

tion growth at

although it is

of the people

and Cebu, the

The Phi

with other cou

perhaps 10 to

alone, there a

There a

for most of th

serving the c

equal to that

---

9 U.S.
Background No

10 Popu
Sheet". (Wash

11 Deli
Today (New Yo

12 Ibid

In 1971, the real gross national product (GNP) picked up an estimated level of about \$7.5 billion or about \$205 per capita.[9] At such a per capita level, the Philippines is considered a "developing country".

The 1972 population of the Philippines is estimated at 39.4 million. Population projections to 1985 indicate an increase to 64 million, the country having one of the highest annual rate of population growth at 3.4.[10] The overall density is about 327 per square mile, although it is greater in the islands of Luzon and Mindanao where most of the people are concentrated. In the urban centers of Manila, Davao and Cebu, the rapid population growth is aggravated by migration.

The Philippine urban population is rather large, as compared with other countries in the rest of Southeast Asia. They account for perhaps 10 to 12% of the total population. In the metropolitan Manila alone, there are about two and a half million people.[11]

There are 17,000 barrios (rural villages) which serve as home for most of the inhabitants. The greater number of barrios are found serving the country's 10 million hectares of cultivated land, an area equal to that of Japan.[12] If not engaged in agriculture, the rural

---

[9] U.S. Department of State. Republic of the Philippines, Background Notes, 1972.

[10] Population Reference Bureau, "1972 World Population Data Sheet". (Washington, D.C : Population Reference Bureau, Inc., 1971).

[11] Delia and Ferdinand Kuhn, The Philippines, Yesterday and Today (New York: Holt, Rinehart and Winston, Inc., 1966), p. 47.

[12] Ibid.

dweller usual

forestry and

along with a

logy on the b

The fo

mention a dis

the bulk of t

centers whose

with the rout

decisions whi

nate from Man

of the people

graphically,

cities are ch

rally, wester

trialization

hand, the ind

communities a

der are predo

sical or soci

[13]Burl

[14]Onof
Prentice-Hall

[15]Ibid

dweller usually gains his living from the sea. Elsewhere a handful of forestry and mining communities are within their areas of operation, along with a few thousand aborigines. The physical impact of technology on the barrios has been slight.

The foremost facets of Filipino culture and development, not to mention a disproportionate segment of the total population, including the bulk of the nation's decision makers, are to be found in the urban centers whose relative liveliness and sophistication contrasts vividly with the routine and poverty of most rural areas.[13] The events and decisions which shape the life and livelihood of the Filipino may emanate from Manila or other urban centers, but the majority (about 70%) of the people affected live in the rural areas of the country. Geographically, Manila and the more or less urbanized larger towns and cities are characterized by social change and mobility, while culturally, western attitudes and values are at work in the spheres of industrialization efforts and in governmental administration.[14] On the other hand, the indigenous or traditional norms and values operate in the rural communities and barrios, where the social structure and the economic order are predominantly stable or static, where there is very little physical or social mobility of technological change.[15]

---

[13]Burley, The Philippines, p. 9.

[14]Onofre D. Corpuz, The Philippines (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), p. 88.

[15]*Ibid.*

Maldi

Philippines

bulk of the

cal power li

comprise an

classes of Ph

The la

crop tenancy

the majority

sub-marginal

to achieve gr

tion of a tru

to make the

citizens.[18]

The Ph

people (83.8%

religious min

ni Kristo and

the day to da

---

16 Burl

17 Ibid

19 John
Solidaridad P

Maldistribution of wealth is an outstanding feature of the Philippines and has a social as well as economic implication.[16] The bulk of the nation's wealth, be it land, industry, commerce or political power lies in the hands of those described as the 'super rich' which comprise an infinitesimal 0.07% of the population. The middle and "rich" classes of Philippine society comprise only 20% of the population.[17]

The land tenure pattern in the Philippines is founded on share-crop tenancy. The best lands are in the hands of a few owners, leaving the majority of landholders with only small lots often on marginal or sub-marginal lands. Land tenure modifications in the country are aimed to achieve greater productivity and higher farm incomes through the creation of a truly viable social and economic structure in agriculture, and to make the small farmers more independent, self-reliant and responsible citizens.[18]

The Philippines is a Catholic nation with a great majority of people (83.8%), identifying themselves as Roman Catholics.[19] Other religious minorities are Aglipayans, Protestants, members of the Iglesia ni Kristo and others. Regional variations are limited in number, but the day to day influence of religion have considerable impact and the

---

[16]Burley, The Philippines, p. 251.

[17]Ibid.

[18]Ibid., p. 155.

[19]John J. Carroll and others, Philippine Institutions (Manila: Solidaridad Publishing House, 1970), p.40.

way of life is

As elsew

focusing on the

failure of his

world is very m

force in perhap

in the future

"God will take

The mul

religious sphe

openness of Ph

influences hav

there is treme

much rapidly t

The Phi

Asia and Pacif

of college gra

secondary educ

peoples, the F

in education,

vertical mover

[20]Ibid.

[22]Ibid.

way of life is conditioned by religious belief.[20]

As elsewhere in peasant societies, peasant religion is concrete, focusing on the vicissitudes of the individual's life, the success or failure of his crops, order and disorder in the community.[21] The spirit world is very much a part of the environment of the barrio -- a vital force in perhaps majority of the people. Reliance on divine insurance in the future is to a great extent likewise reflected on the attitude: "God will take care, so why bother?. . . What will be, will be".

The multiplicity of cultural levels is not restricted to the religious spheres, and is accentuated by the great "permeability" or openness of Philippine society and culture to western influences. These influences have not been felt equally throughout society and culture as there is tremendous imbalance among society with one segment "modernizing" much rapidly than the other.[22]

The Philippines has one of the highest literacy rates on the East Asia and Pacific area. The country ranks high in the world in the number of college graduates per capita. For the average Filipino, primary and secondary education are readily available. Of the newly independent peoples, the Filipinos are passionately education-oriented. They see in education, the means to attain their aspirations of better life and vertical movement in the social ladder. Unfortunately, however, because

---

[20] Ibid.

[21] Ibid.

[22] Ibid. p. 137.

of the poor e

lack of textb

education at

complete the

The Co

objectives of

nal patrimony

natural resou

rightful heri

sions in the

of conservati

S
minera
potent
ces o
of agr
settle
not be
explor
of the
five y
ply, f
of wat
and l

Outsi

the country r

[23]UNES
in the Philip

[24]Con
(Manila: Bure
by People's A

[25]Ibi

of the poor economic conditions in the rural areas, as well as the lack of textbooks and equipment in schools, there is much wastage in education at this stage: only about 50% of those who enter Grade I complete the elementary course.[23]

The Constitution and the Patrimony of the Nation

The Constitution in its preamble, states as one of the primary objectives of the State, the conservation and development of the national patrimony.[24] The concern of the State is the preservation of the natural resource base, the source of the nation's economic growth, as a rightful heritage of the Filipino people still to come. Other provisions in the fundamental law of the land, which are the consequences of conservation as a national policy are the following:[25]

> Sec. 8 Art. XIV. All lands of the public domain, waters, minerals, coal, petroleum and other mineral oils, all forces of potential energy, fisheries, wildlife, and other mineral resources of the Philippines belong to the State. With the exception of agricultureal, industrial or commercial, residential and resettlement lands of the public domain, natural resources shall not be alienated, and no license, concession or lease for the exploration, development, exploitation, or utilization of any of the natural resources shall be granted for more than twenty-five years, except as to water rights for irrigation, water supply, fisheries or industrial uses, other than the development of water power, in which cases, beneficial use may be the measure and limit of the grant.

Outside of public agricultural lands,the natural resources of the country may not be sold to any person, not even to citizens.

---

[23]UNESCO, National Science Policy and Organization of Research in the Philippines (Paris, UNESCO, 1970), p. 49.

[24]Constitution of the Republic of the Philippines. (Proposed) (Manila: Bureau of Printing, 1972), p. 1. This Constitution was approved by People's Assembly in 1973.

[25]Ibid., p. 39.

or uti
pines
associ
is own

Lands

dustrial or c

forest, and g

law.[27] Furth

ecolog
source
domain
to any
the co

A priv

of public dom

in area. A c

hectares or a

hectares. No

cense or perm

sources in ex

Compli

various speci

Fisheries Act

and Water Rig

---

[26]Ibid

[28]Ibid

[30]Nobl

Sec. 9, Art. XIV states that:[26]

> The disposition, exploration, development, exploitation or utilization of any of the natural resources of the Philippines shall be limited to citizens of the Philippines, or to associations at least sixty per centum of the capital of which is owned by such citizens.

Lands of the public domain are classified into agricultural, industrial or commercial, residential, resettlement, mineral, timber or forest, and grazing lands and such other classes as may be provided by law.[27] Further, Sec. 11, Art. XIV states:[28]

> The National Assembly, taking into account conservation, ecological, and developmental requirements of the natural resources shall determine by law the size of lands of the public domain which may be developed, held or acquired by, or leased to any qualified individual, corporation or association, and the conditions therefor.

A private corporation or association may hold alienable lands of public domain except by lease not to exceed one thousand hectares in area. A citizen cannot hold such lands in excess of five hundred hectares or acquire by purchase or homestead in excess of twenty-four hectares. No private corporation or association may hold by lease, license or permit, timber or forest lands and other timber or forest resources in excess of one hundred thousand hectares.[29]

Complimenting and supplementing the supreme law of the land are various special laws, such as the Public Land Act, the Mining Act, the Fisheries Act, the Petroleum Act, the Coal-Land Act, the Law of Water and Water Rights and Forest Laws.[30]

---

[26] Ibid., p. 40

[27] Ibid.

[28] Ibid.

[29] Ibid.

[30] Noblejas, Philippine Law on Natural Resources, p. 1.

Obj

The Co

education as

within a regi

jectives of e

sires and asp

pine Constitu

Board of Educ

I. To
ab

II. To
ci

III. To
vi
co

IV. To
pe
ar

V. To
me
hu

Elemen

citizenship a

are basic for

31 Onof
in the Sevent
ed. by A. G.
for Graduate

32 Mags
Education in

Objectives of Elementary and Secondary Education

The Constitution has pronounced the duty of the State to support education as a means for developing the human potential of its citizens within a regime of liberty and national purpose.[31] The fundamental objectives of education in the Philippines are an expression of the desires and aspirations of the Filipino people, as embodied in the Philippine Constitution. Stated in general terms, they are promulgated by the Board of Education as follows:[32]

I. To inculcate the moral and spiritual values inspired by an abiding faith in God.

II. To develop an enlightened, patriotic, useful and upright citizenry in a democratic society.

III. To instill habits of industry, thrift, and to prepare individuals to contribute to the economic development and wise conservation of the Nation's natural resources.

IV. To maintain family solidarity, to improve community life, to perpetuate all that is desirable in our national heritage, and to serve the cause of world peace.

V. To promote the sciences, arts and letters for the enrichment of life and the recognition of the dignity of the human person.

Elementary education aims to prepare the child for democratic citizenship and " to provide the knowledge, skills and attitudes which are basic for personal development and modern living in an expanding

---

[31]Onofre D. Corpuz, "Philosophy and Goals of Philippine Education in the Seventies," Directions for Philippine Education in the Seventies, ed. by A. G. Elevazo and T. N. Boquiren (Manila: Philippine Association for Graduate Education, 1971), p. 5.

[32]Magsasay Committee on General Education, Toward General Education in the Philippines (Manila: University of the East, 1960), p.6.

society."[33]

the individua

cation skills

and virtues o

With r

tional Progra

> of ele
> seek t
> of the
> ductiv
> light
> signed

Accord

economic need

enable the st

munity. It s

study in inst

The a

the educatio

of the count

satisfaction

toward econom

These indica

[33] Pre
Report, Educ
Onofre D. Co
Philippine E

[34] Dep
Educational
sec. i, par.

society."[33] Basic education should provide literacy and develop in the individual cognitive power, numerical manipulation and communication skills, giving emphasis to the culture, desirable traditions and virtues of the Filipino people.

With regard to secondary education, the Revised Philippine Educational Program has defined its specific objectives as follows:[34]

> The secondary school shall continue the unifying function of elementary education by providing general education and shall seek to discover the varying abilities, interests, and aptitudes of the youth and offer courses in the different fields of productive endeavor according to the talents of youth and in the light of community needs. It shall also initiate a program designed to develop community leadership.

Accordingly, the secondary school, taking into consideration the economic needs of the country, must cultivate vocational efficiency to enable the students to become effective members of their family and community. It shall also offer courses to prepare students for effective study in institutions of higher learning.

The attainment of the goals has necessitated various changes in the educational system to conform to the changing conditions and needs of the country. The idea of education for its own sake and for self-satisfaction had given way to another type of education that is slanted toward economic productivity and geared to the needs of the rural areas. These indicated changes influenced the objectives of the educational

---

[33]Presidential Commission to Survey Philippine Education, Survey Report, Education for National Development: New Patterns, New Directions. Onofre D. Corpuz, chairman. (Manila: Presidential Commission to Survey Philippine Education, 1970), p. 67.

[34]Department of Education, Order No. 1, S. 1957. "The Revised Educational Program Approved by the Board of National Education", Art.1, sec. i, par. V.

program throug

school hopes t

life of relati

promotion of

education of

munity life a

the economic

The ai

to the nation

mission to Su

a. To
de

b. To
in
su

c. To
bl

To be

Society" inst

nand E. Marco

Presidential

enumerated th

---

[35]Vita
(Manila: Phoe

[36]Educ

[37]Lour
Direction," D
1973), p. 2.

program through the community school concept. The Philippine community school hopes to enable every Filipino child, youth and adult, to enjoy life of relative freedom from ignorance, poverty and disease.[35] The promotion of optimum growth and development of the school child, the education of out-of-school youth and adults and the improvement of community life are all directions in the community school concept toward the economic development plan of the government.

The aims of elementary and secondary education today contribute to the national development goals as defined by the Presidential Commission to Survey Philippine Education, namely:[36]

a. To achieve and maintain accelerating rate of economic development and social progress;

b. To assure the maximum participation of all the people in the attainment and enjoyment of the benefits of such growth; and

c. To strengthen national consciousness and promote desirable cultural values in a changing world.

To be able to attain the economic, social goals of the "New Society" instituted during the latter half of 1972 by President Ferdinand E. Marcos, a reorientation in educational goals became imperative. Presidential Decree 6-A, Educational Decree of 1972 (September 29, 1972) enumerated the following aims of the educational system:[37]

---

[35]Vitaliano A. Bernardino, The Philippine Community School (Manila: Phoenix Press, Inc., 1958), pp. 26-27.

[36]Education Survey Report, pp. 62-63.

[37]Lourdes M. Aguilar, "72 Years of Policy Making and Educational Direction," Department of Education and Culture Journal, 1 (September, 1973), p. 2.

a. P
e
s
(
p
a
1

b. T
r

c. [
1
s
c

d. F
1
e

With

tives of el

greater str

In t

was introdu

Filipino ch

was an atte

jectives we

terested in

lies; (2)

(3) to erad

and (4) to

38"S

DEC Journal

a. Provide for a broad general education that will assist every individual, in the peculiar ecology of his own society, to (1) attain his potential as a human being; (2) enhance the range and quality of individual and group participation in the basic functions of society; and (3) acquire the essential educational foundation for his development into a productive and versatile citizen;

b. Train the nation's manpower in the middle level skills required for national development;

c. Develop the high-level professions that will provide leadership for the nation, advance knowledge through research, and apply new knowledge for improving the quality of human life; and

d. Respond effectively to changing needs and conditions of the nation through a system of educational planning and evaluation.

Within the directions and goals of the new society, the objectives of elementary and secondary education are redirected to place greater stress on moral and ethical values.[38]

Science in General Education

In the early days of the Philippine educational system, science was introduced as a subject, in grades four, five and six, to give the Filipino children a broad knowledge in the sciences. In 1904, there was an attempt to define the objectives of science education. The objectives were: (1) to stimulate the pupils and students to become interested in improving their economic conditions and that of their families; (2) to train the students in habits of accuracy in thinking; (3) to eradicate the tendency of pupils and students to learn by rote; and (4) to train them to think and reason on the basis of things

---

[38]"School Heads Asked to Pursue Programs with Greater Vigor," DEC Journal, I (October, 1973), p. 2.

observed.[39]

In the

the basis of

attainment of

citizens who

bers of their

Scienc

volving time

public school

to improve th

definite peri

tary grades,

according to

for the devel

tical thinkin

tial to citiz

The re

---

[39]Mags
Education, p.

[40]Ibi

[41]Dion
Elementary Sc
Journal of Sc

[42]Ibi

observed.[39]

In the early thirties, science objectives were formulated on the basis of their functional value and their contribution to the attainment of the aim of general education -- to produce well-balanced citizens who are prepared to take their place as individuals and members of their respective groups in a democracy.[40]

Science in the elementary curriculum underwent many revisions involving time allotment and grade placement. In 1957, the Philippine public schools adopted a new elementary curriculum which was designed to improve the teaching and understanding of health and science.[41] A definite period was provided for the teaching of science in the elementary grades, devoted to the learning of scientific facts and principles according to the capabilities of the children. Also, it has been used for the development of behavior patterns such as "open-mindedness, critical thinking, resourcefulness and responsibleness, which are essential to citizenship in a democracy."[42]

The revised elementary school program for 1970 provided the

---

[39]Magsaysay Committee on General Education, Toward General Education, p. 228.

[40]Ibid., p. 232.

[41]Dionisio P. Garzon, "An Analysis of the Problems of Teaching Elementary Science in the Philippine Public Schools," The Philippine Journal of Science Teachers, V (September and December, 1970), p. 27.

[42]Ibid.

following sc

1st,

4th,

The signific

offering of

the fourth g

The s

the offering

first year a

cated for ea

The r

tional Boar

series 1973,

of in
area
physi
Scien
Year)

These

in the eleme

---

[43]Aur
Pines," The
December, 19

[44]Dep
"The Revised
May 30, 1973

following science curriculum:[43]

1st, 2nd, and 3rd grades - Elementary Science and Health
30 minutes a day, 5 days a week.

4th, 5th and 6th grades - Elementary Science
40 minutes a day, 5 days a week.

The significant change from the 1957 to the 1970 curriculum is the offering of elementary science separately from health beginning in the fourth grade.

The secondary science curriculum implemented in 1957 prescribed the offering of General Science I and General Science II for all the first year and second year, respectively. A 40-minute period is allocated for each subject daily.

The revised secondary science curriculum, as approved by the National Board of Education, and promulgated in Department Order No. 20, series 1973, gives the following description of science courses:[44]

> The natural science (biological and physical) consist of integrated science courses with emphasis on a particular area at each level. Science I, (First Year) emphasizes physical concepts; Science II, (Second Year), Biology; Science III, (Third Year), Chemistry; and Science IV, (Fourth Year), Physics.

These courses aim to strengthen the science processes developed in the elementary grades and to enable the student to acquire basic

---

[43]Aurelio Juelle, "Integrated Science Teaching in the Philippines," The Philippine Journal of Science Teachers, V (September and December, 1970), p. 7.

[44]Department of Education and Culture, Dept. Order No. 20, s. 1973, "The Revised Secondary Education Program, 1973", Manila, Philippines, May 30, 1973. (Mimeographed)

knowledge o

fically lit

The

inquiry and

and the sci

lopers to s

grated scie

Science Dev

curriculum

fields thro

headings: 1

space. The

problems, m

science dev

the develop

of the Fili

that can pa

In t

45"N

46 Ju

47As
Teaching, I
Manila, Phi
Office for E

knowledge of scientific concepts and principles making him scientifically literate and therefore a more effective citizen.[45]

The major task of science teaching in developing imaginative inquiry and concepts to interpret the physical and biological world and the scientific way of reaching decisions has led curriculum developers to stress upon the concepts and methods of science. The integrated science program, for example,was introduced by the Elementary Science Development Project in 1966, to study, readjust and develop curriculum guides that reflect the unification of the various science fields through the organization of the content under only three main headings: living things; matter, energy and motion; and earth and space. The learning approach emphasized personal experience with problems, materials and phenomena.[46] A report on the integrated science developments submits that the primary consideration underlying the development of the new science curriculum is the widely-felt need of the Filipino society for a more scientifically aware population, that can participate in the economic development of the country.[47]

In the secondary level, an adaptation of the Intermediate

---

[45]"Newsbriefs", DEC Journal, I (September, 1973), p.8.

[46]Juelle, "Integrated Science Teaching", p. 9.

[47]Asian Regional Workshop on the Progress of Integrated Science Teaching, Integrated Science Teaching in the Asian Region. Final Report. Manila, Philippines, August 3-17, 1970. (Bangkok: UNESCO Regional Office for Education in Asia, 1971), p. 11.

Science Curr

first and se

lems and mat

set-up.[48] T

of biologica

cerned with

Simul

is the trai

at the eleme

Education Ce

nerve cente

cher educat

lities and

materials f

studies in

The

of science

nation, as

1.

---

[48]Ibi

[49]Jul
Far East -
1970), pp.

[50]Spe
Education i
to Survey

Science Curriculum Study (ISCS) is being developed to provide the first and second year students with first-hand encounters with problems and materials which are worked out in an individualized learning set-up.[48] The first year curriculum uses the major organizing themes of biological systems, and the earth in space; the second year is concerned with the matter-energy relationships.

Simultaneous to these development of new curriculum materials is the training of teachers as a means of improving science education at the elementary, secondary and teacher education levels. The Science Education Center of the University of the Philippines operates as the nerve center for the Regional Science Training Centers (RSTC's) in teacher education programs in science and mathematics, by providing facilities and materials for practicing teachers, for testing curriculum materials for elementary and secondary levels and conducting research studies in science education.[49]

The Philippine Education Survey of 1970 has clarified the goals of sci ence education that contribute to the developmental goals of the nation, as follows:[50]

1. To make science education more responsive to the needs of the national goals.

---

[48] Ibid., p. 12.

[49] Julian R Brandou, "Science Education in Two Countries in the Far East - A First Hand View," The Science Teacher, XXXVII (October, 1970), pp. 30-31.

[50] Special Area Group for Science Education, "A Report on Science Education in the Philippines." Submitted to the Presidential Commission to Survey Philippine Education, 1970. (Mimeographed.) p. 128.

2. T
r

3. T

4. T

5.

The

pines is an

important c

ture citize

and solutio

The

ronment plu

visible and

had also br

not be boug

the enviro

The

on Human En

vironmental

---

51 Com

2. To use science and technology effectively in the achievement of national goals.

3. To produce scientifically literate citizens.

4. To stimulate the choice of scientific and allied careers by those with the corresponding aptitudes and thus increase the number of scientists, technologists, and technicians.

5. To communicate the excitement and aspiration of scientific endeavors and to increase the power of innovation through an awareness of the methods of science.

The current concern for improved science teaching in the Philippines is an indication of the recognition that science education has an important contribution to make toward the preparation of pupils as future citizens in a rapidly changing society and to the understandings and solutions of problems of national development.

Environmental Issues in the Philippines

The worldwide concern over the deterioration of the global environment plus media exposure in the country helped focus on the highly visible and alarming conditions of the Philippine environment. These had also brought out the fact that a rising standard of living should not be bought at the cost of certain and inevitable deterioration of the environment and of the quality of life in the future.[51]

The National Report of the Philippines to the 1972 Conference on Human Environment in Stockholm reviewed the major components of environmental decline as (1) overcrowding and slums; (2) environmental

---

[51]Committee on Natural Resources, Philippine Environment, p. 6.

pollution i

endangered

These probl

pollution,

As h

highest ann

dinand E. M

State of th

continued e

there is st

over the ye

Ten per cer

students ar

covering ab

kilometer.[5

more dramat

of living,

and family.

---

[52]R
Reports on

[53]C
Population
Parenthood

[54]L
Poisoning

pollution in urban areas; (3) industrial and mining pollution; (4) endangered species; (5) deforestation and (6) special diseases.[52] These problems fall within the world's ills which involve the three P's: pollution, population and poverty.

As have been previously stated, the Philippines has one of the highest annual rate of population growth in the world. President Ferdinand E. Marcos, in his message to Congress in January, 1970 on the State of the Nation said: "With soaring birth rate, the prospects for continued economic development are considerably diminished. Indeed, there is strong possibility that the gains which we have carefully built over the years may be cancelled by a continuing population explosion."[53] Ten per cent of the country's population live in Manila, excluding the students and workers who commute daily from the provinces. The city covering about 700 square miles, packs 5,300 people for every square kilometer.[54] In the rural areas, population growth patterns are even more dramatic when viewed in the light of its impact upon the standard of living, food production, nutrition and health of the mother, infant and family.

---

[52]Report of the Philippines on Environmental Problems, National Reports on Environmental Problems.

[53]Carlos P. Romulo, "The Philippines at the Turning Point," Population, A Challenge to Environment (Washington, D.C.: Planned Parenthood-World Population, 1970), p. 12.

[54]Levi Marcelo, "Danger: Air Pollution and Water Pollution Poisoning Manila Area," Bulletin Today, February 10, 1973.

A relat

nal migration
crowding is nc
ly urbanized a
households car
dards. Increa
to the growth
of crimes (2
diseases and
urban areas,
for example i
disposal site

The ex
tion in Matro
out as primar
Air pollution
in the countr
plants, etc.
motor vehicle
that there ar
into the Grea
comparatively
proached dan

55Rep

56Com

A related problem to population growth is urbanization of internal migration brought about by industrialization in the cities. Overcrowding is not only a common occurence in metropolitan cities and highly urbanized areas in the Philippines but even in rural areas. Poor households can hardly afford homes which conform to minimum public standards. Increasing population pressure and the rural migrants contribute to the growth of slum areas which cause the following: (1) high incidence of crimes (2) widespread and costly fires (3) respiratory and bowel diseases and (4) blighted areas and lower real estate values.[55] In many urban areas, refuse collection and disposal is a common problem. Manila, for example is so congested that there are no available spaces for waste disposal site.

The extremely fast pace of urbanization and rapid growth in population in Matropolitan Manila area and other cities in the country are pointed out as primarily responsible for the environmental pollution in the area. Air pollution is found in Greater Manila and industrial areas elsewhere in the country where there are sugar centrals, cement plants, chemical plants, etc. In Greater Manila, the primary source of air pollution is motor vehicles. The National Water and Air Pollution Commission estimates that there are about 3,000 tons daily of air pollutants being discharged into the Greater Manila atmosphere from 480,000 motor vehicles.[56] Even in comparatively clean and open places like Rizal Park, air pollution has approached dangerous levels.

---

[55]Report of Philippines on Environmental Problems, p. 29.

[56]Committee on Natural Resources, Philippine Environment, p. 11.

The gr

is found in

the country.

a high incid

bagasse dust

and pollutio

pulp factory

Anoth

sion is the

near towns,

chemical fer

resulting po

most Philipp

that the app

agriculture.

weeds and va

ful agricult

leaching, de

climate thro

deficient so

---

57 Ibi

58 Uni
Second Asian

59 Bur

60 Ibi

The greatest concentration of air pollution from sugar centrals is found in Negros, where there are eight of the 19 sugar centrals in the country.[57] In the vicinity of one sugar central, there was found a high incidence of lung trouble among the people which may be due to bagasse dust. In Iligan city, there is a mixture of industrial plants and pollution comes from the steel mill, fertilizer plants, paper and pulp factory and others.

Another area of environmental threat caused by population explosion is the pressure on land and resources. In the country-side areas near towns, the "green revolution" may have led to more intensive use of chemical fertilizers, irrigation water and mechanized methods with the resulting possibility of environmental danger.[58] In their natural state, most Philippine soils are deficient in plant nutrients with the result that the application of artificial fertilizers is necessary for efficient agriculture.[59] Despite the relatively careful manner of soil preparation, weeds and vagaries of local precipitation are major obstacles to successful agriculture. Soil erosion by water, loss of soil fertility through leaching, denudation of forests and local or regional modifications of climate through removal of forests have contributed to flash floods and deficient soils.[60]

---

[57] Ibid.

[58] United Nations Economic Mission for Asia and the Far East, The Second Asian Population Conference, Tokyo, 1-13 November, 1972. p. 5.

[59] Burley, The Philippines, p. 253.

[60] Ibid., p. 52.

The ex

the bio-physi

sediment and

tion load of

Water and Air

tive mines wh

tons daily,

29,750 tons

The in

servable. A

altered the

out regard t

and erosion

are no longe

netic sand h

lands border

ry mine in P

resulting in

A silica min

lung disease

of mines in

disastrous i

---

61 Ben
Magazine (M

The extraction of minerals with some attendant destruction upon the bio-physical environment is not yet totally assessed. In terms of sediment and silt, the mining companies contribute the greatest pollution load of all industrial establishments in the country. The National Water and Air Pollution Control Commission reports that there are 13 active mines which dump tailings into public streams at the rate of 82,800 tons daily, ranging from 70 tons a day for the small marginal ones, to 29,750 tons daily for the giant ones.[61]

The impact of mining activities upon the surrounding land are observable. A chromite mine in Zambales practicing open pit mining has altered the composition of the topsoil and excavated much minerals without regard to the possible damage to the ecosystem resulting in floods and erosion in the vicinity. The beaches along Santo Tomas, La Union are no longer sandy but rather a stretch of mud and potholes because magnetic sand have been extracted by the thousands of tons daily. Even tilled lands bordering the beach were not spared the rapacious practice. A mercury mine in Palawan has covered the surrounding terrain with red tailings resulting in a situation that the only flora that would grow are weeds. A silica mine, also in Palawan has contributed to the high incidence of lung disease called silicosis in the locality. Multiply this by the dozens of mines in the rest of the provinces and their environmental impact have disastrous implications.

---

[61] Benjamin Afuang, "Industry's Dirty Business," <u>The Sunday Times Magazine</u> (Manila), August 29, 1971, p. 14.

There

over the coun

varying degre

out the degre

from resident

Tinajeros-Tul

dustries espe

tamination.

for effluents

and a half of

million peopl

river have al

recipient of

sequences for

for livelihoo

because of po

fishponds.[63]

Pangasinan-La

in and around

tailings come

river.[64] The

the damage to

---

[62]Ward

[63]Comm

[64]Ibi

There are more than 30 rivers of various sizes and lengths all over the country, certain sections of which have reported pollution in varying degrees by industry. Of these, three have been studied to point out the degree of pollution that industrial waste water and effluents from residents have contributed. These rivers are the Pasig River, the Tinajeros-Tullahan River and the Agno River. The pollution from 150 industries especially along the Pasig River have resulted in its total contamination. It already uses up to four-fifths of its carrying capacity for effluents - - 40,000 pounds of organic matter daily, between a quarter and a half of it from industry.[62] The effluents produced by about three million people in the Greater Manila area, which eventually get into the river have all but killed the river. The Tinajeros-Tullahan River is the recipient of pollutants from 14 industries. This pollution has dire consequences for the 20,000 people living downstream. These people depend for livelihood upon the fishponds along the river and its tributaries, and because of pollution, they could not receive the water they need for their fishponds.[63] The Agno River, as a major source of irrigation water in the Pangasinan-La Union area in the north has headwaters in the mining country in and around Benguet. There are at least six big mining companies whose tailings come to about 30,000 tons daily which find their way into the river.[64] The main problem complained of is the siltation of the river and the damage to the irrigation systems due to mine tailings.

---

[62]Ward and Dubos, Only One Earth, p. 174.

[63]Committee on Natural Resources, Philippine Environment, p. 8.

[64]Ibid.

The ex
20 years or s
deforestation
and regulatio
mal inhabitan
extinction.[65]
the tamaraw a

The de
and public sc
try is a stag
reported that
sliced to 6,3
rate of 92,00
pressure and
of deforestat
Tarlac, Bohol
nao, the two
these unprodu
cover sprawls

Of the
diseases like

---

[65] Phil

[66] *Ibid*

[67] *Ibid*

The extensive deforestation on most of the islands during the past 20 years or so has resulted in the depletion of Philippine wildlife. This deforestation and the ineffective implementation of forestry laws, measures and regulations have contributed to the destruction of the natural and normal inhabitants of wildlife such that some species are in the state of near extinction.[65] Examples are the Philippines' endemic monkey-eating eagle, the tamaraw and the various species and sub-species of deer.

The denudation of forest in the country is extensive. Both private and public sources claim that the total deforested area throughout the country is a staggering figure -- 1,302,000 hectares. A leading forester has reported that in Mindanao alone, 7,302,000 hectares of forests have been sliced to 6,313,000 hectares in eleven years or an annual deforestation rate of 92,000 hectares of hard-to-replace timber stocks.[66] Population pressure and the boom in the logging trade have contributed to the rate of deforestation. The critical areas are the provinces of Mindoro, Cebu, Tarlac, Bohol and the Mountain Province. Significantly, Luzon and Mindanao, the two largest islands in the archipelago have high proportion of these unproductive lands. In Luzon, for instance, land stripped of forest cover sprawls over 12.3% of the area, while Mindanao has 9.2% of the area.[67]

Of the ten leading disease killers in the Philippines, respiratory diseases like pneunomia, respiratory tuberculosis and bronchitis are among

---

[65]Philippine National Report on Environmental Problems, p. 37.

[66]Ibid.

[67]Ibid.

the first fi

1968, commun

that pollute

A det

health and s

ment to prot

accelerated

the quality

problem of p

family plann

vate educati

into their c

population g

Presi

people from

the e
would
natio

68 En

the first five places with gastro-intestinal diseases in the group. In 1968, communicable diseases accounted for 39% of all deaths. It may be that polluted environment have aggravated these diseases.

A deteriorating environment is a threat to the nation's prosperity, health and survival. It is the declared policy of the Philippine government to protect and transform the human environment in order to bring about accelerated socio-economic development as well as the opportunity to enhance the quality of life of the greater number of Filipinos. Recognizing the problem of population pressure, Philippine Legislature in 1970 considered family planning as an official policy. In this connection, public and private educational institutions have introduced population education concepts into their curricula as hopeful means to bring to a lower level the present population growth rate.

President Ferdinand E. Marcos makes imperative action to spare the people from misery that comes from pollution when he said:[68]

> Other nations are now desperately seeking the restoration of the ecological balance. Let us avoid this. To do otherwise would be to deny our nation the benefits that derive from our national development and achievement.

---

[68] Environmental Center of the Philippines, A brochure. p. 1.

The

mental conc

education.

in relatio

proaches o

tation. I

1.

attitudes a

2.

logical und

3.

teachers i

The

from its ow

tendant pro

zation, agr

ploitation

population

CHAPTER IV

DEVELOPMENT AND IMPLEMENTATION OF ENVIRONMENTAL EDUCATION

The perspective of a developing country with regard to environmental concerns forms the basis for developing goals of environmental education. This chapter describes the role of environmental education in relation to development goals. Its focus is directed toward the approaches of environmental education and the guidelines for its implementation. It also attempts to answer the following questions:

1. What concepts and processes contribute to the understandings, attitudes and values of an environmentally literate individual?

2. What teaching strategies would be helpful to the growth of ecological understandings and the formation of an environmental ethic?

3. What principles are important for the in-service education of teachers in environmental education?

Perspective

The environmental problems of developing countries are fundamentally from its own lack of development. But, there are also in evidence, the attendant problems brought about by the process of development. Industrialization, agricultural growth, the establishment of new communities and exploitation of natural resources all have environmental consequences. As population increases, the problems of both rural and urban areas become pronounced.

Whil

may be alle

duct do not

problems fr

not detract

vironmental

development

The

the biosphe

try, forest

ward the in

ration of t

demands in

apply techn

cess that w

the benefi

trated in

The

following

wards maki

to the dev

understand

management

pronounced.

While the major environmental problems of developing countries may be alleviated by economic growth, a rise in the gross national product do not by themselves guarantee the amelioration of social and human problems from environmental degradation. Concern for the environment need not detract from the goals of development, instead, the recognition of environmental issues in developing countries should be considered in the developmental process.

The development process inevitably means utilizing the resources of the biosphere for human welfare, through activities in agriculture, industry, forestry, etc. But history has shown that these activities aimed toward the improvement of human conditions were undertaken without consideration of the long-term consequences upon the environment. The increasing demands in developing countries to utilize the natural resources and to apply technology to its fullest extent make imperative an educational process that would enable the citizens of developing countries to maximize the benefits of development and minimize the deleterious effects, as illustrated in developed nations.

Environmental Education for Developing Countries

The education of a society for development goals must focus on the following aspects: (1) the development of the individual capacities towards making him an effective person and responsible member contributing to the development of the country; (2) the development of ecological understandings, attitudes and skills that relate to the conservation and management of natural resources; and (3) cooperative school and community involvemen

If

people who

try in a r

tional sys

cation tod

neous to e

tural reso

industrial

cant issue

dents' kno

the qualit

Thu

pered by a

lance betw

birth of a

orients th

ing the po

ment.

The

by stateme

product of

1.

2.

involvement in the alleviation of poverty, disease and malnutrition.

If education is to play a vital role in the development of young people who can participate effectively as citizens of a developing country in a rapidly changing world, the goals and practices of the educational system must be viewed in the light of challenges placed upon education today: population explosion, changing social patterns simultaneous to economic growth, technology applied to the exploitation of natural resources and the widening gap between standards of living in the industrialized areas and rural communities. These are the more significant issues that education must consider if we are to increase the students' knowledge of the world in which they live, help them to improve the quality of life and to stimulate their thinking.

Thus, technological advance and man-made changes need to be tempered by an "environmental conscience" that would help achieve the balance between the desires of man and the limitations of nature. The birth of an environmental conscience rests upon an education which reorients the people to more realistic values, to the morality of uplifting the poor and to the ecological ethic of stewardship over the environment.

The goals of environmental education may best be properly defined by statements about the characteristics of the individual who is the end-product of an ecologically-oriented curriculum:

1. An individual who understands how he personally fits into the biosphere;
2. A human being and a citizen who is able to solve problems, or

3.

4.

The

education.

ing in a c

relatednes

problem sc

ness of en

use and ma

and (4) th

on issues

Env

vancement

tal goals

the enviro

education

Environme

Ed

attitudes

participate in their solution by reflective thinking and scientific inquiry;

3. A citizen who continually carries the message of environmental management and responsibility toward the environment;
4. A productive member of society whose actions, either individually or collectively, work toward quality of the environment, wise resource use and improvement of human welfare in his community.

The development of such an individual is the goal of environmental education. Environmental education is defined as the process of developing in a citizenry: (1) knowledge of his total environment and the interrelatedness among man, his culture and bio-physical world; (2) skills in problem solving, critical thinking and social change strategies; (3) awareness of environmental problems, attitudes and values necessary for the wise use and management of natural resources and protection of the environment; and (4) the decision-making skills and code of behavior for positive action on issues concerning the environment.

Environmental education meets the challenges of technological advancement and social change as the country moves toward its developmental goals. Understandably, development will help provide solutions to the environmental problems of a developing country, but environmental education will help avoid the environmental consequences of development.

Environmental Education and Goals of Development

Education for development is a dynamic process of modifying values, attitudes and motivations to stimulate and sustain continuous progress, enriching t

personal li

fillment.[1]

part, on th

ral science

tal educati

change thro

so that he

assume that

cal climate

idea of dev

modify thos

The

lopment mot

turn contri

and with th

bute to the

development

elements:[3]

---

[1]Muh
and Southea
pp. 98-99.

[2]Ibi

[3]C.
tional Prog
edited by D
Association

enriching the social and cultural life of the nation, and raising the personal life of the citizens to an increasingly higher level of fulfillment.[1] Goals of national development, as a motive force, rest in part, on the concepts of progress derived from the disciplines of natural science, social sciences and humanities which are integral to the total education of the people. If education is a process of qualitative change through the development of the innate capacities of an individual, so that he may live a fuller, better, more productive life, then we may assume that environmental education helps create a favorable psychological climate - - "a climate in which people bestir themselves with the idea of devel opment as both desirable and possible, and are willing to modify those attitudes which are inconsistent with development efforts".[2]

The input-output model on Figure 1 shows how goals of national development motivate environmental education, how environmental education in turn contributes to the development of potentially productive citizens, and with ther environmental understandings, attitudes and skills contribute to the development of human and material resources toward national development. It is based on the "black box" model which contains the elements:[3]

---

[1]Muhammad Shamsul Huq, Education and Development Strategy in South and Southeast Asia (Honolulu, Hawaii: East-West Center Press, 1965), pp. 98-99.

[2]Ibid.

[3]C. Victor Bunderson and David P. Butts, "Designing an Instructional Program - A Model," Designs for Progress in Science Education, edited by David P. Butts (Washington, D.C.: National Science Teachers Association, 1969), p. 59.

The

cial herita

behaviors i

in a synthe

manpower es

gress.

The

harnessing

tor Genera

of the bene

better life

the

mos

For

productive

dual's pot

[4] Ma
p. 9.

[5] Ib

[6] Ma

The input includes the learner, his inner capacity and his social heritage, the process that will transform input abilities to output behaviors is the curriculum, its aims, concepts and attitudes and values in a synthesis of learning experiences, and the output is the educated manpower essential not only for economic growth but also for social progress.

The process of accelerated growth is facilitated by exploring and harnessing the country's human and material resources. Rene Maheu,[4] Director General of UNESCO states that development can only succeed in the eyes of the beneficiaries if the objectives for growth hold the promise of a better life. He asserts that:[5]

> What development should properly be is a transformation of the human condition that improves the quality of living.
>
> Of all the means for bringing about this transformation, the most decisive is probably education.

For developing countries, education has a dual role: it increases productive capacity and it contributes to the fulfillment of the individual's potential and satisfies his need to know and explain.[6] According

---

[4]Malcolm S. Adiseshiah, It is Time To Begin (Paris: UNESCO, 1972), p. 9.

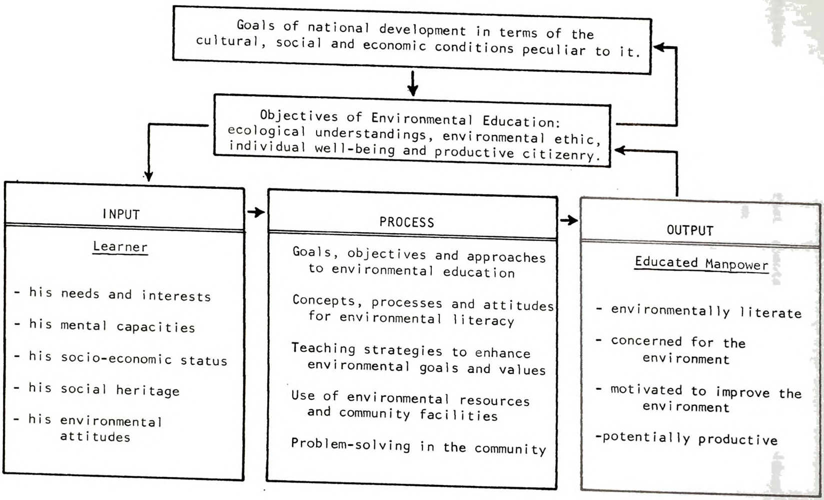
[5]Ibid.

[6]Malassis, Programming of Rural Education, p. 20.

Fig. 1 An Input-Output Model to Illustrate the Contribution of Environmental Education to Goals of National Development

Goals of national development in terms of the

Fig. 1 An Input-Output Model to Illustrate the Contribution of Environmental Education to Goals of National Development



to Malassi

not only r

lev
acc
tic

If

tal proble

experienti

of good ed

tional pro

environmen

taking int

actions.

environmen

of the stu

Science Ed

Lac

environmen

[7] Ib

[9] Jo
ing Enviro
Dembar Edu

[10] Ma
United Sta

to Malassis,[7] an education that promotes and propagates new ideas begets not only new things, but new men. He explained that:[8]

> It changes men's attitudes and relationships, raises the level of their aspirations and makes it easier for them to accept and assist in the change which is an essential condition to economic growth.

Part I. Approaches to Environmental Education and Guidelines for its Implementation

If environmental education is to meet the challenge of environmental problems that beset developing societies, it must be ecological and experiential. Gustafson[9] submits that it must have the three dimensions of good education -- content, concepts and conscience. All the educational programs have a role to improve the student's perception of the environment and help him participate in various kinds of societal action, taking into consideration the total environment in all his "developing" actions. Figure 2 illustrates the broad range of approaches possible for environmental education, putting man and his every action at the center of the study.

Science Education

Lacking basic research and resources to develop a curriculum for environmental education, Brennan[10] suggests that the best way to get

---

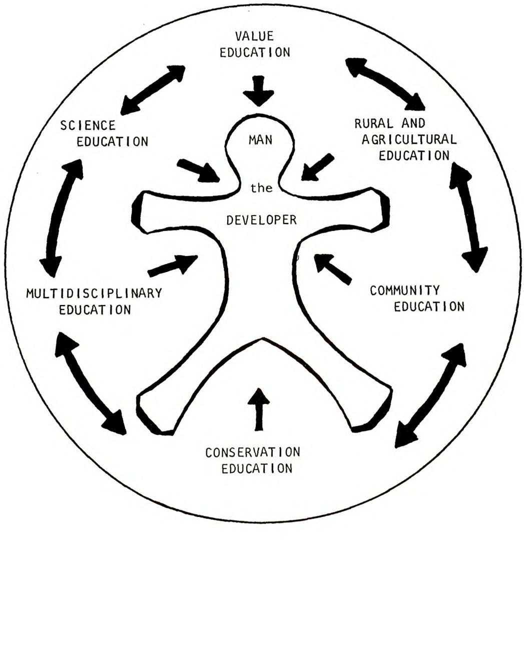
[7] Ibid. [8] Ibid.

[9] John A. Gustafson, "Content, Concepts and Conscience," Interpreting Environmental Issues, edited by Clay Schoenfield. (Madison, Wisconsin: Dembar Educational Research Services, Inc., 1972), pp. 84-86.

[10] Matthew J. Brennan, "Environmental Conservation Education in the United States of America," Prospects, II (Winter, 1972) pp. 474-75.

Fig.

Fig. 2 A "Total" Education Approach to Environmental Education Showing the Contribution and Interrelations of Each Scheme Toward a Social, Political, Economic and Scientific Outlook Of Man Towards His Environment.



environmen

science wh

environmen

all fields

tally lite

riculum to

or out of

Bef

have to re

ronment is

ing proces

Som

should per

1\.

earth, spa

land we wi

2\.

<u>and the su</u>

sil fuels,

3\.

<u>ment and w</u>

natural su

namic bala

---

11 A

environmental education in the curriculum is through the textbooks in science which use conservation concepts as their basic themes. Although environmental education is multidisciplinary and draws its content from all fields, an understanding of the sciences is basic in the environmentally literate individual. This means utilizing the present science curriculum to bring relevant environmental experiences to the child in school or out of school.

Before the environmental ethic attitudes can be developed, it will have to rest on considerable understanding about the environment. The environment is the supporting medium for the learning process and the learning process in turn, aims at producing specific effects in the environment.[11]

Some themes that are inherent in environmental education and which should permeate conceptual goals in science are:

1. The earth-life complex is a closed system. In our spaceship earth, space and resources are limited and we have all the air, water and land we will ever have.

2. Life is tied up with relationships existing between the earth and the sun. The sun is the ultimate source of energy on earth, be it fossil fuels, electrical energy or the very energy we need for human operations.

3. All living organisms including man are dependent on the environment and with one another. Each community has its own influence on the natural surroundings and their interactions create a situation called dynamic balance of nature. Biotic communities differ because their physical

---

[11]Adiseshiah, It is Time to Begin, p. 96.

surroundi

4.

and being

the only

of the sy

the power

5.

rance for

land or w

ing capac

or destro

6.

greater d

rioration

depletion

in residu

people im

tation an

7.

the manne

ces. Ci

where nat

to condit

life and

8.

things sh

surroundings and environmental factors vary.

4. Man is an integral part of the environment, influencing it and being affected by it. As an inseparable part of the system, man is the only rational species that has the ability to alter the relationships of the system - - enhance it or destroy it. With his wisdom, man also has the power to manipulate his environment for optimum environmental quality.

5. All living organisms, plants or animals, have ranges of tolerance for certain environmental factors. Each environmental factor: air, land or water -- is a strand in the web of life and is subject to carrying capacity. Pressures upon the capacity of limiting factors may weaken or destroy the systems depending upon them.

6. Increasing populations and rising levels of living impose greater demands on the natural resources and promote environmental deterioration. Too many peoples with rising levels of consumption cause rapid depletion of resources. Increased industrial production inevitably result in residuals which contaminate the environment. Impoverished masses of people impinge upon the facilities of human settlements, i.e. housing, sanitation and water facilities, transportation, education, etc.

7. Man's economic, social and political welfare is dependent upon the manner and extent to which he utilizes and manages the natural resources. Civilizations have perished through misuse of the environment -- where nature was dominated and exploited. Resource use must contribute to conditions in which men can facilitate their biological and social life and maintain a partnership with nature.

8. A profound and deep-seated respect for the earth and all living things should be established in the conscience of all people. An

environment

hances a ha

and respons

that ethic.

be consider

<u>Conservatio</u>

In s

environment

other. Con

ing about t

American As

the challen

peop
than
than
thei

In a

instilled i

the student

ment. If w

zen, then e

that can co

servation.

of soil nut

gered speci

[12]Am

environmental ethic reflects a commitment to act in a manner that enhances a harmonious relationship with nature. Trusteeship toward land and responsibility for the welfare of future generations are part of that ethic. The esthetic and spiritual value of natural resources should be considered along with their economic values.

Conservation Education

In spite of the tendency to interchange conservation education with environmental education, they must be considered as complimentary to each other. Conservation education has two goals -- development of understanding about the environment and development of responsible concern. The American Association of School Administrators made a statement that poses the challenge to education concerning conservation:[12]

> The natural resources of the country are in the hands of the people. The manner in which they will be used will be no better than their understandings and beliefs. They can do no better than they know how to do. Their purposes will be no higher than their innermost convictions.

In a developing country, there must be conservation consciousness instilled in the students as future decision makers. From such a concern, the students can also derive their motivations to improve their environment. If we are to regard conservation as a responsibility of every citizen, then every school must provide simple, clear and direct activities that can convey meanings, values, and insights into the practices of conservation. The areas for concern in developing countries are: depletion of soil nutrients and forest resources, loss of wilderness areas, endangered species and water resources.

---

[12]American Association of School Administrators, In the Hands, p. 37.

Effe

natural res

for one's s

developing

toward life

servation c

standing th

the balance

The

from that p

a host of

rural chil

there must

fuels, mai

Underlying

1.

2.

3.

Rural and

In

tion shoul

13L

Effective conservation requires an attitude of appreciation toward natural resources -- toward their value and the value of their wise use for one's self, for our fellow men and for future generations. Part of developing conservation consciousness is the development of new attitudes toward life and the bounties of nature.[13] The concepts important to conservation consciousness and practices must also contribute to the understanding that a reckless disregard for other plants and animals and for the balance of nature around us may threaten man's own survival.

The conservation approach for the urban school must be different from that pursued in the rural school. Crop rotation, contour plowing and a host of techniques which may easily be appreciated and understood by the rural child have little meaning in the city science class. In the city, there must be more emphasis on trash and garbage disposal, conservation of fuels, maintainance of water resources and the quality of the environment. Underlying themes to these activities are:

1. The wealth of any nation is represented by its natural resources.
2. Wasteful and inefficient use of the natural resources result into such calamities as flash floods and landslides, destruction of wildlife and pollution of the environment.
3. Conservation measures must be simultaneous to development of natural resources.

Rural and Agricultural Education

In developing countries with large rural population, particular attention should be given to rural and agricultural education. It cannot be

---

[13]Lee and Sale, Environmental Education, pp. 104-105.

treated as

goals are c

and social

forms o

tion, the e

Its aims ar

of positive

community a

Rura

education f

ing lives w

the flight

hension of

where a sub

well-being

subsistence

and houses)

In

rural envi

must be ce

---

[14] M

[15] I

[16] I

[17] I

treated as separate entities, but as a harmonious whole, so that their goals are coordinated effectively. In a national program for economic and social development, rural development involves education as one of forms of action which conduce to the growth of agricultural production, the enhancement of well-being and upgrading of the individual.[14] Its aims are material (increased production), educational (substitution of positive for traditionalist status quo), and social (development of community and team spirit).[15]

Rural education at the primary level is not only to provide basic education for those who will cultivate the land, but also those whose working lives will lie outside of agriculture. Its task is also to slow down the flight from the countryside, and to lay the foundations for the comprehension of, and receptivity to agricultural progress.[16] For countries where a subsistence economy dominates, its object is to increase physical well-being in particular as regards nourishment and health by modernizing subsistence agriculture (food crops), to improve living conditions (villages and houses), and to raise craft standards.[17]

In the primary level, existing courses need to be oriented to the rural environment and the problems facing the community. The teaching must be centered on the "knowledge of the environment", and the teaching

---

[14]Malassis, Programming of Rural Education, p. 23.

[15]Ibid., p. 24.

[16]Ibid., p. 29.

[17]Ibid., pp. 42-43.

of the so-c

powers of c

the linguis

tical cours

in agricult

for general

The

domestic ec

tional and

aspects of

ment as the

school gar

and practi

Rura

goals of e

and second

agricultur

The commun

socio-econ

Value Educ

Val

cation. T

tical deci

---

[18] P

Education,

of the so-called observational sciences, which are calculated to develop powers of concentration and memory, and provide material for progress on the linguistic side and in arithmetic.[18] In the secondary level, practical courses in agricultural education are needed to propagate advances in agricultural practice for improved productivity and also as background for general education.

The concerns of rural and agricultural education would cover health, domestic economy, population balance, agricultural extension work, vocational and practical arts, conservation information and practices, and other aspects of environmental problems. Rural schools can use the rural environment as their teaching material and can even utilize as specific aids their school gardens, tenant or family farms, small livestock breeding, handicrafts and practical dietetics.

Rural education designed for human betterment contributes to the goals of environmental education by providing the students in the elementary and secondary levels with understandings and skills for the management of agriculture and land resources and attitudes of concern for the environment. The community approach involves rural citizens in cooperative action in the socio-economic transformation of their community.

Value Education

Valuing is a process that needs to be fostered in environmental education. Through value education, the student is prepared to engage in critical decision makings, is motivated toward efforts of community development,

---

[18] Pierre Catala, "Education and Rural Development," Prospects in Education, I (Spring, 1969), pp. 8-12.

and to act

decisions o

an individu

attitudes a

not to revi

Valu

act with va

ple clarify

making proc

health, civ

others[21] su

science --

will be tau

of that con

facts level

instruction

The

tion. Hawk

---

[19]S

[20]C
Manual (Co

[21]M
Focus on V

[22]M
Teacher, X

and to act in congruence with one's values.[19] Making sound environmental decisions often imply making choices among competing values. Only when an individual understands all the implications of holding certain beliefs, attitudes and values is he in a position to decide rationally whether or not to revise them.

Values change as new information or new and modified concepts interact with valuing process skills. Elder[20] points out that helping young people clarify values and giving them a better understanding of the decision-making process are within the tasks of subject areas such as social studies, health, civics, human relations, sociology and humanities. Harmin and others[21] suggest that value issues must become a part of the teaching of science -- so much a part of it, that almost no topic in any science class will be taught without some opportunity to consider the values implication of that content. It means that subjects may be taught on three levels: the facts level, the concept level and the values level. The values level of instruction places emphasis on students' opinions and judgements.

The concept of an environmental ethic is entirely a value orientation. Hawkins[22] identifies an environmental ethic as a very deep moral

---

[19] Stapp,"Development of Environmental Education Programs,"p. 12.

[20] Carl A. Elder, Making Value Judgments: Decisions for Today. Teachers' Manual (Columbus, Ohio: Charles Merrill Publishing Co., 1972), pp. 1-3.

[21] M. Harmin, H. Kirschenbaum and L. Howe, "Teaching Science with a Focus on Values," The Science Teacher, XXXVII (January, 1970), pp. 16-20.

[22] Mary Hawkins, "Developing an Environmental Ethic," The Science Teacher, XXXVII (September, 1970), p. 18.

commitment

to the phys

of his own

pends upon

behavior he

The indivi

ecological

interrelat

ting an en

The

lowing val

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

commitment involving man's relationship with other living organisms and to the physical environment, and involving man's relationship to others of his own species and the behavior of the species as a whole. This depends upon the values an individual may have and may have expressed in the behavior he undertakes in relation to the components of his environment. The individual who takes a conservationist's point of view, encompassing ecological problems and makes his decisions based on a concern for the interrelatedness of the ecosystems in the bio-physical world is demonstrating an environmental ethic.

The development of an environmental ethic is embodied in the following valuing:

1. Value the earth-life complex as a closed system.
2. Value the interdependence of man and nature.
3. Value the environment as source of man's fundamental needs.
4. Value living things.
5. Value natural beauty and wildlife.
6. Value the diversity in life.
7. Value the impact of the environment upon one's own physical and psychological well-being.
8. Value that man alone is aware of his effect on the environment and can estimate the consequence.
9. Value the natural resources for today and for future generations.
10. Value any action that tends to alleviate the problems facing the environment.

Youth Orga

Whe

such as Bo

Extension

groups or

significa

munity en

grams tha

logical f

and solve

In

nition of

the conse

training

nization.

to conser

and carin

science c

ciples of

success c

activitie

23

of Enviro

24

Environme

Arbor, Mi

Youth Organizations

Whether student groups organize in school-related organizations, such as Boy or Girl Scouts, 4-H Clubs, Conservation Clubs or Agricultural Extension Workers' Corps,or participate in out-of-school environmental groups or civic action assemblies, their impact upon a community can be significant, when their activities are oriented toward involvement in community environmental problems. These organizations could be part of "programs that will provide young people not only an understanding of the ecological facts of life, but will move them to action in helping to prevent and solve environmental problems".[23]

In Iran, the objectives of environmental education, i.e., the recognition of human environment, the proper utilization of its amenities and the conservation of abundant and rich natural resources -- are part of the training of boys and girls from eight to adolescence in the scouting organization.[24] Some activities aimed to motivate youth to observe nature and to conserve its beneficial resources involve tree planting in public areas and caring for them; food production; homecraft; health and hygiene; and science out-of-doors. The training program concur with international principles of scouting but are adapted to the rural surroundings. To ascertain success of the program, a national rural scouting commissioner coordinates activities of scouts throughout the villages.

---

[23]Ira Winn, "The Education in Environmental Education," The Journal of Environmental Education, I (Summer, 1970), pp. 140-41.

[24]"Report of Iran on Environmental Problems", National Reports on Environmental Problems. U.N. Conference on the Human Environment. Ann Arbor, Michigan: Xerox-University Microfilms, 1973.

An

for Survi

of Michig

sity, loc

ded mixed-

groups an

the other

activitie

public co

In

and organ

the study

the Inter

in 1956 a

same purp

to create

They part

servation

tions and

the prote

of nature

25
Pocket Bo

26
(Paris:

An action group in Ann Arbor, called ENACT (Environmental Action for Survival Committee) composed of student activists at the University of Michigan in 1970 conducted Teach-in on the Environment in the university, local schools and general regional community.[25] The program included mixed-media presentations, environmentally-oriented entertainment groups and two addresses: one by a leader among environmental politicians, the other a leading policy-oriented ecologist. The philosophy behind the activities was to contribute to the building of informed and action-oriented public concern for the human environment.

In many countries in Europe, there have been for decades youth groups and organizations, whose principal function has been the encouragement of the study and protection of nature. These organizations were united into the International Youth Federation for the Study and Conservation of Nature, in 1956 at Salzburg, Austria.[26] Member organizations have in essence the same purpose: to bring young people in contact and sympathy with nature and to create understanding of the complex ecological equilibrium of nature. They participate in exchange of information among member organizations; observations of migratory birds; international census of waterfowl; competitions and essay contests; design of posters to be used in campaigns for the protection of nature; evaluation of nature observations; development of nature trails, etc.

---

[25] John G. Mitchell and Constance L. Stallings, Ecotactics (New York: Pocket Books, Simon and Schuster Inc., 1970), pp. 161-68.

[26] R.A. Stevens, Out-of School Science Activities for Young People (Paris: UNESCO, 1969), pp. 99-104.

In

the Protec

and for yo

of the Min

or week-en

ment under

expected t

tunities f

Som

through o

clubs, as

school new

tions can

conservat

to encour

mental st

school as

and to ar

and schoo

27

28
Teaching
Printers

In Israel, there is a very popular and well organized Society for the Protection of Nature, which has a variety of programs for both adults and for young people.[27] It works in collaboration with the Youth Division of the Ministry of Education. Young people spend their free time, holidays or week-ends in field study centers for conservation, studying the environment under the guidance of trained instructors. The young people would be expected to participate in the work of the centers as well as use the opportunities to observe the nature phenomena in the region.

Some techniques to extend environmental concerns utilized by teachers through organized effort are typified in conservation, science and biology clubs, assembly programs, exhibits, conservation field days and fairs, school newspapers and celebration of conservation week.[28] Youth organizations can do much to further the cause of conservation through "learning conservation by doing;" to develop recreational interest in the out-of-doors; to encourage research and environmental investigations; to develop environmental study areas and landscape of school grounds; to involve students in school assemblies on the topic of conservation or environmental problems; and to arouse conservation interest through exhibits, fairs, posters, movies and school publications.

---

[27] Ibid., p. 107.

[28] The National Association of Biology Teachers, Handbook for Teaching of Conservation and Resource Use (Dansville, Ill., Interstate Printers and Publishers, Inc., 1958), pp. 249-89.

Guideline

Environme

Th

instructi

environme

facilitie

I. Integ

in th

En

science t

standing

environme

Environme

the same

ings. A

Hurd[29] h

general

affairs

in tune

II. Inv

ref

S

mental p

2

Teachers

p. 43.

Guidelines for Development and Implementation of Environmental Education

The guidelines are developed to provide new insights concerning instruction for environmental goals. Attention was given to the aims of environmental education, points of view about instruction, materials and facilities, and concepts of curriculum development.

I. Integrate ecology concepts at all elementary and secondary levels in the science curriculum to make it environmentally oriented.

Environmental concepts serve as ideal integrating elements for science teaching and education, generally. They are relevant to an understanding of man's place in the biosphere, his interrelatedness with his environment and of the conditions under which he adjusts and survives. Environmental concepts enhance the objectives of scientific literacy. By the same token, environmental literacy is enhanced by ecological understandings. An environmentally oriented curriculum in science would be what Hurd[29] has described integrated science to be: "a science program for general education for the masses of people for understanding contemporary affairs and conditions in science. . . a powerful curriculum and one more in tune with the times than traditional approaches."

II. Involve the students in acquiring process skills essential to reflective and critical thinking, inquiry and problem-solving.

Sensitivity to environment, awareness and identification of environmental problems, analyzing them critically and participation in environmental

---

[29] Mary E. Hawkins, "International Conference on the Education of Teachers for Integrated Science," The Science Teacher, XL (May, 1973), p. 43.

managemen

They are

measuring

communica

instructi

cal conte

sivity, d

of active

inquiry,

He learns

III. Des

nee

of

Se

of unrela

in concep

every lar

student c

fied lear

pupils to

reach pup

and intel

30
(Cambridg

3

management decisions are all aspects of the environmental education goals. They are particularly dependent on the scientific processes of observing, measuring, estimating, predicting, comparing, classifying, experimenting, communicating, inferring, analyzing and drawing out inductions. They are instructional characteristics which must be used with the proper ecological content. For the student, this means relinquishment of habits of passivity, docile learning, and dependence on teacher and textbook, in favor of active learning in which lecture and textbook are challenged.[30] Through inquiry, the student discovers for himself, he experiences, he reflects. He learns by doing and by thinking, not by being told.[31]

III. Design and sequence learning activities that accomodate diverse needs, abilities, background, environments and developmental stage of the learner.

Sequencing with emphasis on related concepts and processes instead of unrelated facts of subject matter in the curriculum will ensure growth in conceptual learnings. A concept when combined with other concepts into every larger patterns grows into a more comprehensive understanding of the student of his environment. Alternative modes of instruction and diversified learning materials would increase the learning effectiveness of all pupils toward their maximum potential. A differentiated approach will reach pupils of several levels of reading ability, communication skills and intellectual maturity. Content can be shaped according to the

---

[30] Joseph J. Schwab and Paul F. Brandwein, The Teaching of Science (Cambridge, Mass.: Harvard University Press, 1962), p. 66.

[31] BSCS Special Publication No. 7., Life Science, p. 52.

geographi

signed to

multisens

IV. Emph

Th

of the hu

tudes and

values wh

and the

ethic re

must be

T

thing in

The seco

differen

be consi

ral and

E

be part

fied if

solving

V. Focu

loca

geographical region or ecology of the community. They should be designed to facilitate the child's perception of his environment through multisensory experiences.

IV. Emphasize the development of attitudes and values.

The application of scientific and technical knowledge to problems of the human environment is dependent upon the structure of social attitudes and values.[32] It is important to identify those attitudes and values which are necessary to the perpetuation of environmental quality and the development of "environmental conscience". The environmental ethic regarding preservation of life on earth and stewardship toward land must be exemplified.

Two basic attitudes that must be overcome is the notion that everything in this planet was placed here primarily for our benefit and use. The second unhealthy attitude is the belief that man is a unique being, different and set apart from all other living things. Other barriers to be considered are Man's individual freedom in relation to his use of natural and man made resources and traditional values regarding family size.

Experiences that influence attitudes about the environment should be part of the learning situation. Attitudes and values need to be clarified if students are to participate actively in environmental problem-solving.

V. Focus on the real and immediate topics, problems and issues in the local environment which the students experience and can resolve.

---

[32] Swan, "Formation of Environmental Values", pp. 44-45.

Wh

lems, hi

yond the

nity is

preachin

people

lum is e

and mate

VI. Uti

sch

T

in the e

and envi

both ru

ces, en

conclus

E

human f

the env

teach a

cience"

cular t

in Educ

pp. 130-

When the student is presented with imminent and tangible problems, his learnings are directed toward an end. By being involved beyond the classroom, the student's experience is enriched and the community is serviced. The community-action approach cannot be attained by preaching at people, having them memorize textbooks, and having other people take the initiative. Under the community school, the curriculum is enriched and vitalized by giving greater utilization of the human and material resources of the community.[33]

VI. Utilize to the maximum out-of-class resources starting in the school site and extending into the community.

The most efficient laboratory for experiences in search of meaning in the environment is the environment. Concepts of ecology, conservation and environmental issues are best taught out-of-doors. Field studies in both rural and urban situations provide students with first-hand experiences, enable them to make their own investigations and to draw their own conclusions.

Elements of interrelation and interaction, and the influence of the human factor in a particular site are best illustrated when learned from the environment. The school site as outdoor laboratory can be used to teach about the environment. The development of an "environmental conscience" is achieved when teaching for the environment with methods particular to outdoor education.[34]

---

[33]Pedro Orata, "Community School in the Philippines," Prospects in Education, I (Winter, 1969), p. 52.

[34]Cerovsky, "Environmental Education as Integrating Concept," pp. 130-131.

VII. App

Th

the soci

vant to

sciences

ment as

and phys

academic

life and

the reso

A

social

upon co

factors

per set

lity.

underst

environ

VIII.

achieve

learnin

concept

3

(Harris

back c

VII. Apply the multidisciplinary approach in related subject areas.

The contents of an ecologically-oriented science curriculum and the social studies program should be linked with regard to elements relevant to goals of environmental education. In addition to the natural sciences and social studies, awareness and sensitivity to the environment as well as problem-solving, should be involved in mathematics, health and physical education, language arts, music and drama. In virtually all academic disciplines, opportunity exists to drive home the fact that man's life and the quality of his civilization depend upon the rational use of the resources in his physical environment.[35]

A multidisciplinary approach will develop open-minded attitudes of social responsibility which motivate individuals to make decisions based upon considerations of all economic, political, bio-physical and social factors. Rural and agricultural education need to be emphasized in proper setting in so far as they contribute to environmental and social quality. A correlation of the various subject areas would help students to understand the interrelations between the natural, social and man-made environments.

VIII. Evaluation should be an integral and continual process, providing data necessary for the improvement of the program.

The concern of the classroom teacher is to measure the extent of achievement by the learners of the outcomes of environmental education learning experiences. The knowledge outcomes refer to the ecological concepts and the affective outcomes refer to feelings and attitudes.

---

[35] Eleanor H. Bennett, Guidelines for Environmental Sensitivity (Harrisburg, Penn.: Pennsylvania Department of Education,1972), inner back cover.

A

the forma

after the

class act

and (3) t

knowledge

As

tiveness

rials.

IX. Pro

A

poses:

(2) to i

their ap

competen

tools;

environm

and inst

at all

of envi

tent to

mental

in Envi
Yarmout

A description of the behavioral objectives serves as guide to (1) the formal testing of the skills, concepts or feelings, both before and after the learning experience; (2) the processes or involvement in class activities which indicate the extent of the student's progress; and (3) the presence of certain feelings that are observed without the knowledge of the student in unobtrusive evaluation.[36]

Assessment tools need to be developed also to measure the effectiveness of the environmental education program, its facilities and materials. Criteria must be laid out prior to making judgments.

IX. Provide for extensive in-service teacher education program.

An in-service training for teachers must have the following purposes: (1) to orient teachers of the goals of environmental education; (2) to introduce them to current environmental issues, basic concepts and their application and related teaching strategies; (3) to update their competency in using both man-made and natural environments as learning tools; (4) to focus on the role of the teacher as change-facilitator in environmental education and (5) to assist them in preparing teaching plans and instructional materials in particular grade levels.

An in-service teacher education program should involve teachers at all grade levels and subject areas. It should also provide for a pool of environmental education specialists and resource leaders who are competent to train other teachers and assist in the implementation of environmental education in the classrooms.

---

[36]Dean B. Bennett, "Guidelines for Evaluating Student Outcomes in Environmental Education", Maine Environmental Education Project, Yarmouth, Maine, 1973, pp. 14-15.

ings re

those d

curricu

of the

framewo

attainm

tion.

and sec

areas.

ing the

succes

with na

to the

under

of the

each l

concep

ing ca

cepts

expand

ing in

Part II. Concepts and Processes for Environmental Education

Ecological knowledge is an essential foundation for the understandings required of environmental education. The conceptual themes such as those developed in this section can be infused into the existing science curriculum and will necessitate some changes in orientation and emphasis of the materials and activities presently in use. These will serve as framework for the organization of learning experiences to facilitate the attainment of the concepts, processes and values in environmental education. The organizing elements must be so interwoven to provide continuity and sequence to the students' experiences in science and other related areas.

A conceptual scheme has been developed on the basis of the following theme: The earth has finite resources and all life depends on how successfully man can learn to harmonize his use of the earth's resources with natural communities and ecosystems. Five major concepts contribute to the development of the conceptual scheme. Each fundamental concept under a major concept is presented in learning sequence - - and the order of the sequence will be in the form of a "spiral development," in which at each level of sophistication, the students proceed from the most basic concepts through the entire sequence as far as their maturity and learning capacity will permit them to go toward understanding the major concepts or those fundamental concepts. The major concepts of the scheme are expanded with the identification of fundamental concepts. A corresponding infusion into the science curriculum may then be made relating to a multidi

standin

of the

the dev

ings wi

activit

that co

which c

sions

Concep

these

I

to dis

kind o

solvin

multidisciplinary approach.

In the elementary levels, the emphasis is on developing understandings which will contribute to their effective behavior as trustees of the natural resources and future decision makers and participants in the development of the country. In the secondary levels, these learnings will be considered but there will be more stress on problem-solving activities. All learning experiences should be organized around ideas that contribute to the child's conceptual framework under objectives which consider the cognitive, affective and processes and skills dimensions in the curriculum.

Concepts for Environmental Education

A conceptual scheme for environmental education should include these major themes:

I. Living things are interdependent with one another and with their environment.

II. Organisms (or populations of organisms) are the product of their heredity and environment.

III. Organisms and environments are in constant change.

IV. When matter changes from one form to another the amount of matter remains unchanged.

V. The economy of a region depends on the utilization of its resources and technology.

With these concepts as tools, the teacher may guide his students to discover what is in his surroundings, to place his discoveries in some kind of perspective that will activate sensory awareness, creative problem-solving and develop an understanding of man's interrelationships and use of his

I. Li

env

Grade

Grade

of his environment.

Concepts for Elementary Levels

I. Living things are interdependent with one another and with their environment.

Grade I understandings

1. Around the school are many different kinds of plants and animals.
2. Plants provide clothing, shelter and recreation.
3. Animals are important to man because they help to serve many of our needs.
4. Plants remove essential elements from the soil.
5. Living things require water.
6. Plants, animals, soil and water are interrelated.

Grade II understandings

1. Food is stored in leaves, stems, roots and seed in plants.
2. Plants are the source of all food: animals use, convert and store this food.
3. Animals are dependent upon an adequate supply of food, water, cover and space.
4. Plants and animals live together and depend on each other for some of their needs.
5. Water is made available to living things by a cycle of evaporation and condensation.
6. Most living things depend on oxygen in the air.

Grade

Grade

Grade V

Grade III understandings

1. Energy sources involved in weather include the sun and the rotating earth.
2. Green plants get matter from the environment for growth.
3. Plants provide the soil with cover and protection.
4. Trees aid in controlling water supply.
5. All living things ultimately depend on green plants for food.
6. Man needs the wilderness and natural areas for recreation as well as their economic and scientific value.

Grade IV understandings

1. Plants and animals are dependent on each other and their non-living environment.
2. The interaction of most organisms and their environment are reciprocal.
3. Natural predation is necessary in order to maintain a healthy population or certain species in balance with the environment.
4. Temperature, rainfall and other weather elements are important factors which should help us determine our use of the land.
5. Inorganic soil is formed by weathering of rocks, due to action of water, wind, heat and cold.

Grade V understandings

1. A balance in nature is maintained through the interrelationship of plants and animals and their non-living environment.
2. Organisms may suffer and die when an imbalance in nature occurs.
3. Increasing populations require an increase in food production to prevent ecological decline.

4

5

6

Grade VI

1

2

3

II. Or

he

Grade I

4. Trees influence soil, water, wildlife and the landscape.
5. Individual interaction with the environment creates attitudes and appreciation for the environment.
6. The living world maintains balance through cycles.

Grade VI understandings

1. Man's use of streams, lakes and the sea provide him with many of his personal and community needs.
2. Forests have many natural enemies (disease, wild animals, domestic animals, man, fire and weather).
3. Plants growing together form communities. Each member of the community influences its neighbor.
4. Life within a group imposes duties and responsibilities as well as entailing rights and privileges.
5. Responsibility for maintaining an environment for life and fulfillment of needs and interests is the result of interaction between national and local units of government.
6. Living things interchange matter and energy with the environment.

II. Organisms (or population of organisms) are the product of their heredity and environment.

Grade I understandings

1. Each kind of plant and animal has certain requirments and these determine where it can live.
2. Animals have a habit of living in a certain area, where they are able to satisfy their needs.
3. Plant growth is determined in part by the amount of radiant energy received from the sun.

Grade

Grade

Grade

4. Each kind of tree has its shape, bark, wood, leaves, flowers and fruits different from each species.

5. Animals and plants are adapted to their physical environment.

Grade II understandings

1. Living things are linked by their food habits.

2. Green plants differ from other organisms in that they make and provide food for the living world.

3. Plants respond to light, gravity and water.

4. Plants are adapted to a wide range of environmental factors.

5. Special environments require special adaptive behaviors.

Grade III understandings

1. Different types of animals vary in their organic needs.

2. Living things are organized in form and function to carry on activities that sustain life.

3. The sun's elements are all found in the earth.

4. Space on earth is limited. All living things occupy space.

5. Competition is the foremost of all relationships between living things.

Grade IV understandings

1. Animals compete for space, food and shelter.

2. Environment determines the kinds of organisms which live in in the community.

3. Living things reproduce and develop themselves in a given environment.

4. Energy from the sun is stored in many forms.

5. The sun is the major source of energy involved in the weather.

Grade V

Grade

III.

Grade

Grade V understandings

1. A living thing reproduces itself, develops and interacts in a given environment.

2. Living things capture matter from the environment and return it to the environment.

3. A natural habitat has limited capacity for supporting the organisms that live in it.

4. Wildlife must be conserved and controlled to prevent extinction or overpopulation.

5. Continued population expansion in a limited space creates problems with food, clothing, shelter and recreation.

Grade VI understandings

1. A sense of beauty is essential to the well-being of man.

2. Many adaptations to changes in environment are necessary for one generation to another.

3. Man is the sole organism that can consciously modify his own environment.

4. The participation of citizens in a community ensures the creation of a society in which all individuals can develop fruitfully.

5. Man can alter the environment of organisms in order to destroy or protect them.

III. Organisms and environments are in constant change.

Grade I understandings

1. The air we breathe is common to the entire surface of the earth.

2.

3.

Grade II

1.

2.

3.

4.

Grade III

1

2

3

Grade IV

1

2

2. Air contains water. Air receives water through evaporation.

3. Air supports combustion.

Grade II understandings

1. Nature and man shape the earth's surface.

2. The weather causes constant changes on the earth.

3. The water of the earth is in constant change.

4. Soil holds water.

Grade III understandings

1. Chemical and physical changes in the earth's crust change rocks into soil.

2. Soil erosion by water, wind, and gravity are examples of the constant change occurring on the earth's crust.

3. Mountains are formed by folding and faulting in the earth's crust, by volcanic action and by erosion of plateaus.

Grade IV understandings

1. Some rocks and minerals have a plant or animal source.

2. Minerals are classified according to origin and physical properties.

3. Air exerts pressure in all directions. Air pressure can do useful work.

4. Air contains dust and other pollutants.

5. The topsoil on which life depends is a thin layer of the surface of the earth.

6. An imbalance in non-living things exist because of the changes of the earth.

Grade V u

1.

2

3

4

Grade VI

1

2

IV. W

r

Grade

Grade V understandings

1. Changing environments affect living things.
2. Living things have changed over the ages.
3. The oceans are a source of minerals.
4. Some mining operations threaten other resources and are threatened by depletion.

Grade VI understandings

1. Soils are a combination of minerals, living organisms, organic matter, water and air.
2. Water is self-replenishing and self-depeleting resource; it is intermittently replenished by precipitation and is steadily depleted by evaporation, percolation and surface and underground runoff, which may eventually find its way into the sea.
3. Forests are constantly undergoing change, and as they mature, and are harvested, or die, some species of plants and animals may be replaced by others.
4. Wildlife populations are decreased by many natural and man-made factors.
5. The erosion and misuse of productive topsoil has helped to cause disappearance of some nations. A shift in fertility of surface soil can cause a shift in human populations.

IV. When matter changes from one form to another the total amount remains unchanged.

Grade I understandings

1. Water dissolves many substances.

Grade

Grade

Grade

Grade

2. Water expands when frozen. Warm water rises.

3. Wind is moving air.

Grade II understandings

1. Water evaporates to become a gas - water vapor; and freezes to become a solid - ice or snow.

2. Physical changes in matter can be both constructive or destructive.

Grade III understandings

1. Properties of a substance affect its reaction with other substances.

2. Through the process of decay or decomposition, organic matter is broken down to form soil humus.

3. In chemical or physical change, the total amount remains constant.

4. The sun's energy striking a surface is absorbed, reflected and/or transmitted.

Grade IV understandings

1. Weather forecasting is based on the knowledge of the weather elements.

2. Chemical changes in matter produce useful products.

3. Matter exists in small units called molecules and atoms.

4. Atoms have weight.

Grade V understandings

1. The constant composition of the atmosphere can be upset by the activities of man.

2. Chem

tru

3. Know

to

Grade VI under

1. Liv

the

2. Liv

ino

3. Wea

as

V. The econom

and techno

Grade IV under

1. Tre

con

2. Fe

lo

3. Ce

wa

la

4. Fo

dr

5. On

ma

an

2. Chemical changes in matter can be destructive and constructive.

3. Knowledge of the concepts underlying combustion enables us to prevent losses by fire.

Grade VI understandings

1. Living microorganisms, fungi and small animals help decompose the organic matter in the soil.

2. Living things depend upon bacteria in the soil to convert inorganic matter into usable nitrates.

3. Weather management is carried out by smudge pots, trees used as windbreaks and cloud seeding.

V. The economy of a region depends on the utilization of its resources and technology.

Grade IV understandings

1. Trees and products from trees are vital to the economy of the community, city, nation and the world.

2. Fertile soil was partly responsible for the patterns of development and speed of advancement of civilization.

3. Certain land management practices help to reduce the flood waters and silt that small streams empty into rivers and lakes.

4. Forests are important in helping protect watersheds from droughts and floods.

5. One phase of wildlife management is the proper control and manipulation of habitats by man through (a) fire, cutting, and spraying (b) flooding (c) food and cover planting

(d)

prac

Grade V unders

1. Man

2. Wis

3. A n

nat

res

4. The

and

5. Pla

lov

mar

6. Unv

ra

ti

Grade VI unde

1. Th

re

2. We

st

3. Th

du

4. Va

t

a

(d) lakes and stream improvement and (e) soil conservation practices.

Grade V understandings

1. Man uses the resources of his environment.
2. Wise use of community resources tend to assure availability.
3. A nation's physical foundation is its soil resource, and the nation's success today depends greatly on how well this soil resource is managed.
4. The oceans provide high quality protein for the diet of man and minerals for its industries.
5. Planting, experimentation, selective and clear cutting, followed by replanting and fire control are part of the work of managing forests.
6. Unwise practices that often result in the destruction of natural resources include soil erosion, fire, drainage and pollution of water.

Grade VI understandings

1. There are two types of resources - the renewable and nonrenewable resources.
2. We hold title to and can freely use our natural resources as stewards or trustees.
3. The nature and abundance of a community's resources change during a lifetime.
4. Various kinds of industries will need to depend on the scientific method and scientific practices to solve their problems as polluters of the environment.

5. Peo

and

res

I. <u>Living thi</u>

<u>environmen</u>

1. Gre

mat

2. Pla

vit

3. In

is

4. In

to

5. Pl

ph

6. In

th

7. Sp

po

II. <u>Organism</u>

<u>heredity</u>

1. Th

ge

2. Li

5. People cause pollution and destruction of natural resources, and people as citizens have a responsibility to conserve resources and prevent environmental degradation.

Concepts for Lower Secondary Levels

I. Living things are interdependent with one another and with their environment.

1. Green plants capture sun energy and combine it with raw materials from soils, water and air.
2. Plants store food in the forms of starch, sugars, proteins, vitamins and cellulose.
3. In one of nature's important cycles, nitrogen from the air is made available to plants and animals.
4. In the carbon dioxide cycle, oxygen is freed and returned to the atmosphere.
5. Plants keep the supply of oxygen in the air constant through photosynthesis.
6. In a biotic community, species tend to interact with one another and modify the conditions of life with which each exists.
7. Species and environmental factors interact to keep animal population in balance in the community.

II. Organisms (or populations of organisms) are the product of their heredity and environment.

1. The characteristics of a living thing are laid down in a genetic code.
2. Living things reproduce and develop themselves in a given

en

3. Sp

4. Al

va

5. Gr

in

en

III. Organis

1. Th

2. Fo

3. Li

4. Ch

5. Ma

me

IV. When mat

remains

1. Ma

2. So

vo

3. P

t

4. T

e

V. The econ

and tech

1. M

environment.

3. Special environments require special adaptive behviors.

4. All organisms have limits of tolerance for environmental variations.

5. Group living requires cooperation within and between groups in order to maintain an optimum physical, social and cultural environment for all.

III. <u>Organisms and environments are in constant change</u>.

1. The planet Earth has many examples of geologic changes.

2. Fossils are evidence of former plant or animal life.

3. Living things have changed through the ages.

4. Changing environments affect living things.

5. Man influences living things by changing the environment to meet his needs.

IV. <u>When matter changes from one form to another the total amount remains unchanged</u>.

1. Matter can be transformed to produce energy.

2. Some minerals are valuable forms of matter which can be converted to usable products of energy.

3. Production of electrical energy is dependent upon other natural resources.

4. The use of electricity, "synthetic" materials and nuclear energy may reduce the pressure of depletion of scarce resources.

V. <u>The economy of a region depends on the utilization of its resources and technology</u>.

1. Man has learned to conserve and improve soil with fertilizer

a

t

2. F

v

3. A

t

4. I

t

5. R

o

6. I

o

7. G

a

d

Figur

thing is the

Figur

Grade IV lev

with one ano

Figur

Around the s

in the Grade

and lime, erosion control, irrigation, and other conservation practices.

2. Forest management practices will sustain watershed and prevent wasteful lumbering practices.

3. A continuing and adequate supply of useful water depends on the wise use and development of water resources.

4. Industrial pollutants can be disposed of with minimum damage to the environment.

5. Recycling of wastes could diminish pollution and depletion of resources.

6. Individual concern can lead to the enhancement of the quality of the environment.

7. Growing populations and/or increased demands for agricultural and industrial products may cause pollution problems, or the depletion of resources.

Figure 3 illustrates a vertical development of the concept: A living thing is the product of its herdity and its environment.

Figure 4 suggests a horizontal development of a subconcept in the Grade IV level of the major concept: Living things are interdependent with one another and with their environment.

Figure 5 suggests a multidisciplinary approach to the subconcept: Around the school are many kinds of plants and animals, for development in the Grade I level.

Fig. 3

is

Grade Level
I
II
III
IV
V
VI

Fig. 3 Vertical Development of the Concept: A living thing is the product of its heredity and environment.

Grade Level	Subconcepts
I	Differences and similarities among some common plants and animals Observable changes in some common plants and animals
II	Needs of some common plants and animals Living things are linked by their food habits
III	Food-getting in plants and animals Competition
IV	Growth and environmental factors (diseases and health) Plant communities in different environments
V	Forest and wildlife needs Aesthetic values in nature
VI	Conservation of forests and wildlife Adaptation by structure and function of living things to their environment

Fig. 4 *A Horizontal Development of a Subconcept under:* Living things are interdependent with one another and their environment.

Grade Level V *Subconcept:* A balance in nature is maintained through the

Fig. 4 A Horizontal Development of a Subconcept under: <u>Living things are interdependent with one another and their environment</u>.

Grade Level V	Subconcept:	A balance in nature is maintained through the interrelationships of plants and animals and their non-living environment.	
Organisms interact with their surroundings (environment) to produce observable changes.	Changes occur over a short period of time or over a long period of time.	The observed properties and changes that occur in a group of similar objects (called population) generally exhibit some variability.	The variability may be inherent in the population or due to the effects of the environment.

Note: The development of the theme proceeds laterally in the grade level. Conceptual themes developed vertically ramify the development in the earlier grade level.

Fig. 5 A Multidisciplinary Approach to the Subconcept: <u>Around the school are many kinds of plants and animals</u>. Grade I level.

SOCIAL STUDIES	LANGUAGE ARTS	HEALTH	ART	MATHEMATICS

Fig. 5 A Multidisciplinary Approach to the Subconcept: <u>Around the school are many kinds of plants and animals</u>. Grade I level.

SOCIAL STUDIES	LANGUAGE ARTS	HEALTH	ART	MATHEMATICS
Differences and similarites among children with their parents.	Building vocabulary about plants, pets, gardens and farms.	Identifying foods that comes from plants and animals.	Sketches and color to show feelings about family and nature.	Counting games using pictures of animals and plants.
Occupations of people that has to do with animals.	Supportive literature about animals. Talking about parents and families.	Demonstrating habits of cleanliness, and keeping pets clean.	Creative use of leaves and dried flowers. Making posters of animals.	Counting the kinds of flowers and leaves collected. Counting petals and seeds in pod.

Process Skil

Proces

so completely

taught withou

tion are the

ture of these

matter with w

and content i

only as an ar

ture, namely,

concepts and

to process th

ledge, to exp

mation into h

A prog

rate as many

concepts, chi

so that they

and measuring

sequenced acc

[37]Hild
Rationale,"
A.Harris Ston
pp. 56-57.

[38]Ibid

[39]Gros

Process Skills

Process and content objectives for environmental education are so completely interwoven that their integration in science cannot be taught without using both. The acts of discovery in a learning situation are the products of the individual's intellectual effort; the nature of these acts, however is dictated by the stucture of the subject matter with which the learner deals. This brings the method of inquiry and content into a transactional relationship.[37] Content is seen not only as an array of facts to be absorbed but as something that has structure, namely, a way of organizing detailed facts in the light of some concepts and principles. Thus, the learner needs a strategy of inquiry to process these: to relate these facts before him with his prior knowledge, to explain and understand new phenomena and transform this information into his own conceptual schemata.[38]

A program designed to use with conceptual systems should incorporate as many process activities as possible to be effective. To learn concepts, children should have the opportunity to interact with objects so that they also learn such science processes as observing, predicting, and measuring. Gross and Railton[39] illustrate that there is no need for sequenced acquisition of the process skills nor do they have to be taught

---

[37]Hilda Taba, "Learning By Discovery: Psychological and Educational Rationale," Readings on Teaching Children Science, Louis I. Kuslan and A.Harris Stone, editors (Belmont, Calif.: Wadsworth Publishing Co, 1969), pp. 56-57.

[38]Ibid., p.57.

[39]Gross and Railton, Teaching Science, pp. 17-18.

per se. Comme

such as:[40]

"

(hypoth

if we d

ing), "

ber of

that's

sizing)

tionall

time, h

To teach

that the child

municate, etc.,

materials. The

with facts, bui

of a concept ca

ses used in its

are essential t

Figure 6

concept: Organ

heredity and en

fies the theme

ment and the pr

the content. T

and mental capa

---

[40] Ibid.

[41] Ronald
Thinking Through
1970), p. 16.

per se. Comments and questions are evidences of processes in action, such as:[40]

> "Hey, look at that! (observing), "I wonder if. . ." (hypothesizing), "How can we find out? (testing), "I'll bet if we did this. . ." (predicting), "How many are there?" (counting), "How long is it?" (measuring), "This one has the same number of legs as those but that one has more," (classifying), "If that's so, then I'll bet. . ." (inferring, predicting, hypothesizing), "We can't do it that way because. . ."(defining operationally), "But if we test both light and moisture at the same time, how will we know?" (controlling variables).

To teach the children, the processes, therefore, it is necessary that the child actually observe, measure, infer, predict, classify, communicate, etc., act like a scientist and be more involved with concrete materials. The processes cannot stand alone, they must of necessity deal with facts, built up to an understanding of the concepts. The strength of a concept cannot be determined without an understanding of the processes used in its formulation.[41] Both content and process in varying degrees are essential to the development of the thought processes of children.

Figure 6 suggests a tri-dimensional model on the development of a concept: Organisms (or population of organisms) are the product of their heredity and environment, based on a content/process design. It identifies the theme under consideration, the concepts relative to its development and the processes to be practiced by the students as they encounter the content. The grade level suggests considerations of developmental stage and mental capacities and the concept represents the unifying structure

---

[40] Ibid.

[41] Ronald S. Anderson, Alfred DeVito and others, Developing Children's Thinking Through Science (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 16.

around which

ing experienc

confronts the

events in the

gation to ena

developed on

Figure

tive and prod

thing is the

of appreciat

values must

they respond

Menesini[44] a

ness
ment
high
their
chang
eleme
age,
the p
preta
actio

[42]Pau
(Washington,

[43]Ada

[44]Men

around which the teacher organizes process skills objectives of the learning experiences and develops appropriate teaching strategies. The teacher confronts the students with interesting objects, phenomena or discrepant events in the environment; engage the students in strategies of investigation to enable the students to come to a new concept or to a concept developed on a higher level of understanding.[42]

Figure 7 suggests some areas of objectives in the cognitive, affective and process skills dimensions for the conceptual theme: A living thing is the product of its heredity and environment.[43] The objectives of appreciation, awareness, knowledge and understanding, attitudes and values must take into account the different age levels and different ways they respond to environmental studies. These goals are described by Menesini[44] as follows:

> For younger students, the goal is APPRECIATION, an awareness of what environment means and knowing about the environment can add fun to the childhood. For students of the junior high school age, who are beginning to look into the world of their own, the program offers an insight into environmental changes through technology, a sense of the UTILIZATION of the elements of today's world. For the students of high school age, about to enter the responsibilities of young adulthood, the program offers probing questions leading to policy interpretations, and to an ENVIRONMENTAL ETHIC stressing positive action.

---

[42]Paul F. Brandwein, Building Curricular Structures for Science (Washington, D.C.: National Science Teachers Association, 1967), pp. 18-20.

[43]Adapted from LeVon Balzer, "Environmental Education," p. 245.

[44]Menesini, Environmental School, p. 5.

Fig. 6 A Content/Process Design for the Concept: Organisms (or population of organisms) are the product of their heredity and environment.

GRADE IV LEVEL PROCESS SKILLS	CONCEPTS	Animals space shelt	Environm of or the c	Living t given	Stimuli and e	The sun

Fig. 6 A Content/Process Design for the Concept: Organisms (or population of organisms) are the product of their heredity and environment.

GRADE IV LEVEL CONCEPTS	PROCESS SKILLS
Animals compete for space, food and shelter.	Observing and communicating competitive behavior of animals; observing and assuming food chain relationships; identifying and recording behavior of animals under study.
Environment determines the kinds of organisms which live in the community.	Observing and identifying the organisms; the characteristics of habitats; measuring the different temperatures and recording data; inferring from animal adaptations the habitat of the animal.
Living things reproduce themselves in a given environment.	Observing organisms and their special adaptations for life in an aquatic habitat, identifying, recording and reporting data; interpreting studies made on the seashore; collecting and examining aquatic or marine specimens.
Stimuli from the environment consist of matter and energy.	Observing different organisms react differently to the same stimuli; assuming "preferences" of some organisms for particular areas in the seashore; identifying interacting parts of the ecosystem.
The sun is the major source of energy involved in the weather.	Observing and comparing the effect of heat on wind directions; measuring atmospheric temperature; inferring wind directions; charting weather changes; formulating hypothesis about the weather; inferring relationship between sun, temperature of the ground, air currents and cloud formation.

Fig. 7

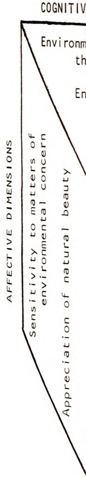
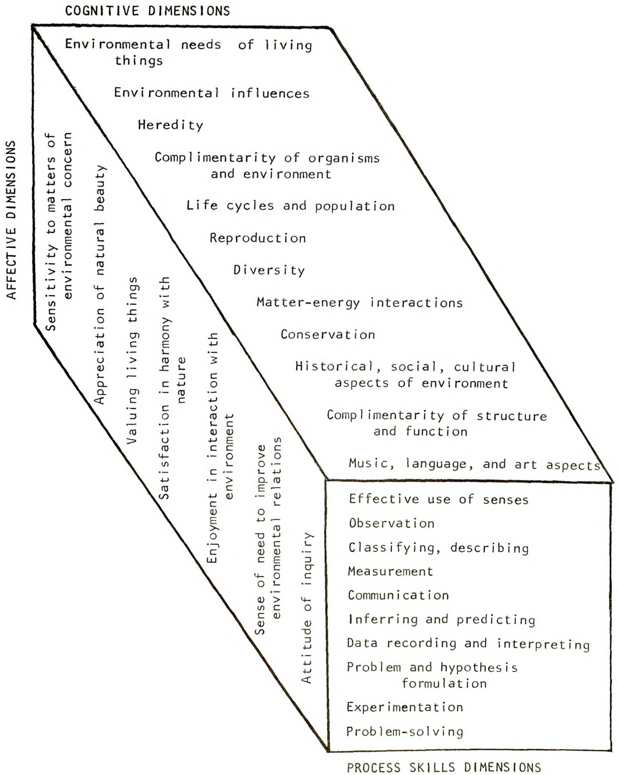

AFFECTIVE DIMENSIONS
Sensitivity to matters of environmental concern
Appreciation of natural beauty

Fig. 7 Grid Suggesting Some Areas of Objectives for Conceptual Theme: <u>A living thing is the product of its heredity and environment</u>.



Part

Envi

The te

nal process.

helping the s

racy. The ba

development c

and the posi

Teacher's Cha

The e

rest upon the

composite of

teacher's own

and the unde

ing method.

and Personal

Indiv

sion require

in their int

is all about

in the class

transmitted

Where the in

---

[45] Iol
the Primary
Vol. II, p.

Part III. Some Suggested Teaching Strategies for Environmental Literacy and Ecological Conscience

The teacher in any classroom occupies a key role in the educational process. In environmental education, the teacher is responsible for helping the students attain the goals of functional environmental literacy. The basic objective of the teacher is to assist students in the development of ecological understandings of the bio-physical environment and the positive attitudes and values toward the improvement of its quality.

Teacher's Changing Role in Environmental Education

The effectiveness and success of the environmental education program rest upon the teaching method of the teacher. The teaching method is a composite of three facets: Personality, Strategy and Philosophy.[45] The teacher's own philosophy of education, the philosophy of the curriculum and the underlying philosophy of the school system will all influence teaching method. It is clearly impossible to isolate Strategy from Philosophy and Personality.

Individualized instruction under the scheme of continuous progression requires a change in the patterns of teachers' behavior, new roles in their interaction with students and a new perception of what instruction is all about. The conventional role of teacher autonomy and authority in the classroom needs to be discarded and to the students instead must be transmitted the responsibility of managing his own learning environment. Where the instructional approach involves self-pacing materials and the

---

[45] Iolo Wyn Williams, "Teaching Methods in Integrated Science at the Primary and Secondary Levels," Trends in Integrated Science Teaching, Vol. II, p. 71.

student oper

required: c

than demand,

situation, a

of the child

in order to

the choice o

open inquiry

priate quest

of informati

The t

tudes and va

teacher who

avoid teachi

students' pr

the teacher

inward look

lysis of his

what he does

mental educa

---

[46] ISC

[47] Kar

[48] Wil

[49] Jam
of Environme

[50] Ter

student operates in an activity-centered environment, a role change is required: counsel more than tell, guide more than lead, encourage more than demand, respond to more than require to.[46] In a student-centered situation, another role takes on a new importance: "that of observer of the children's present experiences, who analyze these observations in order to develop the insight and understanding necessary for making the choice of relevant future experiences for them".[47] Where there is open inquiry, the teacher provides materials and resources, asks appropriate questions and provides information or directs students to sources of information.[48]

The task of assisting students in the development of their attitudes and values about the environment needs careful consideration. The teacher who is concerned with environmental education cannot legitimately avoid teaching about values if he wants to have a realistic impact on his students' present and future citizenship behavior.[49] The first step for the teacher to meet the demands of environmental education is to have an inward look on his own knowledge and value systems. It calls for an analysis of his own environmental attitudes, because a teacher cannot give what he does not have. Terry[50] commented that teachers offering environmental education courses without subjecting their own environmental

---

[46] ISCS Newsletter, No. 10, September, 1972. p. 1.

[47] Karplus and Thier, A New Look, pp. 80-81.

[48] Williams, "Teaching Methods in Integrated Science," p. 78.

[49] James P. Shaver, "Environmentalism and Values," The Journal of Environmental Education, II (Fall, 1972), p. 51.

[50] Terry, Teaching for Survival, p. 16.

attitudes to

students bec

ecological r

principles t

tributed to

Plann

the attitude

is difficult

need to know

class and in

teacher cann

a build-up o

interests, b

tive of an e

Deali

society.[52] H

lic issues w

examination

cher should

about the en

Clari

dents to exa

---

[51] Cli

tion," The J

[52] Sha

attitudes to criticism are educating for hypocrisy. He adds that if students become academic experts on ecology, yet cannot see their own ecological roles and cannot judge their own lives by the ecological principles they have learned, environmental education will not have contributed to environmental quality.

Planning a quality curriculum without first pre-assessing some of the attitudes and values the student currently holds about the environment is difficult and inefficient.[51] Before an activity is planned, teachers need to know about the different types of attitudes represented in the class and instruction is planned accordingly, considering each type. The teacher cannot impose his values, nor can he moralize; he can only provide a build-up of experiences that will help develop a student's attitudes, interests, beliefs, goals, aspirations and feelings that would be indicative of an environmental value.

Dealing with values, the teacher has to be an agent of a democratic society.[52] He has the right, an obligation to guide the discussion of public issues within the context of basic social values and to encourage the examination of personal values as they relate to public issues. The teacher should assist the student in clarifying his attitudes and values about the environment.

Clarifying attitudes and values as a teaching strategy leads students to examine his own position, maybe defend his own position to the

---

[51] Clifford E. Knapp, "Attitudes and Values in Environmental Education," The Journal of Environmental Education, III (Summer, 1972), p. 28.

[52] Shaver, "Environmentalism and Values," p. 51.

class, make

the solutio

that of pre

dure, the t

Teachers mu

atmosphere

threat of r

the student

ing to thei

The i

the science

door activi

environment,

tegral part

tion, the te

much as poss

maturation a

the environm

out" -- but

---

[53]Jam
Teaching, ed
Prentice-Hal

[54]Ibi

[55]Kar

class, make decisions about issues and consider appropriate action for the solution of issues.[53] The teacher's role in this method is neither that of preacher nor that of passive listener. In a clarification procedure, the teacher strives to establish a climate of psychological safety.[54] Teachers must refrain from making harsh judgments and instead provide an atmosphere in which children will feel free to express themselves without threat of ridicule and derision. Teachers must have tremendous respect for the students, to be concerned with the ideas expressed by them, by listening to their ideas and remembering them.

The integration of environmental concepts as unifying elements in the science curriculum makes imperative knowledge about the use of outdoor activities. The teacher provides opportunities for exploring the environment, and also for the children's discovery of themselves as integral part of the world around them. In an environmental study situation, the teacher emerges as the crucial individual who needs to know as much as possible about the learner and his intellectual capabilities, maturation and experience.[55] The increasing emphasis on the study of the environment and its use as a resource, does not involve mere "going out" -- but a great deal of ingenuity in devising practical investigations

---

[53] James Raths, "A Strategy for Developing Values," <u>Studying Teaching</u>, edited by James Raths and others. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971), p. 308.

[54] <u>Ibid</u>.

[55] Karplus and Thier, <u>A New Look</u>, p. 81.

with minimum

environment.

teachers for

resource lea

pretive work

door activit

While

studies, he

as follows:

1. To
t

2. To

3. To

4. To

5. To

6. To

7. To

8. To

9. To

10. To
of

11. To
wo

The va

[56] Perr

with minimum of scientific equipment but with maximum use of the child's environment. Planning involves collaboration and cooperation with other teachers for multidisciplinary applications, with parents and community resource leaders for assistance as volunteer field guides for for interpretive work and with older students who can contribute to make the outdoor activity a rewarding experiences for the children.

While the teacher is rarely the dominant figure in environmental studies, he has complicated funcitons. Perry and others[56] explain them as follows:

1. To arouse the children's interest in their environment and to raise challenging problems in connection with it,
2. To discuss the approach to problems or topics,
3. To organize the working groups,
4. To arrange visits or expeditions,
5. To provide reference materials for children's use,
6. To provide materials needed for practical work,
7. To arrange for visiting speakers,
8. To discuss and guide the progress of each group,
9. To initiate and develop discussions and debate,
10. To persuade each group to explain their work to the rest of the class, and
11. To provide facilities for displays or exhibitions of the work carried out.

The various roles the teacher must fulfill to be effective are

---

[56]Perry and others, Handbook for Environmental Studies, pp. 14-19.

summarized

rewarder, a

Where to Te

The

tion toward

litarian an

of all envi

taught. It

economic pr

The "

classroom m

tential is

the total e

place to im

It provides

room learni

The o

are:[59]

Help

57 Byro
pp. 40-42, c

58 Jean
p. 21. A rep

59 Benn

summarized by Massialas[57] as: planner, introducer, sustainer, manager, rewarder, and value investigator.

Where to Teach -- Places for Environmental Education

The places for environmental education have a significant contribution toward its goals. The study of the environment takes on a more utilitarian and more scientific context, if we are to regard it as the basis of all environmental learnings and as an essential aspect of every subject taught. It arouses the child's interest in it and to play his part in its economic progress.

The "out-of-classroom" situations can be used to relate traditional classroom materials to the outside world. Any site with educational potential is one which accelerates the process of studying relationships in the total environment. Educative environments involve the use of <u>any</u> place to impart knowledge and understanding of the way the world works.[58] It provides an experience for the child to ask questions and apply classroom learnings to actual surroundings.

The outcomes to be achieved from outdoor classroom experiences are:[59]

> Help young people to understand local, national and world resource-use problems.

---

[57] Byron G. Massialas, "Inquiry", Today's Education, LVIII (May, 1969), pp. 40-42, cited by Sale and Lee, Environmental Education, pp. 51-52.

[58] Jean Worth Matthews, "Parks and Processes," Trends, July, 1971), p. 21. A reprint.

[59] Bennett, Guidelines for Environmental Sensitivity, p. 13.

Crea

Supp

Prov

Help

Deve

The

to grade le

Grad

Grad

Grad

I Ye

Env

(2) commu

areas; and

evaluating

teacher to

1.

2.

3.

Create an awareness and an understanding of the environments and its effects on everyday living.

Supply educational experiences which bridge the gap between the classroom and the natural environment.

Provide a better understanding of the interrelationships fundamental to living things.

Help to recognize natural resource problems and issues.

Develop a high sense of individual responsibility to analyze problems and corrective measures relative to physical and natural environment.

The scope and sequence of the use of study environments according to grade levels may be as follows:

Grades 1 - 2	:	the school
Grades 3 - 4	:	the neighborhood
Grades 5 - 6	:	the community
I Year - II Year	:	may be related not only to school, neighborhood, community, province, or country, but extended to the world with regard to problems concerning the environment.

Environmental study sites may be classified as: (1) school site; (2) community resource and facilities; (3) natural ecological study areas; and (4) environmental education centers. A set of criteria for evaluating a field study site or community resource which will help the teacher to make the best use of these resources are as follows:

1. Is the site suitable for the objective under consideration?
2. Is the site meaningful for age and developmental levels in the class?
3. Will the resource be used within a thirty to forty minute

4.

5.

6.

The

diately ava

program. T

school site

be used, su

cal feature

and bad cha

loped.[60] W

including l

the school

site select

to the tota

an ecologic

history int

creation ar

The

learning ex

ralizations

[60]Ed
Facility Re

[61]Ri
tion", Main

period, including walking to and from school?

4. Can the experience be linked with other subject areas?

5. Is the site safe from hazard?

6. Is the site practical in terms of accessibility and convenience?

The School Site. The existing school facility is the most immediately available resource for implementing an environmental education program. To realize its full potential as a learning laboratory, the school site and plant must be inventoried to determine how they can best be used, such as the geographical characteristics of the site, the physical features of the building, environmental problems of the site, its good and bad characteristics and what site areas or nearby areas can be developed.[60] When the situation arises, students, teachers and the community including local government assistance, should participate in developing the school grounds as facility for environmental education. With proper site selection, planning and development, the school site can contribute to the total educational process. It can perform these related roles: as an ecological laboratory, an environmental management laboratory, a natural history interpretative area and a multiple-use school and community recreation area.[61]

The outdoor classroom on the school site is a place for creative learning experience; it gives depth, meaning and new dimensions to generalizations about and understandings of man's relation to his environment.

---

[60] Educational Facilities Laboratories, Environmental Education/Facility Resources, p. 10.

[61] Richard H. MacGown, " The School Site in Environmental Education", Maine Environmental Education Project, Yarmouth, Maine, 1972. p.1.

Much can be

door classr

1.

2.

3.

4.

Comm

for environ

immediate s

dents, it m

ronmental l

dent's own

accessible

facilities,

particular

education.

the workab

The

ces geared

---

[62] So

Much can be learned from textbooks, lectures and discussions but an outdoor classroom in the school site provides the following:[62]

1. Children can learn directly from the natural environment, as well as about it.
2. Its use requires no special permit, no time-consuming arrangements for transportation, etc. and involves no shifting of time schedules.
3. It is immediately accessible to children and teachers.
4. It is immediately available for continuous studies, for unexpected observations, for supervised individual study projects and for capitalizing on the "teachable moment".

Community Resources and Facilities. The use of community facilities for environmental education puts students into the real world. While their immediate surroundings and community facilities may be familiar to the students, it meets the issue of relevancy when viewed and analyzed for environmental learning. When the school site has limitations, even the student's own backyard, a vacant lot, a wooded area, a garbage dump, or any accessible community facility can provide first-hand learnings. Health facilities, market places, shantytowns, industry and economic enterprise particular to the community all have roles to play toward environmental education. People, places and things in the community can form part of the workable curriculum.

The entire community becomes a facility for learning with experiences geared toward improving the local environment. A community survey

---

[62] Soil Conservation Service, Outdoor Classrooms on School Sites, p.2.

will provid

tures and c

graphy, the

environment

the involve

tion that w

Comm

on a proble

its problem

potentially

Rega

class by pr

the group b

expected of

(2) Close t

things that

Eco

rious bioti

vide unlim

conservati

tems are r

from large

these natu

63 S

will provide a wealth of data concerning the natural environmental features and characteristics of the community, its economic and social geography, the human environmental use areas and its characteristics and the environmental problems of the community. This information obtained with the involvement of the students will motivate them to participate in action that will improve the quality of their life.

Community resource persons can also provide needed information on a problem. As leaders and experts, they can assist student groups in its problem-solving efforts. Community agencies and organizations may be potentially helpful for youth environmental organizations.

Regardless of the resource utilized, the teacher must prepare the class by pre-planning. Two simple rules to follow are:[63] (1) Orient the group before they are taken out. Tell them what to expect and what's expected of them, what to look for, and what the desired outcomes are; (2) Close the field exercise with a short critique - a review of the things that were learned.

Ecological Study Areas. Rural areas have natural sites with various biotic communities and diverse geo-physical environments, which provide unlimited opportunities for the study of ecological relationships, conservation concepts and dependence of man upon other organisms. Ecosystems are real -- like a pond, a field, a forest, a river, lake or ocean, from large or small, terrestial or aquatic, laboratory or field. Within these natural sites can also be studied the whole range of natural

---

[63] Shomon, Manual for Outdoor Conservation Education, p. 58.

phenomena s

seashore ec

source-use

a park,a pl

opportunity

In s

tic compone

ral and fun

be directed

tended to

ronment.[64]

the studen

future exp

tem to org

quiry syst

in a cumul

The

Var
occ
and

Pat
tic
phy

64U
Environmen
Office, 1

65I

phenomena such as earthquakes, volcanism, faults and flooding. Erosion, seashore ecology, waste disposal, logging, shifting agriculture and resource-use can similarly be studied. For the urban child, any habitat -- a park,a playing field, an old cemetery or churchyard would provide ample opportunity for studying man's influence on these habitats.

In spite of the unique combinations of particular abiotic and biotic components in any particular area, there are certain general structural and functional attributes that are recognizable to which attention can be directed. Toward this end, the use of "environmental strands", are intended to facilitate the process of viewing and perceiving the total environment.[64] They can be used as a reference point to interrelate the things the student knows, sees and feels in his own life and with all the student's future experiences and education. They might also be considered as a system to organize one's thinking, planning and inquiring. As a simple inquiry system, it enables one to progress from the simple to the complex in a cumulative manner.

> The environmental strands are:[65]
>
> Variety and similarity. The differences and likenesses which occur among all living and non-living things, conditions, and states.
>
> Patterns. Systems or perceptions of systems of structure, function, behavior, and design of things, living and non-living, physical and abstract, cognitive and affective.

---

[64] U.S. Department of Interior, National Park Service, National Environmental Study Area: A Guide (Washington, D.C.: Government Printing Office, 1972), p. 35.

[65] Ibid., p. 28.

Int
shi

Con
amo

Evo
to
and

In

the learne

tion; (2)

parts that

composed f

Env

lity for e

ters. The

and resour

It may be

nal park c

or non-res

directing,

nities ava

In

lowing sho

1.

66 J
(Minneapol

67 E
pp. 35-38.

Interrelation and interdependence. The dynamics of relationships and relativity which exists among all things.

Continuity and change. The dynamics of form in time which exists among all things.

Evolution and adaptation. The process of survival or the failure to survive of all things in terms of time (continuity and change), and interaction and relativity (interrelation and interdependence).

In the study of ecosystems, there are three aspects involved in the learner's perception: (1) the first impression or esthetic perception; (2) the scientific point of view of classifying and sorting out the parts that make up the whole; and (3) the total impression that emerge composed from the parts that fit together in an area.[66]

Environmental Education Centers. A more sophisticate level of facility for environmental education is found in environmental education centers. They have specific environmental education programs, facilities, and resources which are developed, preserved and interpreted by a staff. It may be an outdoor education school with resident facilities, a national park or preserve, a regional environmental study center with resident or non-resident facilities. The center's services are oriented toward directing, corrdinating and interrelating a multitude of study opportunities available throughout its environs.

In the development of an environmental education center, the following should be considered:[67]

1. The natural environment must serve as a major educational

---

[66]Janet Nickelsburg, Field Trips: Ecology for Youth Leaders (Minneapolis, Minn.: Burgess Publishing Co., 1966), p. 1.

[67]Educational Facilities Laboratories, Environmental Education, pp. 35-38.

fac

2.

bro

psy

3.

use

4.

amp

out

The

school sys

the countr

funds rais

joint vent

vide setti

interns fr

Strategy I

The

with a mor

constant u

learn more

not only a

mals, soil

area, but

A s

facility on any program.

2. Elements of effective teaching and cooperative living are brought together, especially in resident programs, where social, psychological and educational considerations must be fully met.

3. Multi-purpose, convertible facilities for total community use will ensure year-round opportunities.

4. Outdoor facilities such as nature trails, laboratory stations, amphitheater, recreational facilities, etc. must be developed without disturbing the natural aspects of the site.

The environmental education center may be owned and developed by a school system, or the program may be incorporated in the parks system of the country. It can also be operated as a public-private venture with funds raised from endowments, membership fees or special donations. As a joint venture of schools and private or public agencies, it will also provide setting for the training of personnel in environmental education and interns from schools of education, forestry and natural resources.

Strategy I. Explorations in the School Grounds

The school grounds as an outdoor laboratory provides the teacher with a more extensive environment to achieve some objectives. Through a constant use of this facility, the teacher has a greater opportunity to learn more about the flora and fauna in the school grounds. It involves not only a qualitative appreciation of the different kinds of plants, animals, soil and terrain that characterize the types of habitat in the local area, but a particular association of plants and animals that live there.

A scaled map of the school site should be prepared and areas for exploratio

garden plo

lawn, wood

areas may

studies.

The

specific g

sign their

lop and to

Con

provides b

climate or

soil chemi

B.

more rapic

water fron

fungi and

Top

pic which

in the 'we

by the cla

and inves

nity may

used for

exploration should be marked off clearly, such as cultivated site or garden plots, unplowed areas, roadway, denuded playground, fence, grass lawn, wood lot, swamp, etc. The characteristics of these identified areas may be the basis of an on-site discussion, prior to environmental studies.

The suggested activities in this section are not directed to a specific grade level, but are presented as exemplars for teachers to design their own activities appropriate to the concepts they wish to develop and to the developmental stage of the students involved.

Concept Development. A. Major concepts. The physical environment provides basic essentials for life. Differences in the parent material, climate or vegetation influence the physical characteristics of the soil, soil chemistry and the organic composition of the soil.

B. Subconcepts. Certain soils will permit water to infiltrate more rapidly, others, less rapidly. Some soils are good at "lifting up" water from deeper layers when the surface is dry. Living microorganisms, fungi and small animals help decompose the organic matter in the soil.

Topic Web. The 'topic web' is an attempt to show areas of the topic which might be used as starting points in pre-trip discussions. Areas in the 'web' for detailed coverage will depend upon the emphasis desired by the class and the interest expressed by the students. Explorations and investigations about the given topics in the school grounds or vicinity may be the primary objectives or some aspects of the topics may be used for supplementary projects of investigation.

Soil

Textu

Struc

Obj

1.

soil and w

2.

ment of th

3.

develop sk

4.

appreciati

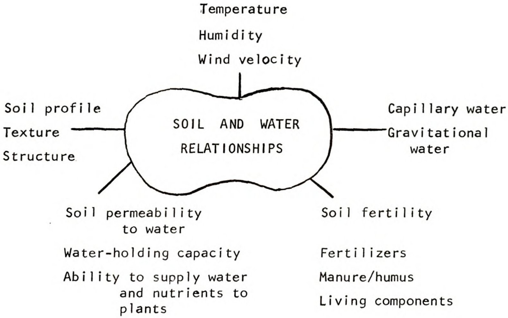
Are

i.e., the

material c

found. Th

coarse lik



<u>Objectives of the outdoor activity</u>

1. To help students understand some of the relationships between soil and water;

2. To investigate the role of some living things in the development of the soil;

3. To sharpen powers of observation, stimulate curiousity, develop skills in gathering and recording data; and

4. To develop in students sensitivity, awareness and ethical appreciation of all environments.

<u>Area discussions.</u> In studying the soil of a particular site, i.e., the school site, the first step is to determine where the parent material came from and how it was transported to the spot where it is found. The texture of the soil should be carefully examined. Is it coarse like gravel or some sands? Or is it fine like silt or clay?

What could
soil mater
the vicini
clues of t
horizons o

Are
cut off bo
school gro
dy, clay,
ground, ma
the same d
more than
record the
group may
types and

B.
to 1 " bor
with a pie
of ascent
of time.
of this ex

C.
and water

68A
Environmen

What could be the diameters of gravel, sand, clay or silt? Because most soil material is the product of weathering, what clues could be found in the vicinity to indicate its possible source? Would a soil profile show clues of transport and deposition? What would we find in the different horizons of the soil?

Area studies.[68] A. Select several tin cans of equal size and cut off both tops and bottoms. Choose the pre-identified sites in the school grounds. Determine the particular soil types in the area as sandy, clay, adobe, loam or humus. Work the cans 1/2 to 3/4 inch to the ground, making sure in each case that the can is forced into the ground the same distance. Care should be taken not to disturb the ground anymore than necessary. Pour a measured amount of water in each can, and record the time it takes for all the water to enter the soil. (Each group may work out their investigations in all designated sites and soil types and record and report on their findings in the class discussion.)

B. Pack clay soil into a wide diamter glass tube, say about 1/2 to 1 " bore. Pack another tube of same size with sand. Block one end with a piece of fine gauze. Immerse in a bowl of water. Note the speed of ascent in each case and the total ascent of water after a given period of time. Record the observations. (Can the students design a variation of this exercise?)

C. Put several live earthworms in a glass jar of subsoil, feed and water them. Some groups could put their jars in different environment,

---

[68]Adapted from G.A. Perry and others, Teachers' Guidebook No. 1 Environmental Studies (London: Blandford Press, 1968), pp. 36-37.

i.e., wind

the elemen

desire. M

worms for

life of th

the end of

jar, obser

<u>Strategy I</u>

The

the Parana

range of c

variety of

shore and

can best i

that we gi

tact with

The

changes --

rents, and

the drying

streams fr

tions neces

of toleranc

period of t

ability of

i.e., window sill of the classroom, out in the school yard exposed to the elements, in a dark corner of the room or in as many places they desire. Make a daily log of observations and care given to the earthworms for a period of two weeks. What variables are important to the life of the earthworm? What observations can be made on the soil after the end of the period? (If pupils should pour too much water into the jar, observe the effects of flooding and poor drainage.)

Strategy II. The Seashore Along the Bay

The Manila Bay seashore is a rich area to explore, be it along the Paranaque beach or the Malabon-Navotas section. It offers a wide range of conditions, presents many different habitats occupied by a great variety of organisms. The study of ecological communities along the seashore and their relationships with the varying factors of the environment can best illustrate that the health of the entire ocean hinge on the care that we give to the waters near the coast and the lands that are in contact with it.

The seashore community is subject to a wide range of environmental changes -- change in surface temperature of water, tides affecting currents, and number of hours a beach is covered by the waves or exposed to the drying air, and salinity fluctuations when diluted with fresh water streams from Laguna Bay, Marikina River and Malabon River. These variations necessitate adaptations among organisms to give them a wider range of tolerance to varying amounts of salinity in the water, such as longer period of time for fresh water to remain unmixed with sea water and the ability of animal organisms to hold their footing against forces of pounding,

biota whic

ing the po

tice of ma

would be i

the resour

Con

provides b

mals have

organisms

location,

trolling p

B

own unique

port a div

jected to

distributi

Obj

1.

habitats a

2.

adapt to v

3.

and identi

4.

pounding, pushing and pulling of breakers. All these factors add to a biota which differs in many ways from that of open beaches. Considering the pollutants that Pasig River dumps into Manila Bay, plus the practice of making sewage of the sea, the consequences on the aquatic life would be impressive, affecting the conomic life of people depending upon the resources of Manila Bay.

Concept Development. A. Major Concepts. The physical environment provides basic eseentials for life. All living organisms, plants or animals have ranges of tolerance for certain environmental factors. Living organisms react to all factors of the environment, in their particular location, but there frequently occurs a discrepant event which has controlling power through its excess or deficiency.

B Subconcepts. Habitats vary in size and quality, each with its own unique conditions. The shallow and upper regions of ocean water support a diverse community of animal life. The seashore community is subjected to a wide range of environmental changes. Population density and distribution within a community are dependent upon many factors.

Objectives of the Field Trip

1. To identify the variety of organisms that occupy the different habitats along a seashore.

2. To illustrate the different ways by which the types of life adapt to variations in the seashore environment.

3. To observe the means by which pollution has affected the bay, and identify possible kinds of pollution.

4. To develop in students sensitivity, awareness of the marine

environment

cern for it

Topi

Factors
Tida
Sal
Temp
Sed
Nutr

Pollut
Ind
Sew
Sol

Pre

dents conc

ocean? Wh

Ini

of environ

in the sec

rock zones

source of

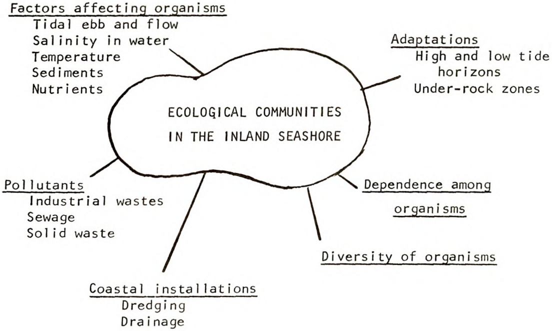
date of fi

be measure

different

environment and its economic significance to man, and to develop a concern for its quality.

Topic Web.



Pre-trip discussions. What are some of the concepts of the students concerning animal life on the seashore and shallow waters of the ocean? What is the importance of the ocean to Filipino life?

Initial class work and study should first introduce the wide range of environmental changes that occur in the seashore of Manila Bay. Identify in the section to be explored the high and low-tide horizons and the under-rock zones. The Office of the Coast and Geodetic Survey would be a good source of information of time of high-tides and low-tides on the proposed date of field trip. How would salinity of the water at different points be measured? What are the differences in temperature of the water at different hours of the day and its effects on various organisms? What would be th

The

conditions

and commun

Fie

note of th

factors in

B.

as many ty

C.

an aquari

D.

tion obse

Be

i.e., the

the seash

P

1

types to

graph gr

2

to act

the fun

rap sha

recomme

would be the effects of waves upon the marine life on the bay?

The class discussions must be centered on points to observe and conditions to identify with regard to adaptations, diversity of organisms and communities and the understandings of the concept of pollution.

Field Activities A. Group work in collecting specimens, taking note of their habitats, observing and recording adaptations to different factors in the biota.

B. Study of algae growth. Collect samples of algae and try to get as many types for classification and mounting.

C. A study of the clam. Collect living specimens and put them in an aquarium with brackish water.

D. Pollution in the bay. Record the presence and kinds of pollution observable in the area and the possible sources of pollution.

Before leaving the seashore, the group discussions may be held, i.e., the state of mutual interdependence in the communities along the the seashore.

Post-field trip activities

1. To determine growth of algae, transfer samples of different types to a jar of sea water, relatively clear of algae. Record and graph growth.

2. Make periodic observations of a clam, when it moves or begins to act like it is alive. If there is a need to identify and understand the functions of its parts, open the clam's shell. It is necessary to rap sharply on the ventral edge of the shell or slit the hinge in the recommended procedure with the shell remaining intact however opened.

Try to ide

the variou

3.

ecologica

4.

shore tol

you obser

in the en

F

shore, th

ing them?

W

What is t

W

of algae

(

environme

5.

communit

6

conserva

answered

a

b

c

Try to identify as many parts as can be distinguished. Draw and label the various organs within a clam and make a table of their functions.

3. Group reports on environmental factors that might disrupt ecological communities on the seashore.

4. Class discussion. To what extent can an organism in the seashore tolerate changes in the physical nature of its environment? Did you observe in some organims some visible effects produced by the change in the environment?

From the collective reports, can you make a diagram of the seashore, the types of organisms found and the environmental factors affecting them?

What are the sources of food of the clam and other bivalves? What is the value of the clam to the habitat?

What is the common type of algae found? What are the three types of algae that are sources of food for marine life in the intra-tidal zone?

Can you make a diagram of the effects of pollution on an aquatic environment?

5. What other plans can be devised by students to explore marine communities along the seashore?

6. In an effort to actually relate the student to the need for conservation in the Manila Bay area, the following questions may be answered as a result of the field trip:

a. Were all those organisms (shown in the diagram) always there?

b. Where do you suppose they came from originally?

c. How do they live, eat and reproduce?

d.

e.

f.

g.

h.

i.

j.

Teacher's

1.

ledges of

piles tha

2.

of materi

3.

the day's

the servi

4.

in the se

fore the

5.

disrupt t

6.

if accomp

d. Do these organisms compete with each other? How?

e. Why are these organisms in this particular place and not in some other place?

f. What are the environmental factors which affect them?

g. Is this a good place for them? What might happen if any of the "good" conditions are changed?

h. Will they always remain there?

i. How important are they to other organisms?

j. If these organisms are left undisturbed, what would be the optimum factors for their continued survival?

Teacher's Role

1. Encourage beachcombing, tidepool searching, peering under the ledges of rocks, digging in the mudflats and exploring the wharves and piles that jut out into the water.

2. Assign groups for identification, observation and collecting of materials (living and non-living specimens).

3. Safety precautions are essential. (If swimming is included in the day's activities, parents' written permission should be necessary and the services of a life guard be available.)

4. Pictures, charts and drawings of organisms to be encountered in the seashore should be viewed and discussions centered about them before the trip.

5. Evaluation should focus on the environmental factors that might disrupt the ecology of the seashore communities.

6. Group reports may be displayed on bulletin boards especially if accompanied with pictures and drawings or sketches. The collected

specimens r

7.

be made fo

of group p

<u>Strategy I</u>

La

Greater Ma

The plant

tional pur

area suita

cepts as w

Stu

of the lak

lance. It

and relate

tions. Th

sibilities

of the are

factor in

The

trip on a

for secon

<u>Co</u>

matter an

are chara

is the so

specimens might also be displayed.

7. If a camera is available, a pictorial of the activities may be made for a slide presentations as recapitulation or for evaluation of group processes and inquiry techniques.

Strategy III. Ecosystem Analysis of La Mesa Dam and Watershed

La Mesa Dam at the outskirts of Quezon City is important to the Greater Manila Area. It helps serve the water needs of the residents. The plant and animal communities, the topography and its use for recreational purposes, i. e., picnic grounds, swimming, and fishing make the area suitable for ecological analysis to teach basic environmental concepts as well as the factors which comprise the ecosystem.

Students in the community must understand the natural processes of the lake environment and be sensitive to its complex and delicate balance. It is also important to realize that the use and enjoyment of water and related natural resources continue unimpaired even for future generations. The student must be informed of its limitations and about the possibilities of action to prevent its deterioration. The ecosystem analysis of the area, hopefully, should develop awareness and sensitivity to a vital factor in their environment.

The suggested activity may be a long range project or a 1-day field trip on an area of interest, or as an extension of a classroom experience, for secondary students.

Concept Development. A. Major concepts. Living things interchange matter and energy with the environment and other living things. There are characteristic environments, each with its characteristic life. Man is the sole organism that can consciously modify his own environment.

B. S

changing.

sumers and

resources

Obj

1.

comprise L

2.

quality or

3.

and preser

4.

ship towa

Pre-

part of t

system.

and Water

Re

in the la

Wh

limiting

Ha

sions and

that cou

B. Subconcepts. Most communities of plants and animals are always changing. Natural ecosystems consist of abiotic materials, producers, consumers and decomposers. Man needs the wilderness and natural areas for the resources it offers, recreation and scientific value.

Objectives of the Field Trip

1. To conduct an on-the-spot analysis of the various factors that comprise La Mesa Dam and Watershed ecosystem.

2. To identify the limiting factors as indices of environmental quality or degradation.

3. To suggest corrective action and practices that will improve and preserve the ecosystem.

4. To develop concern over the environment and attitudes of stewardship toward the area.

Pre-field trip discussions. Environmental evaluation is as much a part of the field trip as the development of concepts regarding the ecosystem. What would be the questions that students ask about La Mesa Dam and Watershed?

Review the vital life processes of photosyntheses and respiration in the lake and land area.

When do we say that a community is balanced? What would be the limiting factors toward its stability?

Have some students who had been to the site recall their impressions and observations. What would be some of the factors in the area that could be the focus of observations, besides those in the checklist?

Fie

to guide t

A r

Sewage Adm

may be hea

Act

in the fie

Pos

1.

of the stu

2.

and practi

to a newsp

3.

of the sit

additional

4.

problems,

the full

The Role o

1.

observatio

2.

69

Field trip activity. The ecosystem analysis utilizes score sheets to guide the teams in evaluating the various components of the site.[69]

A resource talk from an official of the National Waterworks and Sewage Administration regarding management of the site and its problems may be heard at the site.

Activities planned by teachers of other areas may be integrated in the field trip for a multidisciplinary approach.

Post-field trip activities.

1. A display bulletin of photographs and the summary findings of the student groups may be posted for the information of the whole school.

2. The results of group discussions concerning corrective action and practices to improve or preserve the site can be the subject of letters to a newspaper editor to agencies concerned.

3. If the ecosystem analysis was conducted on "component" basis of the site, the quality of the site component can be the springboard for additional class discussions.

4. Class discussions can also focus on the observed ecological problems, the effects of human activity and means to improve and preserve the full value of the site.

The Role of the Teacher

1. Students working as a team must be encouraged to discuss their observations before answering the score sheets.

2. Utilize interdisciplinary approach by working with other

---

[69]Appendix B illustrates the score sheet for Ecosystem Analysis.

teachers o

even as a

3.

sion of th

4.

helpful.

Strategy

Of

as lack o

subject m

rimentati

quiry tra

room acti

him to di

depend on

A

kinds of

of the p

and suff

and test

ships am

mation a

7

Readings

7

teachers of subject areas to integrate their objectives in the field trip, even as a post-field trip activity.

3. Allow recreational activities during the trip under the supervision of the physical education teacher.

4. The use of photographic records in this trip would be most helpful.

Strategy IV. A Lesson in Question and Answer Inquiry

Often times a demonstration lesson is necessary for such reasons as lack of equipment for each child to manipulate or where the quantity of subject matter is too small or impractical for individual or on-site experimentation. But a demonstration may also serve as a springboard for inquiry training. Inquiry training is a means to supplement ordinary classroom activities and to provide a child a plan of operation that will help him to discover causal factors through his initiative and control, and not depend on the explanations of teachers or other knowledgeable adults.[70]

A question-asking strategy may be used to gather the following kinds of information: (a) identification, verification of the parameters of the problem (b) the identification of the conditions that are necessary and sufficient to produce the events of the episode and(c) the formulation and testing of theoretical constructs or rules that express the relationships among the variables of the observed physical event.[71] These information about the objects, properties, conditions and events under

---

[70] J. Richard Suchman, "Inquiry Training in the Elementary School", Readings on Teaching Children Science, pp. 73-79.

[71] Ibid.

observatic

data.

Thi

trate caus

adapted tc

during an

menon, an

Objective

1.

sively, s

2.

and to ma

3.

son produ

General P

1.

given to

a.

b.

c

d

observation increase the probability of gathering all the significant data.

This activity is suitable for Grade IV and upper levels to illustrate cause and effect of a phenomenon or "to find out why", but may be adapted to simpler situations for lower levels. It may also be conducted during an out-of-door activity upon the confrontation of a natural phenomenon, animal tracks, bird nests, ant hills, etc.

Objectives

1. To familiarize the child with inquiry tactics of probing aggressively, systematically and objectively.

2. To help the child to discover meaningful patterns independently and to make inferences himself from the empirical data obtained.

3. To encourage the child to analyze events critically and to reason productively with the obtained data.

General Procedures

1. Before the demonstration starts, the following pointers are given to the class:

a. There will be no talking or discussion on the part of the teacher or students while the "silent" demonstration takes place.
b. A panel of 8-10 students who will participate in the "experimentation" will be chosen immediately after the demonstration.
c. The rest of the class will serve as non-participant observers, but will have the important task of evaluating the panels -- their strategy and tactics, and the demonstration itself.
d. All questions will emanate from the panel and must be so phrased so as to be answerable only by a "yes" or "no" by the teacher.

e.

f.

g.

h.

Suggested

1.

soil, sand

all sample

2.

rubber ban

3.

e. Two types of questions are allowed them: the verification question to check their observation, test their hunches, the identity or property of the object, or the conditions of the event; and the experimental question where the child states the conditions and hypothesizes on the resulting event. (The teacher's response may be "yes", "that all depends" or "tell me more". Questions that tend to ask of the teacher's understanding must not be answered, but the response instead is, "What could you do to find out for yourself?")

f. When there is sufficient data to warrant an appropriate inference, any member in the panel can present his inference.

g. In a game situation, the panel starts out with 100 points, with a three point deduction for every question asked. Thirty points is added when an inference is made correctly. A member who makes three incorrect inferences is "benched" and may not ask further questions.

h. There will be a chance for all members of the class to participate in the game by rotation. A team of two students may also serve as demonstrators and provide the corresponding answers.

Suggested activity for the demonstration

1. Collect different soil types: garden soil, clayish or silty soil, sand and soil mixture or adobe that is pulverized. Be sure that all samples are equally dry.

2. Get three old-fashioned lamp chimneys, 3 small cloth squares, rubber bands and three one-quart glass jars.

3. Tie the cloth square over the top of each chimney with string

or rubber

source typ

4.

the unders

observatio

5.

the chimne

All

<u>Post-activ</u>

A l

inferences

class at t

Bas

as useful

Non

comments.

The

of looking

<u>Strategy V</u>

Va

sized to r

problem-s

It is the

for makin

such deci

or rubber band. Invert them and fill about 2/3 full with soil from each source type.

4. Place the chimneys in the glass jars, with the covered top at the underside. The set-up must be ready before the class begin their observations.

5. Three students will simultaneously pour 200 cc. of water into the chimneys, labeled A,B, or C.

All questions may begin after the water cease to drip in all jars.

Post-activity discussions

A listing on the board may be made of the observations and the inferences made by the panel, or by the non-participating members of the class at their seats.

Based on the activity, the class discuss soil-water relationships as useful in agriculture, soil and water conservation practices.

Non-participating observers may come up with either questions or comments.

The class may design their own "silent" demonstrations as means of looking for answers on problems that interest them.

Strategy V. Value Clarification

Valuing as an aspect of environmental education needs to be emphasized to motivate the students to participate effectively in environmental problem-solving activity. Value judgements involve reflection and reason. It is the task of environmental education to provide the necessary basis for making such value judgements. The students need practice in making such decisions. The teacher should assist the students to identify and examine th

that perpe

the enviro

society.

"Cl

upon situa

involved i

that few s

mental ma

better th

Ac

sum total

Ch

Pr

Ac

Unless a

7

tion,"

7

Teachin

pp. 28-2

examine their values about the environment and develop those attitudes that perpetuate the preservation of life on earth, improve the quality of the environment and motivate them to be useful and productive members of society.

"Clarifying" values and attitudes entails creating and capitalizing upon situations in which students are led to examine one or more conditions involved in valuing.[72] The basic assumption underlying this strategy is that few students are given opportunities to make decisions about environmental management and the more decision-making experience they have, the better they will be able to clarify their attitudes and values.

According to Raths, Harmin and Simon,[73] a value results from the sum total of seven conditions, all operating together. These are:

<u>Choosing</u>	1.	Choosing freely.
	2.	Selecting from alternatives.
	3.	Giving thoughtful consideration to the consequences of each alternative.
<u>Prizing</u>	4.	Cherishing, being happy with the choice.
	5.	Affirming the choice publicly.
<u>Acting</u>	6.	Doing something with the choice.
	7.	Doing something repeatedly in some pattern of life.

Unless all these conditions are operating in a situation, a value is not

---

[72] Clifford E. Knapp, "Attitudes and Values in Environmental Education," <u>The Journal of Environmental Education</u>, III (Summer, 1972), p. 26.

[73] Louis E. Raths, Merrill Harmin, and Sidney Simon, <u>Values and Teaching</u> (Columbus, Ohio: Charles E. Merrill Publishing Co., 1966), pp. 28-29.

present. A

and activit

The Role of

1.

solutions t

all people.

2.

of ridicule

the classro

3.

students,

4.

a variety o

Activity #

Thi

and make v

1.

according

officer, a

deaf, or p

2.

his rankin

3.

of their r

74 A

Clarificat

present. Attitudes, interests, beliefs, goals, aspirations, feelings, and activities are indicators of values.

The Role of the Teacher

1. Students should be made aware that there are many alternative solutions to a problem, and that a solution of a problem may not satisfy all people.

2. The students must be free to express themselves without threat of ridicule or derision in a non-judgemental atmosphere or climate in the classroom.

3. The teacher must be concerned with the ideas expressed by his students, to listen to them and to remember their ideas.

4. The teacher must organize the learning experiences to include a variety of techniques in value clarification.

Activity # 1 Rank order technique

This situation requires the students to look deeper into themselves and make value judgements.[74]

1. Give the class three alternatives and for them to make choices according to their preference, e.g. which would you rather be -- a police officer, an agricultural extension worker, or an accountant/ blind man, deaf, or paralyzed on a wheel chair, -- and rank order the choice.

2. A tally may be made of the rankings. The teacher may also give his rankings.

3. Some students may be asked to explain their choice or the order of their rankings.

---

[74]Adapted from Sidney Simon, L. Howe and H. Kirschenbaum, Values Clarification (New York: Hart Publishing Co., Inc., 1972), pp. 58-60.

Activity #

This

playing the

discussion

1.

planning o

the studen

2.

dual free

with plan

3.

place the

4.

briefly

5

planatio

Activity

S

theirs.

their a

resourc

Activity # 2 Values continuum

This is a useful technique to aid students in identifying and displaying their values.[75] It will also get a good spread of opinion and discussion over an issue.

1. An issue is chosen and presented to the class, e.g., family planning or population control, and discussed briefly to make certain that the students have the necessary background information.

2. The values continuum is placed on the board to reflect individual freedom (I.F.) on one end, and government control (G.C.) on the other; with planned parenthood (P.P.) at the midpoint:

I.F. . . . . P.P. . . . . G.C.

3. The students write their initials under the spot they wish to place themselves.

4. The student who wishes to make his position known, discusses briefly the meaning of his position.

5. After the students' participation, the teacher may make an explanation regarding his position.

Activity # 3 Counter Attitudinal Role Playing[76]

Students play the roles of people holding attitudes different from theirs. After defending different positions, students sometimes change their attitudes because they have expanded their perception of the issue.

1. Before the activity, take a vote of the pros and cons to a resource-use problem, e.g., extracting black magnetic sand from the beach

---

[75]Ibid.

[76]Knapp, "Attitudes and Values," p. 28.

for export

2.

the idea,

to the bea

3.

of the min

opposed th

the issue

issue.

4.

to present

panel, who

the member

5.

decide whe

6.

sion and

Protectio

consider

Ro

to help s

tribute t

verbal re

anxiety o

for export. Divide the class into two groups.

2. The mining developers and residents on the beach shall favor the idea, while the environmental activists and other residents adjacent to the beach do not favor the idea.

3. The panel who shall present their side favoring the extraction of the mineral shall be composed of the members of the class who originally opposed the issue; while the panel who shall present their side against the issue shall be composed of students who were originally in favor of the issue.

4. Group discussion shall precede the hearing to enable the students to present their opinions to members of the group. It will also enable the panel, who were previously selected by their group, to hear the views of the members.

5. The issue comes for discussion before the town council who shall decide whether to license the operations or not.

6. After the council hearing, the council may present their decision and recommendations, or the panels can appeal to the Environmental Protection Commission to come up with alternative decisions which would consider all opposing interests.

Role playing and other simulation games can be devised by teachers to help students understand the interrelationships of factors which contribute to decision making. Other methods for attitude change include: verbal reinforcement, debates, providing new information, introducing anxiety or fear arousing situations, and changing certain social factors.

new sc

concept

prepare

environ

to many

tional

sibilit

questio

experie

be effe

standin

environm

T

by the n

administ

tion of

implemen

tively s

It

organizi

either on

77

Part IV. Some Guidelines for In-service Education of Teachers for Environmental Education and Suggested Program of Activities

Teacher education in the past did not keep pace with demands of new science courses, and with the integration of environmental education concepts into its curriculum, today's teacher will find herself ill-prepared for the demands of the task. A new educational process like environmental education carries with it content that is quite unfamiliar to many teachers, emphasis on new methologies and new directions for national educational goals. For example, the student's increasing responsibility to conceptualize and internalize whatever he is studying, the questioning behavior of the teacher and the ecological orientation of the experiences are new demands upon the teacher. Teachers must be helped to be effective in helping youth increase their interest, awareness and understanding of their environment as well as their responsibility to help solve environmental problems and improve the community.[77]

The introduction of new and improved curriculum should be preceded by the necessary orientation training of the educational supervisors and administrators under whose guidance it will be implemented. An appreciation of the approaches to environmental education and how it can best be implemented in the school system will enable the administrators to effectively steer the teaching program toward its goals.

It is the purpose of this section to suggest guidelines for planning, organizing and conducting in-service education activities and programs, either on local, regional or national basis.

---

[77] Stapp, "In-service Training in Environmental Education", pp. 254-56.

I. All

an

I

cerns:

tual the

of envir

research

must foc

cedures.

II. Pla

the

lev

the

W

quire at

tion in

problems

research

educatio

nifican

will wo

within

Educati
Yearboo
son B.
pp. 113

1. <u>All aspects of curriculum development and implementation should find an important place in the in-service training of all teachers</u>.

In-service programs should cover any or all of the following concerns: (1) philosophy and goals of environmental education; (2) conceptual themes, processes and values of environmental education; (3) methods of environmental education and teaching strategies; and (4) evaluation and research in environmental education. In-service education, therefore, must focus upon effective instruction and modification of teaching procedures.[78]

II. <u>Planning, organizing and implementing the activities must involve the active cooperation and participation of teachers of all grade levels and subject areas and top-status groups among school people -- the administrators, supervisors and curriculum specialists</u>.

Working committees can help determine the important needs that require attention for the effective implementation of environmental education in the school system. They can deal with specific instructional problems, utilizing all potential resources: group members, consultants, research, facts, experiences and opinions. The success of in-service education activities depends upon people working on problems that are significant to them. Those involved in the project should plan on how they will work on it. The boundaries of teacher participation and decisions within each school need to be defined so that in-service groups will know

---

[78]J. Cecil Parker, "Guidelines for In-service Education," <u>In-service Education for Teachers, Supervisors and Administrators</u>, The Fifty-sixth Yearbook of the National Society for the Study of Education, Part I, Nelson B. Henry, editor. (Chicago: The University of Chicago Press, 1957), pp. 113-14.

what pr

III. C

r

being f

cedure.

the ins

group-o

objecti

are to

IV. Act

tea

T

ledge of

and issu

and comm

must inc

site res

educatio

be empha

V. In-

I

79

tion Prog

80

what problems they are free to tackle.[79]

III. Clearly formulated purposes must evolve for each procedure and resource.

The determination of the needs and identification of the problem being focused in the program are very much related to the choice of procedure. The most appropriate procedures toward those ends consider, first, the instructional problem; second, the human relations and cooperative group-operation skills; and third, the problem-solving methodology.[80] The objectives must be clearly defined to the participants. If the activities are to result in changed behavior, means and ends need to be consistent.

IV. Activities must have direct relationship to the activity in the teacher's immediate situation.

The focus of the program should be on helping teachers to use knowledge of children, knowledge of related disciplines, environmental problems and issues, human and material resources, local "environments" like school and community, curricular design and instructional strategies. The program must include action-oriented materials and methodology which utilize school site resources and community environmental facilities. Concepts of outdoor education, conservation, community development and value education should be emphasized through various programs.

V. In-service education programs should be diversified and developmental.

Individual differences among teachers should be recognized in setting

---

[79]B. Jo Kinnick and others, "The Teachers and the In-service Education Program", NSSE Fifty-sixth Yearbook, p. 151.

[80]Ibid.

up in-se

the teac

among te

matter f

a variet

ness wor

nars and

tems rel

willass

prove co

E

If the t

liar wit

use. He

conducti

are comp

VI. In-

of

S

as a who

tunity e

group si

change.[8]

8

sixth Ye

up in-service education plans. It should provide opportunities to solve the teachers' individual deficiencies. Learning experiences will differ among teachers of different stages of professional growth, various subject-matter fields and grade levels and value orientations. A system must offer a variety of opportunities for in-service education. Sensitivity and awareness workshops will provide an overview of the environmental issues. Seminars and symposia may be used to clarify objectives, concepts and value systems related to environmental education. Workshops and training institutes willassist in developing materials and identifying resources as well as improve competencies for outdoor education and field studies.

Environmental education centers are suitable for work with teachers. If the teachers are to bring children to the facility, they must be familiar with the provisions available for study and concepts enhanced by their use. Here the teachers can function and maintain their teaching role, by conducting their own outdoor program in the area of whatever subject they are competent in.

VI. <u>In-service program, whenever possible should utilize the values of of informal groups within the structure of formal organization.</u>

Small groups working together contribute resources which when taken as a whole, is richer than those of any one "best" member. Greater opportunity exists for people to relate themselves to each other in informal group situations. Group decisions help individuals achieve behavioral change.[81] Assistance must be rendered by a staff member who can provide

---

[81] Parker,"Guidelines for In-service Education", NSSE, The Fifty-sixth Yearbook, p. 106.

expert he

assist th

ting sta

working c

mutual re

VII. The

par

of

In

concerned

standings

nistrator

service ed

lopment o

the workin

Plan # 1

Thi

chers who

to promote

seminar-wo

a.

b.

82 A

Service Edu

expert help in individual and group problem-solving processes, and to assist the group through confusion and frustration common to a group getting started or moving forward. The activities should be conducted in a working climate which maximize the effectiveness of the groups through mutual respect, support, permissiveness and creativeness.

VII. The success of the in-service education program is determined in part by the environmental awareness and attitudes and sensitivity of the administrator to the strengths and weaknesses of his staff.

In any environmental education program the administrator must be concerned with helping the school personnel develop the attitudes, understandings and process skills needed for effective teaching. If the administrator is to serve as facilitator of change and co-ordinator in in-service education, he must: (a) provide inspiration, (b) encourage development of good organization for in-service education, (c) facilitate the workings of groups, and (d) create a climate for growth.[82]

Plan # 1 Seminar-Workshop in Environmental Sensitivity

This program is directed to administrators, supervisors and teachers who have not had any environmental teach-in. It is an initial step to promote attitude change among the participants. The objectives of the seminar-workshop are the following:

a. To define the major objectives of environmental education,

b. To list ecological themes as foundation for environmental in different grade levels,

---

[82]Arthur Lewis and others, "The Role of the Administrator in In-Service Education," NSSE, The Fifty-Sixth Yearbook, p. 157.

F

an evalu

tion car

be neede

will ena

of conce

T

of envir

1

obligati

is, the

mental ec

vironment

the total

the disci

and probl

to train

part of t

dent upon

2.

gists hav

that all

c. To identify environmental problems in the community,

d. To list some value orientations toward the environment, and

e. To gain new awareness and perception of the environment through a value-clarification process.

Four teachers with past record of success with group interactions, an evaluation specialist and three resource persons in environmental education can adequately staff such a seminar plus other resource speakers as may be needed from the locality. Two staff meetings prior to the scheduled dates will enable the group to share goals, pinpoint problems and discuss topics of concern as well as the techniques for evaluation which will be utilized.

The three-day seminar-workshop will be concerned with three aspects of environmental education:

1. The nature of environmental education. Teachers have a deeper obligation than transmission of knowledge, important that may be, and that is, the development of values, habits and problem-solving skills. Environmental education spells out the "tools" we need in order to improve the environment and work towards national development. It has a vital place in the total education of the individual, bringing as it does the fusion of the disciplines toward the confrontation and solution of environmental issues and problems. Basically, the teacher's task in environmental education is to train future citizens who understand clearly that man is an inseparable part of the world system and that his continued survival is totally dependent upon the continued functioning of that system.

2. Themes of ecology. Although ecology is a young science, ecologists have developed a few principles which fall under a holistic view -- that all living things are part of a single system in the process of

interact
themes w
a) Ever
plexity,
Man's ac
cies enc
function
ment in
factor w
resource
which ha
rapidly
limited
3
awakened
tal degr
informed
scientif
comes in
mind to
to assis

83
84
Affective
cations,

interaction with each other and with the inorganic environment.[83] These themes will appear or be implied again and again in environmental studies: a) Everything in the environment is related to everything else. b) Complexity, is in part, responsible for the stability of most ecosystems. c) Man's activities tend to reduce the complexity of ecosystems. d) No species encounters in any given habitat the optimum conditions for all its functions. e) Although living beings react to all factors of the environment in their particular location, there frequently occurs a discrepant factor which has controlling power through excess or deficiency. f) Some resources do not renew themselves because they are a result of a process which has ceased to function. g) Environmental change often occurs more rapidly than organic biological evolution. h) A species is geographically limited to the extremes of the environmental adversities it can withstand.

3. Environmental sensitivity and perception. Teachers must be awakened to a resource-oriented, problem-centered approach to environmental degradation. As part of environmental perception, teachers should be informed about environmental issues, as well as keeping up to date with scientific and social advances. Interest begins with curiousity and becomes interest when the individual's sense of values leads his conscious mind to explore the stimulus to greater detail and seek for other stimuli to assist in the learning process.[84] The tools for environmental perception

---

[83]Foster and Hermanson, Introduction to Environmental Science, pp. 3-7.

[84]Albert F. Eiss and Mary Harbeck, Behavioral Objectives in the Affective Domain (Washington, D.C.: National Education Association Publications, 1969), p. 32.

are: str

gical av

standing

T

out" app

ploring

introduc

and the

be cont

sensory

relativ

tives,

ronment

mental

are: strong general education, understanding of natural resources, ecological awareness, economic awareness, problem-solving interest and understanding that man is a part of the human ecosystem.

The seminar-workshop will not be conducted on the "time-is-running-out" approach. It is aimed at being investigative and innovative in exploring areas of concern in the community. Experiential activities will introduce the teachers to the issue of sensitivity to their environment and the process of valuing. As model for students, the teachers should be continuously questioning, probing and providing students with multisensory experiences and emphasizing the development of positive values relative to the environment.

Suggested Program of Activities for Three Days

A six-hour daily session will be sufficient in identifying objectives, understanding concepts, developing new perceptions about the environment and acquiring new insights on some value orientations for environmental studies.

Day one

a. Introductions, announcements, filling up of data forms and questionnaires and pre-tests.

b. Discussion of the rationale and objectives of environmental education as it relates to the country's developmental goals.

c. Lecture/slide presentation of ecological themes.

d. An informational film

Day two

a. Resource talk on outdoor education and environmental encounters

b. Environmental activities using adaptations of Environmental Studies/Action Cards.[85]

---

[85]Environmental Studies Cards. American Geological Institute, 1970.

Da

T

of the

pre-tes

cipants

Plan #

involve

used to

of the

teachi

enviro

of lec

help t

doors.

c. Listing affective objectives for environmental studies in the school site

d. Working out suggested activities for either in-school or out-of-school activities

e. A value clarification session

Day three

a. Discussion of the various approaches to environmental education

b. A conceptual field trip in the school vicinity

c. A slide presentation on environmental concerns

d. A post-test on attitudes and concepts related to environmental education

e. Conclusion: General reports
Future plans
Evaluation of participants and workshop proper

The results of the evaluation will be the basis for the modification of the program and the data from the information sheets, questionnaires, pre-tests and post-tests will permit analysis and assessment of the participants.

Plan # 2 An In-service Institute with a One-Week Session and Bi-monthly Meetings called MAST (Monday Afternoons with Science Teachers).

A one-week institute prior to the start of the school year would involve teachers who have had the 3-day sensitivity workshop. It can be used to organize learning activities to conform with the scope and sequence of the conceptual structure of the theme under consideration, to construct teaching units, to investigate resources and determine ways of utilizing environmental facility in the community, to provide teachers with a series of lecture-demonstrations by specialists in environmental research and to help teachers to be proficient in the methods of teaching children out-of-doors.

will imp

ture res

teachers

seminars

respons

learning

in thei

The training program may be conducted at two levels: those who will implement it in the classroom and those who will participate as future resource leaders in the preparation of teaching materials. These teachers can provide leadership in the field, actively participate in seminars, workshops and other training activities for teachers who are responsible for environmental education in their schools.

Objectives of the institute will be the planning of teaching-learning experiences which integrate concepts of environmental education in their respective subject areas and grade levels.

<u>Day one</u>

a. Orientation session on the multidisciplinary approach

b. Resource talk on curriculum structure

c. Lecture-discussion on instructional and behavioral objectives

d. Group sessions

<u>Day two</u>

a. Resource talk on ecological concepts

b. Resource talk on conservation education

c. Activity on value clarification

d. Group sessions

<u>Day three</u>

a. A simulation game

b. Group sessions

c. A field trip to a community site or sites

<u>Day four</u>

a. A slide presentation on school site development as outdoor laboratory

b. Resource talk on government agencies concerned with environmental quality

c. Group sessions

d. A field trip to a natural area

parts:

availed

coming

teachers

their pr

with the

Plan # 3

A

communit

which is

scout ca

the Los

would be

A

related

1

2

Day five
a. A demonstration on the inquiry technique
b. Completion of group reports and projects
c. Display and exhibit of teaching materials
d. Conclusion: General reports
Future plans
Inspirational

The two-hour bi-monthly meetings called MAST shall consist of two parts: exploration of materials and resources that can be utilized or availed of in the classes implementing the program and discussion of forthcoming themes and major concepts and the possible approaches available to teachers. These bi-monthly meetings will enable teachers to talk about their problems, serve as reinforcement to their activities and self-renewal with the opportunity to learn of resources available to them.

Plan # 3 A Two-week In-residence Summer Institute

A school division can arrange three workshops in one summer at a community site in the region with available residence facilities and which is in the proximity of environmental resources. Provincial boy scout camp sites may be developed for the purpose. On the national level, the Los Baños College of Agriculture or the Teachers' Camp in Baguio City would be excellent institute sites.

An institute of this type will consist of four distinct but interrelated phases:

1. A series of resource speakers on various aspects of environmental education.
2. A series of daily, 1 and 1/2 hour, subject matter discussions on ecological themes and concepts, processes and values that are integral to environmental education.

fines th

it can b

the bas

resource

is held

mented v

the effe

processe

stand th

ments.

is basic

ture upo

the sin

on how

resourc

tation

3. A daily, 3-hour group session on teaching strategies, such as gaming, value clarification, community survey, outdoor education and field studies.

4. Out-of-door activities including two whole-day field trips.

The in-service program could revolve about a broad theme that defines the major thrust of the activities of the participants. For example, it can be concerned on concepts of soil-water relationships developed from the basic to the more complex problem-solving activities, or studying marine resources and developing activities for seashore studies, if the institute is held at a coastal region.

All the above mentioned in-service training plans should be implemented with the leadership of a qualified coordinator.

Summary

A society that strives for economic well-being must anticipate the effects of development activities on the natural resources and on the processes of the environment. It is important that the citizenry understand the relationships of man with other living things and their environments. Thus ecological knowledge is essential to development, just as it is basic to conservation.

The conceptual framework developed in this study provides a structure upon which to build teaching-learning experiences. It is based on the singular theme: The earth has finite resources and all life depends on how successfully man can learn to harmonize his use of the earth's resources with natural communities and ecosystems. The ecological orientation in the science curriculum provides the understandings and process

skills r
the valu
ing expe
E
paths.
ings of
politics
cipation
ment goal
Th
positive
tions to
program f
lopment o
and the i

skills required of an environmentally literate citizen. An emphasis on the valuing process throughout all subject matter content elevates learning experiences beyond the facts and concepts level.

Environmental education can be reached by a variety of different paths. A field-oriented, problem-solving approach, enlarged by understandings of interrelationships between ecology, economics, social studies, and politics, and which encourages student involvement as well as civic participation and action, all relate the vital factors relevant to the development goals of the country.

The teacher has a critical role in assisting the students to develop positive attitudes toward the environment and to facilitate their motivations to improve the quality of the environment. An in-service training program for teachers of environmental education will assist in the development of their own competencies, the modification of teaching behavior, and the improvement of instructional quality.

Introd

ting t
tries
or lat
mental
cern i
change
vances
ing an
rable.

of tom
for th
Some w
be bet
action
leader
servat
than w
ment.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

In its desire for economic growth, the Philippines is accelerating the exploitation of rich resources, clearing forests for its industries and giving up agricultural lands for urban settlements. Sooner or later, after a period of growth, limiting factors and their environmental consequences will take effect. Growth without environmental concern is a costly mistake that developing countries can ill-afford. The changes in society and the intensive applications of technological advances require that part of an educated person's knowledge is understanding and preventing environmental detrioration before it becomes intolerable.

The Filipino youth in schools today will be the decision-makers of tommorrow. They must realize that immediate needs cannot be bartered for the long-term effects of economic development upon the environment. Some will become the environmental specialists of 2000 A.D. who need to be better equipped to discourage the environmental degradation of today's actions and monitor the quality of the environment. Others will provide leadership for rural development through improved agricultural and conservation practices, Many will be teachers, who need to know much more than what we know about ecology, resource-use and quality of the environment. Their education must begin now.

for env

within

the imp

the fol

develop

environ

curricu

and imp

transla

and act

in a ci

relatec

in prob

(3) awa

for the

the env

for pos

facets

at var

indivi

opport

improv

pose o

Summary

The purpose of this study was to develop a conceptual framework for environmental education for Philippine schools, that considers goals within the context of the nation's aspirations for economic growth and the improvement of the Filipino society. As a descriptive study, it used the following procedures: (a) examining the foundations for curriculum development in environmental education; (b) describing the Philippine environment and educational setting; (c) determining the approach toward curriculum structure; (d) adapting guidelines for curriculum development and implementation and for the in-service education of teachers; and (e) translating the conceptual structure into suggested teaching strategies and activities for the training of teachers in service.

Environmental education is defined as the process of developing in a citizenry: (1) knowledge of his total environment and the interrelatedness among man, his culture and bio-physical world; (2) skills in problem-solving, critical thinking and social change strategies; (3) awareness of environmental problems, attitudes and values necessary for the wise use and management of natural resources and protection of the environment; and (4) decision-making skills and code of behavior for positive action on issues concerning the environment. It has many facets to its multiple functions: developing ecological understandings at various levels, fostering the development of the personality of the individual and of an environmental ethic, opening various vocational opportunities concerning the environment, and motivating action for the improvement of the community and the quality of life. It is more purpose oriented, enhanced by the specifications related to the environment and the

the stu
ticipat
the tot
perspec
which a
rious s
tions b

<u>The ear</u>
<u>man car</u>
<u>communi</u>
tion of
process
cepts a
about t
lities
some ch
present

educati
troduce
environ

and the needs of the community.

All the educational programs have contributions to make towards the student's perception of the environment and his motivations to participate in various kinds of societal action, taking into consideration the total environment in all his "developing" actions. An ecological perspective in science instruction serves as an operative framework in which all teachers in other disciplines can work. A correlation of various subject areas would enable students to understand the interrelations between the natural, social and man-made environments.

This study has developed a conceptual scheme under the theme: <u>The earth has finite resources and all life depends on how successfully man can learn to harmonize his use of the earth's resources with natural communities and ecosystems</u>. It can serve as framework for the organization of learning experiences to facilitate the attainment of the concepts, processes and values in environmental education. These environmental concepts as unifying elements in the science curriculum require knowledge about the use of outdoor activities in the school site, community facilities and resources and natural ecological areas. It will necessitate some changes in orientation and emphasis of the materials and activities presently in use toward attitude development and community action.

To enable teachers to teach effectively for goals of environmental education, an in-service training program is imperative. It should introduce teachers, supervisors and administrators to the philosophy of environmental education, its basic concepts and their applications, and assist

grade

must b

in pro

proble

deplet

pollut

ment o

citize

have e

throug

depth,

tions

basis

phasis

linkin

tion c

dary l

and co

value

vities

assist teachers in preparing instructional materials in particular grade levels. As change-facilitators in the community, the teachers must be aware of current environmental issues and develop competencies in problem-solving, inquiry teaching and social-change strategies.

If education is to meet the role of helping the nation solve the problems of rapidly expanding population, inadequate food production, depleted forest and soil resources as well as threats of environmental pollution, the educational system must be reformed toward the development of environmental literacy and ecological conscience among its citizenry.

Conclusion

Curriculum materials and designs for environmental education have emphasized the selection and organization of ecological concepts through various subject-matter approaches. They vary in scope and depth, but they reveal discernible characteristics which had implications for this study. These are: (1) their emphasis upon science as basis of learning experiences for environmental studies; (2) the emphasis upon methods of inquiry and problem-solving activities; (3) linking the subject disciplines in concept development; (4) integration of environmental education concepts into the elementary and secondary levels (K-12); (5) attention to outdoor learnings in school sites and community resources for first-hand experiences; (6) emphasis on value education; and (5) the use of multi-media in the learning activities.

ecologi

rived t

nity a

mental

in env

object

evalua

educat

the go

the st

guidel

follow

towar

prove

both

ing

the

mat

rel

The conceptual framework developed in this study integrates the ecological elements of the subject matter, the learning processes derived from interaction with the environment and problems of the community and the affective processes as motivating force for an environmental ethic. It can serve as a master plan for curriculum development in environmental education. Within this framework, can be formulated objectives, learning experiences and criteria for student and program evaluation. As curricular structure, it will guide the in-service education of teachers in developing instructional materials related to the goals of environmental education. The program designs suggested in the study were developed from descriptive information and from the major guidelines obtained from related literature of this study.

Within the context of the thesis developed in this study, the following conclusions are made:

1. Environmental education for development goals is directed toward community development, growth of environmental ethic and the improvement of the environment, focusing upon contemporary problems of both rural and urban environments.

2. Science teaching can provide the core element in the existing curriculum wherein ecological concepts can be integrated at both the elementary and secondary levels.

3. The multidisciplinary approach that cuts across subject matter divisions allows for learning experiences concerning interrelationships between man and nature within the educational schemes

of ru

educa

exper

quiry

devel

ronmen

concep

ness,

lopmen

of the

of the

vironm

dents,

tives

problem

mental

enable

ronment

of rural and agricultural education, conservation education, value education and community education.

4. The strategies that are found in program designs emphasize experiences outside the classroom, the use of community resources, inquiry processes, mutidisciplinary activities and value clarification.

5. "Awareness-oriented" teaching must progress toward "attitude" development and "action-oriented" strategies from a broad base of environmental issues pertinent to the community.

6. Teachers need extensive in-service education in environmental concepts, processes and values to increase their understanding and awareness, improve their teaching skills and be involved in curriculum development.

7. The needs of the community, the psychological characteristics of the learners and the socio-economic conditions and bio-physical aspects of the community are important foundations for curricular programs in environmental education.

8. Cooperative efforts and close working relationship among students, teachers, parents, businessmen, community leaders and representatives of governmental agencies in the confrontation of environmental problems will enhance the goals of environmental education.

9. There is no single curriculum and no easy answer to environmental education; instead this study provides curricular options to enable teachers to operate within some descriptive umbrella of environmental education.

Recomm

severa

the Pl

to pl

framew

to ap

of re

stage

grams

is re

in th

tried

nitie

and/o

envir

is re

conce

guage

rienc

Implications and Recommendations

Recommendations for Further Research

The imperatives developed in this study implies research in several areas in environmental education, in so far as it relates to the Philippine environment.

1. Considering the importance of information and data relevant to planning effective curriculum experiences implied by the conceptual framework of this study, it is recommended that research be conducted to appraise existing students' interests and specific needs, the state of readiness of the learners at different levels, the developmental stages of the learners and the social climate for learning.

2. Recognizing the limitations of environmental education programs, unless they are subjected to experimentation and evaluation, it is recommended that the guidelines, concepts and processes described in this study be initially implemented on a pilot-basis. It should be tried out in different types of schools in the urban and rural communities, utilizing various approaches and resources, so that revisions and/or suggestions be made prior to its implementation in the country.

3. Inasmuch as the focus of this study is on the integration of environmental education concepts in the existing science curriculum, it is recommended that additional research be conducted on how ecological concepts can fit into already existing programs in social studies, language arts and other curricular areas, correlating the learning experiences toward a lateral development of concepts.

4. Aware that attitude change is basic to positive environmental

conc

ted

the

perc

for s

mende

techn

flexi

objec

exper

be ma

sourc

labor

recomm

for te

grams

role o

countr

lopmen

educat

concern, it is recommended that attitude surveys, measurement and related studies be made of students, parents, teachers and other sectors of the community regarding their attitudes toward the environment and their perception of environmental issues.

5. Recognizing that maximum use of teaching resources is needed for successful implementation of any educational program, it is recommended that research be directed to the development and use of teaching techniques such as: team-teaching, student-tutoring, multi-media use, flexible scheduling, programmed instruction, etc. that would facilitate objectives of environmental education.

6. Considering the value of community resources and on-site experiences for environmental education, it is recommended that studies be made on the local level to identify, describe and evaluate the resource potential of a community as basis for the development of outdoor laboratories or environmental education centers.

7. On the basis of the guidelines presented in this study, it is recommended that studies be initiated to develop evaluative instruments for teachers and students to measure the effectiveness of teaching programs in environmental education.

8. Aware that this study is an initial effort at clarifying the role of environmental education in the development goals of a developing country, it is recommended that more research be undertaken on the development of principles and concepts for curricular plans for environmental education on a broad curriculum approach.

Recomm

goals

proces

trato

tal e

menta

throu

toget

train

colle

depen

ecolo

tion

metho

in sc

tiona

instr

for i

shoul

and d

for l

train

teach

Recommendations for the Implementation of the Study

The Department of Education and Culture should circularize the goals and philosophy of environmental education as well as its concepts, processes and values; provide for the in-service training of administrators, supervisors and teachers on the various aspects of environmental education at all levels and subject areas; and establish an Environmental Education Division to implement environmental education programs throughout the country, research and develop instructional materials together with teachers' guides and provide assistance for in-service training programs in the school divisions. Further, it should require colleges and universities to develop courses related to man and interdependence with his environment, problems of human settlements, human ecology and environmental health, resource-use and conservation, population dynamics, etc. and for teacher training institutions to include a methods course for environmental studies.

It is recommended that curriculum study committees be organized in school divisions to integrate ecological concepts into the instructional materials at the elementary and secondary levels and to develop instructional objectives and assessment techniques. Ongoing activities for in-service workshops, institutes, conferences and follow-up meetings should be conducted to renew and support teacher goals.

Regional environmental education centers should be planned for and developed on a site with unique ecological features, with facilities for laboratories, audio-visual and resource library. It will serve as training center to provide a variety of study opportunities for students, teachers and citizens besides serving as tourist facility for the area.

aspect

Culture

cies p

of the

and co

newly-

Rizal.

outdoo

area a

and sc

it is

the or

mental

ment,

The employment of mass-media for non-formal education is another aspect of environmental education which the Department of Education and Culture could undertake. It is recommended that other governmental agencies pool their resources into the educational and informational programs of the department which are designed to develop environmental awareness and concern among the adult population.

This study also implies several actions to be considered by the newly-established Environmental Center of the Philippines at Bicutan, Rizal. It is recommended that their immediate area be developed as an outdoor laboratory for the use of the students in the Greater Manila area and as a tourist facility incorporating the esthetic, educational and scientific values of the flora and fauna of the Philippines. Further, it is recommended that the agency extend encouragement and support toward the organization of civic and community action groups related to environmental clean-up, conservation practices, environmental systems management, outdoor recreation and environmental education.

BIBLIOGRAPHY

BIBLIOGRAPHY

Aaronson, Terri. "World Priorities." Environment, XIV (August, 1972), 4.

Abraham, Herbert J. World Problems in the Classroom. Paris: UNESCO, 1973.

Abt, Clark C. and Cogger, Virginia H. "Educational Games for the Sciences." The Science Teacher, XXXVI (January, 1969), 36.

Adiseshiah, Malcolm S. It is Time To Begin. Paris: UNESCO, 1972.

Advisory Council on Environmental Education. Second Annual Report. Washington, D.C.: Office of Education, Department of Health, Education and Welfare, 1973.

Afuang, Benjamin. "Industry's Dirty Business." The Sunday Times Magazine (Manila), August 29, 1971, 14.

Aguilar, Lourdes M. "72 Years of Policy Making and Educational Direction." DEC Journal, I (September, 1973), 2.

American Association of School Administrators. Conservation Education in American Schools. Twenty-ninth Yearbook. Washington, D.C.: American Association of School Administrators, 1951.

________. Conservation in People's Hands. Washington, D.C.: American Association of School Administrators, 1964.

Anderson, Ronald D.; DeVito, Alfred: Dyrli, Odvard Egil; Kellogg, Maurice; Kochendorfer, Leonard; and Weigand, James. Developing Children's Thinking Through Science. Englewood Cliffs, N.J.: Prentices-Hall, Inc., 1970.

Arnsdorf, Val. "Relationships of Social Sciences and Natural Sciences in Ecologic Education." The American Biology Teacher, XXXIV (April, 1972), 206-08.

Ashbaugh, Byron and Beuschlein, Muriel. Things to Do in Science and Conservation. Dansville, Ill.: The Interstate Printers and Publishers, Inc., 1960.

As

Az

Ba

Ba

Ba

Be

Be

Be

—

—

Ber

Ber

Blo

Asian Regional Workshop on the Progress of Integrated Science Teaching. Integrated Science Teaching in the Asian Region. Final Report. Bangkok: UNESCO Regional Office for Education in Asia, 1971.

Azanza, Rodolfo, V. "Perspectives in Development-Oriented Educational Expansion." The Philippine Journal of Education, LII (June, 1973), 8-9.

Balzer, LeVon. "Environmental Education in the K-12 Span." The American Biology Teacher, XXXIII (April, 1971), 220-23.

Bathurst, Effie., ed. Conservation Education in the Rural Schools. Washington, D.C.: National Education Association, 1943.

Bautista, Heriberto A. "The School's Role in the Economic Goals of the New Society." The Philippine Journal of Education, LII (June, 1973), 3-4.

Behrman, Daniel. In Partnership with Nature: UNESCO and the Environment. Paris: UNESCO, 1972.

Bell, Garrett de, ed. The Environmental Handbook: Prepared for the First National Environmental Teach-In. New York: Ballantine Books, Inc., 1970.

Bennett, Dean B. "Guidelines for Evaluating Student Outcomes in Environmental Education." Maine Environmental Education Project, Yarmouth, Maine, 1973. (Mimeographed.)

________, and MacGown, Richard H. "The Community Environmental Inventory." Maine Environmental Education Project, Yarmouth, Maine, 1972. (Mimeographed.)

________, and Willinck, Wesley H. "Organization and Operation of a K-12 Environmental Education Program." Maine Environmental Education Project, Yarmouth, Maine, 1973. (Mimeographed.)

Bennett, Eleanor H. Guidelines for Environmental Sensitivity. Harrisburg, Pennsylvania: Pennsylvania Department of Education, 1972.

Bernardino, Vitaliano A. The Philippine Community School. Manila: Phoenix Press, Inc., 1958.

Blough, Glen O. "Science and Outdoor Education or Nobody can Really Feel How I Feel." Outdoor Education. Edited by Donald R. Hammerman and William M. Hammerman. Minneapolis, Minnesota: Burgess Publishing Co., 1973.

Blum, Abraham. "Towards Rationale for Integrated Science Teaching." New Trends in Integrated Science Teaching. Vol. II. Edited by P. E. Richard. Paris: UNESCO, 1973.

Brandou, Julian R. "Science Education in Two Countries in the Far East - A First Hand View." The Science Teacher, XXXVII (October, 1970), 30-31.

Brandwein, Paul F. Building Curricular Structures for Science. Washington, D.C.: National Science Teachers Association, 1967.

________. "Conservation." The Science Teacher, XXXIV (April, 1967), 13.

Brehm, Shirley A. A Teacher's Handbook for Study Outside The Classroom. Columbus, Ohio: Charles E. Merrill Publishing Company, 1969.

Brehman, Thomas R. Environmental Demonstrations, Experiments and Projects for Secondary Schools. New York: Parker Publishing Company, 1973.

________, and Qutub, Musa. "Environmental Activities and Problem Solving." The Science Teacher, XXXVIII (April, 1971), 55-56.

Brennan, Matthew J. "Environmental Conservation Education in the United States." Prospects, II (Winter, 1972), 474-75.

________. ed. People and Their Environment. Teachers Curriculum Guides to Conservation Education. 8 Vols. Chicago, Illinois: J. G. Ferguson Company, 1969.

________. "The Conceptual Field Trip." Science and Children, VII (March, 1970), 34-35.

Brewer, A. C. "The Role of Science Supervision." A Sourcebook for Science Supervision. Edited by Mary B. Harbeck. Washington, D.C.: National Science Teachers Association, 1967.

Brown, Robert E. and Mouser G. W. Techniques for Teaching Conservation Education. Minneapolis, Minn: Burgess Publishing Company, Inc., 1964.

BSCS Special Publication No. 6. New Materials and Techniques in the Preparation of High School Biology Teachers. Boulder, Colorado: Biological Science Curriculum Study, 1969.

BSCS Special Publication No. 7. Life Science in the Middle School. George M. Clark, editor. Boulder, Colorado: The Regents of the University of Colorado, 1969.

Bunderson, Victor C. and Butts, David P. "Designing an Instructional Program - A Model." Designs for Progress in Science Education. Edited by David Butts. Washington, D.C.: National Science Teachers Association, 1969.

Bureau of Public Schools, Philippines, Memorandum No. 67. Guidelines for Effective Science Teaching. Manila, 1965. (Mimeographed.)

Burley, T. M. The Philippines: An Economic and Social Geography. London: G. Bell and Sons, Ltd., 1973.

Caldwell, Lynton Keith. Environment, A Challenge to Modern Society. Garden City, New York: Doubleday and Company, Inc., 1971.

Carroll, John J., Araneta, Francisco and Keane, John T. Philippine Institutions. Manila: Solidaridad Publishing House, 1970.

Catala, Pierre. "Education and Rural Development.: Prospects in Education, I (Spring, 1969), 8-12.

Cerovsky, Jan. "Environmental Education as an Integrating Concept in Science Teaching." New Trends in Integrated Science Teaching. Vol. II. Edited by P. E. Richard. Paris: UNESCO, 1973.

Chamberlain, Virginia M. "A Description of the Use of a Values Clarification Approach in the Teaching of Earth Science Classes." Unpublished Ph. D. dissertation, Michigan State University, 1971.

Committee on Natural Resources, Senate of the Philippines. The Philippine Environment. A Report. Manila: National Media Production Center, 1972.

Commoner, Barry. The Closing Circle. New York: Bantam Books, 1972.

Constitution of the Republic of the Philippines. Manila: Bureau of Printing, 1972.

Cook, Robert S. and O'Hearn, George T., eds. Processes for a Quality Environment. Green Bay, Wisconsin: The University of Wisconsin-Green Bay, 1971.

Cooperative Extension Service. Ecosystem Analysis. Extension Bulletin E-763. Michigan State University, April, 1973.

Corpuz, Onofre D. "Philosophy and Goals of the Philippine Education in the Seventies." Directions for Philippine Education in the Seventies. Edited by A. G. Elevazo and T. N. Boquiren. Manila: Philippine Association for Graduate Association, 1971.

D

D

D

D

Do

Ei

"E

Council of Environmental Quality. Environmental Quality. Second Annual Report. Washington, D.C.: U.S. Government Printing Office, 1971.

Dassman, Raymond F. Environmental Conservation. 3rd. ed. New York: John Wiley and Sons, Inc., 1972.

________, Milton, John P. and Freeman, Peter H. Ecological Principles for Economic Development. New York: John Wiley and Sons, Ltd., 1973.

"Definition: Conservation Education, Outdoor Education, Environmental Education." A Paper from the National Conference of the Conservation Education Association, Lafayette, Louisiana, August, 1970.

Department of Education, Dept. Order No. 1. "The Revised Educational Program Approved by the Board of National Education." Manila, 1957.

Department of Educational Services. Conservation, A Guide for Teachers. Chicago, Ill.: Field Enterprises Educational Corporation, 1972.

Department of Education and Culture, Dept. Order No. 20. " The Revised Secondary Education Program, 1973." Manila, 1973.

Doll, Ronald C. Curriculum Improvement: Decision-Making and Process. Boston: Allyn and Bacon, Inc., 1967.

Donaldson, George W. and Donaldson, Alan, D. "Outdoor Education: Its Promising Future." Outdoor Education. Edited by Donald R. Hammerman and William M. Hammerman. Minneapolis, Minn.: Burgess Publishing Company, 1973.

________, and Donaldson, Louise E. "Outdoor Education -- A Definition." Outdoor Education. Edited by Donald R. Hammerman and William M. Hammerman, Minneapolis, Minn.: Burgess Publishing Company, 1973.

Doran, Rodney L. and Watson, William. "Games for Science Classroom." The Science Teacher, XL (April, 1973), 31-32.

Eiss, Albert F. and Harbeck, Mary. Behavioral Objectives in the Affective Domain. Washington, D.C.: National Education Association Publications, 1969.

"Elements of a New Environmental Ethic." The Case for Environmental Education. Washington, D.C.: U.S. Office of Education, 1970.

Elevazo, A. O. and Boquiren, T. N., eds. Directions for Philippine Education in the Seventies. Manila: Philippine Association for Graduate Education, 1971.

Environmental Education/Facility Resources. New York: Educational Facilities Laboratories, Inc., 1972.

Fall, Michael W. "Teaching Ecology in the Urban Environment." The American Biology Teacher, XXXI (December, 1969), 572-73.

Fischer, John. "Survival U." Affirmative Education. Edited by Barry Schwartz. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

Fleetwood, George R. "Teachers' Guide for Environmental Education." Department of Instruction, North Carolina Board of Instruction, Raleigh, North Carolina, 1970.

Forselius, Sten. "Environmental Education in the School Curricula: The Swedish Example." Prospects, II (Winter, 1972), 477-84.

Foster, Philips W. Introduction to Environmental Science. Homewood, Ill.: Learning Systems Company,1972.

Galushim, V. M. and Doraiswami, S. "Three Approaches to Environmental Education in the Schools." Journal of Environmental Education, IV (Summer, 1973) 10-11.

Garzon, Dionisio P. "An Analysis of the Problems of Teaching Elementary Science in the Philippine Public Schools." The Philippine Journal of Science Teachers, V (September and December, 1970) 27-28.

George, Robert W. "A Comparative Analysis of Conservation Attitudes in Situations where Conservation Education is a Part of the Educational Experience." University Microfilms, Ann Arbor, Michigan, 1966.

Glass, Bentley. "The Philosophy of a Curriculum Study." BSCS Newsletter, XXXVII (Novermber, 1969), 3-5.

Goodlad, John I. "The Curriculum." Rational Planning in Curriculum and Instruction. National Education Association Center for the Study of Instruction. Washington, D.C.: National Education Association, 1967.

Gross, Phyllis and Railton, Esther P. Teaching Science in an Outdoor Environment. Berkeley, Calif.: University of California Press, 1972.

Governor's Environmental Task Force. Michigan's Environmental Future. William B. Stapp, chairman. Lansing, Michigan, 1973.

Gusta
En
si

Hamme
Fa
Un

of
Co

Harbe
D.

Hard
19
In

Hardy
Ed
19

m

Harm
w
1

Harr

Hawk
C
m
i

Hawk

Her

Gustafson, John A. "Content, Concepts and Conscience." Interpreting Environmental Issues. Edited by Clay Schoenfield. Madison, Wisconsin: Dembar Educational Research Services, Inc., 1972.

Hammerman, Donald R. "A Historical Analysis of the Socio-Cultural Factors that Influenced the Development of Camping Education." University Microfilms, Ann Arbor, Michigan, 1961.

__________, and Hammerman, William M., eds. Outdoor Education: A Book of Readings. 2nd ed. Minneapolis, Minn.: Burgess Publishing Company, 1973.

Harbeck, Mary, ed. A Sourcebook for Science Supervisors. Washington, D.C.: National Science Teachers Association, 1967.

Hardin, Garrett. "Education for Tommorrow." Environmental Education 1970. Edited by Everett Hafner and others. New York: Scientists' Institute for Public Information, 1970.

Hardy, Clifford A. "Training Social Studies Teachers in Environmental Education." The Journal of Environmental Education, IV (Summer, 1973) 14-15.

__________, and Cowan, Paul J. "Environmental Education and the Elementary School." Science and Children, VIII (May, 1971), 16-17.

Harmin, Merrill, Kirschenbaum and Simon, Sidney B. "Teaching Science with a Focus on Values." The Science Teacher, XXXVII (January, 1970), 17-20.

Harris, Melville. Environmental Studies. New York: Citation Press, 1971.

Hawkins, Donald E. and Vinton, Dennis A. "Environmental Education." Outdoor Education: A Book of Readings. Edited by Donald R. Hammerman and William M. Hammerman. Minneapolis, Minn.: Burgess Publishing Company, 1973.

Hawkins, Mary. "Developing an Environmental Ethic." The Science Teacher, XXXVIII (September, 1970), 17-18.

__________. "International Conference on the Education of Teachers for Integrated Science." The Science Teacher, XL (May, 1973), 43.

Herrick, Virgil E. Strategies of Curriculum Development. Edited by James B. Macdonald, Dan W. Anderson, and Frank B. May. Columbus, Ohio: Charles E. Merrill Books, Inc., 1965.

He

Ho

Ho

Ho

How

Hu

Hu

ISC

Int

Int

Jac

Jan

Jue

Hetherington, Martin. "Teaching Aids for Environmental Science." Michigan State University, January, 1971.

Hodson, H. V. The Diseconomies of Growth. New York: Ballantine Books, 1972.

Hoem, Jean C. "Environmental Education in the Arts." Processes for A Quality Environment. Edited by Robert S. Cook and George T. O'Hearn. Green Bay, Wisconsin: The University of Wisconsin-Green Bay, 1971.

Holobinko, Paul, Rasmussen, F.A. and Showalter, Victor. "Synopsis of Games and Simulations in the Commercial Edition of the ERC Life Science." Environmental Education: A Sourcebook. Edited by Cornelius Troost and Harold Altman. New York: John Wiley and Sons, Inc., 1972.

Howlett, George. "Twelve Major Concept Categories and Their Rationale." Project I-C-E (Instruction-Curriculum-Evaluation), Green Bay, Wisconsin, 1973. (Mimeographed.)

Huq, Muhammad Shamsul. Education and Development Strategy in South and Southeast Asia. Honolulu, Hawaii: East-West Center Press, 1965.

Hurd, Paul Dehart. "Education's Response to Awareness Needs." The Case for Environmental Education. Washington, D.C.: U.S. Office of Education, 1970.

________. "Guidelines for Development of a Life Sciences Program in the Middle School." BSCS Newsletter, XXXIV (April, 1969), 2.

ISCS Newsletter, Number 10, September, 1972. Florida State University, Tallahassee, Florida.

Intermediate Science Curriculum Study. Probing the Natural World, Level 3. Morristown, N.J.: Silver Burdett Company, 1973.

International Bureau of Education. The Study of the Environment in School. Paris: UNESCO, 1968.

Jackman, W. S. Nature Study. 3rd Yearbook of the National Society of the Scientific Study of Education. Chicago: University of Chicago Press, 1904.

Jarrett, Henry, ed. Perspectives on Conservation. Baltimore: Johns Hopkins Press, 1966.

Juelle, Aurelio. "Integrated Science Teaching in the Philippines." The Phiilippine Journal of Science Teachers, V (September and December, 1970), 7.

Karplus, Robert and Thier, Herbert D. A New Look at Elementary School Science. Chicago: Rand McNally and Company, 1967.

Kay, Richard. "Environmental Education Through the State Education Agency". A lecture presented at Idaho State University, 1970. (Miemographed.)

Kentucky Department of Education, Division of Program Development. "Kentucky's Environmental Education Program". A brochure.

Kinnick B. Jo; Boney, Virginia; Huntington, Elizabeth A; Rasmussen; Simon, Shirley A; Tacinas, Nicolas G. and Zimmerman, Elizabeth. "The Teachers and the In-service Education Program." In-Service Education for Teachers, Supervisors and Administrators. Fifty-sixth Yearbook, National Society for the Study of Education. Part I. Chicago: The University of Chicago Press, 1957.

Klimas, John. "Education and the Ecological Crisis." Science and Children, VII (March, 1970),30-31.

Knapp, Clifford E. "Attitudes and Values in Environmental Education." The Journal of Environmental Education, III (Summer, 1972), 28.

Kormondy, Edward J. Concepts of Ecology. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969.

Kuhn, David J. "A Simulation Game on Natural Selection." The Science Teacher, XXXVI (January, 1969) 68.

_________. "Value Education in the Sciences: The Step Beyond Concepts and Processes." University of Wisconsin-Parkside, 1972. (Mimeographed.)

Kuhn, Ferdinand and Kuhn, Delia. The Philippines, Yesterday and Today. New York: Holt, Rinehart and Winston, Inc., 1966.

Kuslan, Louis I. and Stone, Harris A. Teaching Children Science: An Inquiry Approach. Belmont, Calif.: Wadsworth Publishing Company, Inc., 1968.

___________. Readings on Teaching Children Science. Belmont, Calif.: Wadsworth Publishing Company, Inc., 1969.

Labinowich, Ed. "A Closer Look at Environmental Education." Environmental Education in the Elementary School. Edited by Sylvia K. Shugrue and Bernice Lamberton. Washington, D.C.: The National Science Teachers Association, 1972.

Lambert, J.M., ed. The Teaching of Ecology. Oxford and Edinburgh: Blackwell Scientific Publications, 1967.

Lawson, Chester A. "The Life Science Program of the Science Curriculum Improvement Study." The American Biology Teacher, XXIX (March, 1967), 185-90.

Lenica,Jan and Sauvy, Alfred. Population Explosion. New York: Dell Publishing Co., 1962.

Lerner, Marjorie S. "In-service Science Activities for the Elementary School Teacher." Readings in Science Education for the Elementary School. Edited by Edward Victor and Marjorie S. Lerner. New York: The MacMillan Company, 1967.

Lewis, Arthur J. "The Role of the Administrator in In-service Education." In-service Education for Teachers, Supervisors and Administrators. Fifty-sixth Yearbook. The National Society for the Study of Education. Part I. Chicago: The University of Chicago Press, 1957.

Linsky, Ronald B. "Educational Strategies for an Environmental Ethic." The Science Teacher, XXXVIII (January, 1971), 16-18.

MacGown, Richard H. "The School Site in Environmental Education." Maine Environmental Education Project, Yarmouth, Maine, 1972. (Mimwoegraphed.)

Magsaysay Committee on General Education. Toward General Education in the Philippines. Manila: University of the East, 1960.

Malassis, L. Economic Development and the Programming of Rural Education. Paris: UNESCO, 1966.

Mand, Charles E. Outdoor Education. Columbus, Ohio: Charles E. Merrill Publishing Company, 1972.

Manson, Joy and Salmon, R.B. An Experiment in Environmental Studies. Edinburgh, U.K.: Oliver and Boyd, 1968.

Marcelo, Levi. "Danger: Air Pollution and Water Pollution Poisoning Manila Area." Bulletin Today, (Manila), February 10, 1973.

Marland, S. P. Jr. "Environmental Education." American Education, VII (May, 1971), 8.

Massialas, Byron G. "Inquiry." Today's Education, LVIII (May, 1969), 40-42.

Matthews, Jean Worth. "Parks and Processes." Trends, July, 1971. (A reprint.)

McGaw, D. H. and McGaw, C. A. "Audio-Tutorial Learning in the Secondary School." Individualized Science, Like It Is. Edited by Henry J. Triezenberg. Washington,D. C.: National Science Teachers Association, 1972.

Meeker, Joseph W. "Academic Fields and other Polluted Environments." The Journal of Environmental Education, IV (Spring, 1973) 37-39.

Menesini, Mario M. The Environmental School. Orinda, Calif.: Educational Consulting Service, 1970.

Mirka, George. "Factors Which Influence Elementary Teachers' Use of Outdoor Classrooms." The Journal of Environmental Education, IV (Summer, 1973), 31-33.

Mitchell, John G. and Stallings, Constance L. Ecotactics. New York: Pocket Books, Simon and Schuster, Inc., 1970.

National Association of Biology Teachers. Handbook for Teaching of Conservation and Resource-Use. Dansville, Ill.: Interstate Printers and Publishers, Inc., 1958.

National Education Association. Environmental Education in Public Schools. Washington, D.C.: National Education Association, 1972.

National Environment Education Development. Adventure in Environment, Teachers' Guide. Morristown, N.J.: Silver Burdett Company, 1971.

National School Public Relations Association. Environment and the Schools. Washington, D.C.: National School Public Relations Association, 1971.

National Society for the Scientific Study of Education. Science Education in American Schools. Forty-sixth Yearbook. Part I. Chicago: The University of Chicago Press, 1947.

__________. Education in Rural Communities. The Fifty-first Yearbook. Chicago: The University of Chicago Press, 1952.

__________. In-Service Education for Teachers, Supervisors and Administrators. Fifty-sixth Yearbook. Part I. (Chicago: The University of Chicago Press, 1957.

__________. The Integration of Educational Experiences. Fifty-seventh Yearbook. Part III. (Chicago: The University of Chicago Press, 1958.

National Science Teachers Association. "School Science Education for the 70's." The Science Teacher, XXXVIII (November, 1971), 49.

________. Programs in Environmental Education. Washington, D.C.: National Science Teachers Association, 1970.

New Hampshire Division of Instruction. "Environmental Education for New Hampshire Elementary and Secondary Schools." New Hampshire State Department of Education, Concord New Hampshire, 1971.

New Jersey Environmental Education Council. "The Master Plan for Environmental Education: A Proposal for New Jersey." Washington, D.C.: U.S. Office of Education, 1971.

Nicklesburg, Janet. Field Trips: Ecology for Youth Leaders. Minneapolis, Minn.: Burgess Publishing Co., 1966.

Noblejas, Antonio H. Philippine Law on Natural Resources. Manila: Central Book Supply, Inc., 1961.

Novak, Joseph D. "Audio-Tutorial Techniques." Individualized Instruction, Like It Is. Edited by Henry J. Triezenberg. Washington, D.C.: National Science Teachers Association, 1972.

NSTA Committee on Conservation and Environmental Studies. "Selection of Curriculum Materials in Conservation and Environmental Studies." The Science Teacher, XXXVII (May, 1970), 35.

NSTA Committee on Issues. "NSTA Positions on Critical Issues Confronting the Science Teaching Professions." The Science Teacher, XXXVII (October, 1970), 55-56.

Odum, Eugene, P. Ecology. New York: Holt, Rinehart and Winston, 1966.

Orata, Pedro T. "Community Schools in the Philippines." Prospects in Education, I (Winter, 1979), 52-53.

Osborn, Ron and Spofford, Roger. "Interdisciplinary Involvement in Environmental Field Trips." The Science Teacher, XXXVII (April, 1970), 73-74.

Overcash, Rosson. "Environmental Studies in the City." The Science Teacher, XXXVIII (February, 1971), 18.

Parker, Cecil J. "Guidelines for In-Service Education." In-Service Education for Teachers, Supervisors and Administrators. Fifty-sixth Yearbook. National Society for the Study of Education. Part I. (Chicago: The University of Chicago Press, 1957.

Pas

Per

Pla

Pop

Po

Pr

Qu

R

R

R

Passmore, John. Outdoor Education in Canada - 1972. Toronto: Canada Education Association, 1972.

Perry G. A., Jones, E. and Hammersley, A. Handbook for Environmental Studies. London: Blandford Press, 1971.

________. Teachers' Guidebook No. 1, Environmental Studies. London: Blandford Press, 1968.

Places for Environmental Education. New York: Educational Facilities Laboratories, Inc., 1971.

Population Curriculum Study. A Conceptual Scheme for Population-Environment Studies. Experimental Edition Revised. Newark, Delaware: University of Delaware, 1973.

Population Reference Bureau. 1972 World Population Data Sheet. Washington, D.C.: Population Reference Bureau, Inc., 1972.

Presidential Commission to Survey Philippine Education. Education for National Development: New Patterns, New Directions. Survey Report. Manila, 1970.

Qutub, Musa Y. "How to Make Science Interesting." Science Education, LVI (April-June, 1972), 231.

________. Secondary Environmental Science Methods. Columbus, Ohio: Charles E. Merrill Publishing Co., 1973.

Ralston, Noel P. and Martin, Ivan R. "A Cross Cultural Environmental Education Model." Environmental Education, II (Winter, 1970),32-36.

Rasmussen, Fred A. "Science Teaching and Academic Gaming." The American Biology Teacher, XXXI (December, 1969), 560.

Raths, James. "A Strategy for Developing Values." Studying Teaching. Edited by James Raths, John R. Pancella and James E. Van Ness. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971.

Raths, Louis E., Harmin, Merrill and Simon, Sidney. Values and Teaching. Columbus, Ohio: Charles E. Merrill Publishing Co., 1966.

Renner John W. and Stafford, Don G. Teaching Science in the Secondary School. New York: Harper and Row, 1972.

Report of Iran on Environmental Problems. National Reports on Environmental Problems. U.N. Conference on the Human Environment. Ann Arbor, Michigan: Xerox-University Microfilms, 1973.

Report of Philippines on Environmental Problems. National Reports on Environmental Problems. U.N. Conference on the Human Environment. Ann Arbor, Michigan: Xerox-University Microfilms, 1973.

Richard, Paul W. "Enrichment in Biology." The American Biology Teacher, XXXI (October, 1969), 444-47.

Richmond, P.E., ed. New Trends in Integrated Science Teaching. Vols. I and II. Paris: UNESCO, 1971 and 1972.

Romey William D. Inquiry Techniques for Teaching Science. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968.

Romulo, Carlos P. "The Philippines at the Turning Point." Population, A Challenge to Environment. Washington, D.C.: Planned Parenthood-World Population, 1970.

Rosengren, John H. Outdoor Science for the Elementary Grades. West Nyack, N.J.: Parker Publishing Co., Inc., 1972.

Roth, Charles. "A Massachusetts Audubon Society Program." Processes for Quality Environment. Edited by Robert S. Cook and George T. O'Hearn. Green Bay, Wis.: University of Wisconsin-Green Bay, 1971.

Roth, Robert E. "Fundamental Concepts for Environmental Management Education (K-16)." Environmental Education, I (Spring, 1970), 65.

__________, and Hegelson, Stanley L. A Review of Research Related to Environmental Education. Columbus, Ohio: The Ohio State University, 1972.

Rowe, Mary Budd and Hurd, Paul DeHart. "The Use of In-Service Programs to Diagnose Sources of Resistance to Innovation." Journal of Research in Science Teaching, IV (No. 1, 1966), pp. 3-13.

Rutherford, James and Gardner, Marjorie. "Integrated Science Teaching." New Trends in Integrated Science Teaching. Edited by P. E. Richmond. Vol. I. Paris: UNESCO, 1970.

Sale, Larry L. and Lee, Ernest W. Environmental Education in the Elementary School. New York: Holt, Rinehart and Winston, Inc., 1972.

Samples, Robert E. "Environmental Studies." The Science Teacher, XXXVIII (October, 1971), 36-37.

Schlich, Victor. "Environmental Encounters." American Education, VII (August/September, 1971), 23-26.

Schoenfield, Clay, ed. Interpreting Environmental Issues. Madison, Wisconsin: Dembar Educational Research Services, Inc., 1973.

Science Education Center, University of Oklahoma. "Evaluating Elementary School Science Curriculum." Science and Children, X (December, 1972), 14.

Schwab, Joseph J. and Brandwein, Paul F. The Teaching of Science. Cambridge, Mass.: Harvard University Press, 1962.

Sharp L. B. and Partridge, DeAlton E. "Some Historical Backgrounds of Camping." Outdoor Education: A Book of Readings. Edited by Donald R. Hammerman and William M. Hammerman. Minneapolis, Minn.: Burgess Publishing Company, 1973.

Shaver, James P. "Environmentalism and Values." The Journal of Environmental Education, IV (Fall, 1972), 51.

Shomon, Joseph J. Manual of Outdoor Conservation Education. New York: National Audubon Society, 1968.

Shugrue, Sylvia and Lamberton, Bernice, eds. Environmental Education in the Elementary School. Washington, D.C.: National Science Teachers Association, 1972.

Simon, Sidney B., Howe, L. and Kirshenbaum, H. Values Clarification. New York: Hart Publishing Company, 1972.

Slesnick, Irwin L. "Population Education - A Response to a Social Problem." The Science Teacher, XXXVIII (February, 1971), 22-23.

Smith, Julian W. " A Decade of Progress in Outdoor Education". Outdoor Education: A Book of Readings. Edited by Donald R. Hammerman and William M. Hammerman. Minneapolis, Minn.: Burgess Publishing Compnay, 1973.

__________; Carlson, Reynold, E.; Donaldson, George, W.; and Masters, Hugh. Outdoor Education. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1963.

Spears, Harold. Curriculum Planning Through In-Service Training Programs. Englewood Cliffs, N.J. Prentice-Hall, Inc., 1957.

Special Area Group for Science Education. "Science Education in the Philippines." A report submitted to the Presidential Commission to Survey Philippine Education. Manila, 1970. (Mimeographed.)

Stapp, William B. "Community Profile and Life-Style Survey." A paper in a Seminar-Workshop on Problems of Human Settlements, at Higgins Lake, Michigan, July 15-19, 1973. (Mimeographed.)

________. "Development, Implementation and Evaluation of Environmental Education Program K-12." University of Michigan, April, 1973. (Mimeographed.)

________. "Environmental Education: Approaches to Curriculum Development (K-12). Processes for Quality Environment. Edited by Robert S. Cook and George T. O'Hearn. Green Bay, Wisconsin: University of Wisconsin-Green Bay, 1971.

________. "Environmental Encounters." Environmental Education: A Sourcebook. Edited by Cornelius Troost and Harold Altman. New York: John Wiley and Sons, Inc., 1972.

________. "In-Service Teacher Training in Environmental Education." Environmental Education: A Sourcebook. Edited by Cornelius Troost and Harold Altman. New York: John Wiley and Sons, Inc., 1972.

________. Integrating Conservation and Outdoor Education into the Curriculum (K-12). Minneapolis, Minn.: Burgess Publishing Company, 1965.

________; Bennett, Dean; Bryan, William, Jr.; Fulton, Jerome; MacGregor, Jean; Novalk, Paul; Swan, James; Wall, Robert; and Havlick, Spenser. "The Concept of Environmental Education." The American Biology Teacher, XXXII (January, 1970), 15-17.

State of Michigan Legislature, Senate Concurrent Resolution No. 69. April 28, 1971.

Stevens, R. A. Out-of-School Science Activities for Young People. Paris: UNESCO, 1969.

Strong, Douglas H. The Conservationists. Menlo Park, California: Addison-Wesley Publishing Co., 1971.

Strong, Maurice F., ed. Who Speaks for Earth. New York: W.W. Norton and Company, Inc., 1973.

Studebaker, Paul. "The Justification for Environmental Education." The Journal of Environmental Education, IV (Summer, 1973), 48.

Suchman, J. Richard. "Inquiry Training in the Elementary School." Readings on Teaching Children Science. Edited by Louis I. Kuslan and A. Harris Stone. Belmont, Calif: Wadsworth Publishing Company, Inc., 1969.

Sund, Robert E., Tillery, Bill W. and Trowbridge, Leslie. Elementary Science Discovery Lessons: the Biological Sciences. New York: Allyn and Bacon, 1970.

Swan, James. "Formation of Environmental Awareness: A Social Awareness." Processes of a Quality Environment. Edited by Robert S. Cook and George T. O'Hearn. Green Bay, Wis.: University of Wisconsin-Green Bay, 1971.

________. "The Challenge of Environmental Education." Phi Delta Kappan, LI (September, 1969) 27-28.

Taba, Hilda. Curriculum Development, Theory and Practice. New York: Harcourt, Brace and World, Inc., 1962.

________. "Learning by Discovery: Psychological and Educational Rationale." Readings on Teaching Children Science. Edited by Louis I. Kuslan and A. Harris Stone. Belmont, Calif.: Wadsworth Publishing Company, 1969.

Tansey, P.J. and Unwin, Derick. Simulation and Gaming in Education. London: Methuen Educational, Ltd., 1969.

Terry, Mark. Teaching for Survival. New York: Ballantine Books, Inc., 1971.

Troost, Cornelius J. and Altman, Harold, eds. Environmental Education: A Sourcebook. New York: John Wiley and Sons, 1972.

Tyler, Ralph W. Basic Principles of Curriculum and Instruction. Chicago: University of Chicago Press, 1950.

United Nations Economic and Social Council. National Science Policy and Organization of Research in the Philippines. Paris: UNESCO, 1970.

________. Problems of the Human Environment. Report of the Secretary General, E/4667.

________. Use and Conservation of the Biosphere. Proceedings of the Intergovernmental Conference of Experts on the Scientific Basis for Rational Use and Conservation of the Resources of the Biosphere, Paris, 4-13 September 1968

United Nations Economic Mission for Asia and the Far East, The Second Asian Population Conference. Tokyo, 1-13 November, 1972.

United Nations General Assembly, Conference on the Human Environment, Stockholm, 5 - 16 June 1972. An Action Plan for the Human Environment, A/Conf. 48/5.

_________, Development and Environment, A/Conf. 48/10.

_________, Educational, Informational, Social and Cultural Aspects of Environmental Issues, A/Conf. 48/9.

U.S. Department of Agriculture, Soil Conservation Service. An Outline for Teaching Conservation in Elementary Schools. Washington, D.C.: Government Printing Office, 1971.

_________. Outdoor Classrooms on School Sites. Washington, D.C.: Government Printing Office, 1972.

U.S. Department of Health, Education and Welfare, Office of Education. A New Role for American Education. Government Printing Office, 1970.

_________. Environmental Education, Education That Cannot Wait. Washington, D.C.: Government Printing Office, 1971.

_________. The Case for Environmental Education. Washington, D.C.: 1970.

U.S. Department of Interior, Bureau of Land Management. All Around You: An Environmental Study Guide. Washington, D.C. Government Printing Office, 1971.

U.S. Department of State. Republic of the Philippines. Background Notes. Washington, D.C.: Government Printing Office, 1972.

Victor, Edward and Lerner, Marjorie S. eds. Readings in Science Education for the Elementary School. New York: The MacMillan Company, 1967.

Visher, Halene H. " A Determination of Conservation Principles and Concepts Desirable for Use in the Secondary Schools." University Microfilms, Ann Arbor, Michigan, 1960.

Ward, Barbara and Dubos, Rene. Only One Earth. New York: W.W. Norton and Company, Inc., 1972.

Wentworth, D. F.; Couchman, J.K. MacBean,John C., and Stecher, Adam. Examining Your Environment. 12 Units. Minneapolis, Minn.: Winston Press, 1972.

White, Roy C. "A Study Associating Selected Conservation Understandings with Available Community Resources from Grades Four Through Twelve." University Microfilms, Ann Arbor, Michigan, 1967.

Williams, Iolo Wyn. "Teaching Methods in Integrated Science at the Primary and Secondary Levels." Trends in Integrated Science Teaching. Vol. II. Edited by P. E. Richmond. Paris: UNESCO, 1972.

Wing, Richard. "Simulation as a Method of Instruction in Science Education." The Science Teacher, XXXV (May, 1968), 41-42.

Winn, Ira. "The Education in Environmental Education." The Journal of Environmental Education, I (Summer, 1970), 140-41.

Wisconsin Environmental Education Plan. A brochure distributed at the National Conference of the Conservation Education Association, Murray, Kentucky, August 12-16, 1973.

Wittich, Walter A. and Schuller, Charles F. Audio-Visual Materials, their Nature and Use. 4th ed. New York: Harper and Row, Publishers, 1967.

APPENDICES

APPENDIX A

List of Sources Used for the Development of Fundamental Concepts for Environmental Conservation Education

1. American Association of School Administrators, Conservation Education in American Schools. Twenty-ninth Yearbook. Washington, D.C.: American Association of School Administrators, 1951.

2. Byron Asbaugh and Muriel Beuschlein, Things to Do in Science and Conservation. Dansville, Ill.: The Interstate Printers and Publishers, Inc., 1960.

3. Effie G. Bathurst, editor. Conservation Education in Rural Schools. Washington, D.C: National Education Association, 1943.

4. Matthew J. Brennan, editor. People and Their Environment. Teachers' Curriculum Guides. 8 Volumes. Chicago: J.G. Ferguson Publishing Company, 1969.

5. Robert E. Brown and G. W. Mouser. Techniques for Teaching Conservation Education. Minneapolis, Minn.: Burgess Publishing Company, 1964.

6. Raymond F. Dassman, Environmental Conservation. 3rd ed. New York: John Wiley and Sons, Inc., 1972.

7. Phyllis Gross and Esther P. Railton, Teaching Science in an Outdoor Environment. Berkeley, Calif.: University of California Press, 1972.

8. Robert E. Roth, "Fundamental Concepts for Environmental Management Education (K-16), Environmental Education, I (Spring, 1970), 65-74.

9. Larry L. Sale and Ernest W. Lee, Environmental Education in the Elementary School. New York: Holt, Rinehart and Winston, Inc., 1972.

10. Joseph J. Shomon, Manual for Outdoor Conservation Education. New York: National Audubon Society, 1968.

11. William B. Stapp, Integrating Conservation and Outdoor Education into the Curriculum (K-12). Minneapolis, Minn.: Burgess Publishing Company, 1965.

12. Cornelius J. Troost and Harold Altman, editors. Environmental Education: A Sourcebook. New York: Wiley and Sons, Inc., 1965.

13. U.S. Department of Agriculture, Soil Conservation Service, An Outline for Teaching Conservation in Elementary Schools. Washington, D. C.: Government Printing Office, 1971.

1.

and

E

APPENDIX B

Score Sheet For Ecosystem Analysis[1]

I. Site Overview.

It is important to identify the character of the site, the present use and function of the area and signs of environmental quality.

A. Character of the Site

Location	______Urban area	_____Rural area
Affect by population	______Yes	_____No
Stability	______Stable	_____Unstable
Complexity	______Simple	_____Complex
Productivity	______Low	_____High
Land use demand	______Heavy	_____Light

B. Present Land Use

Function of the site (agricultural, natural resources, recreational, residential, industrial, commercial)

C. Signs of Environmental Quality

1. Soil erosion	____not evident	___evident
2. Plant life	____vigorous, dense	___sickly, sparse
3. Animal Life (birdlife)	____present	___absent
4. Air pollution	____not noticeable	___noticeable
5. Water pollution	____not visible	___visible

---

[1]Adapted from 4-H Bulletin 330B, Ecosystem Analysis. Cooperative Extension Service, Michigan State University, 1973.

II.

air,
the
ment

6. Storm sewers, ditches ____adequate ____overloaded

7. Swamp areas ____maintained ____filled-in

8. Solid waste litter ____clean ____problem

9. People pressure ____light ____medium ____heavy

10. "Color of site" ____green ____brown-black

II. Site Components

Each site -ecosystem -- has a number of basic component parts: water, air, soil and biota (plants and animals). The results will help identify the limiting factors and corrective action needed for maintaining environmental quality.

A. Water Component of the Site

1. Type of surface water ____standing water

   ____flowing water

2. Temperature of the water ____surface

   ____bottom

3. Dissolved oxygen level: surface ____parts per million

   bottom ____ppm

4. Turbidity of water ____low ____medium ____high

5. Chemical nutrients in water (optional)

   Nitrogen test ____ppm

   Phosphates test____ppm

B. Air Component of the Site

1. Visibility ____clear ____haze ____fog ____smog

   Time of day: ____

2. Particulate matter ____solid ____liquid

   Very low ____low____moderate ____high ____

3. Particulate type _____soil _____ash _____pollen _____other

4. Noticeable effects on plants _____none _____slight _____moderate _____severe

C. Soil Component of the Site

1. Position Floodplain _____ Terrace _____ Upland _____

2. Slope _____nearly sloping _____gently sloping _____moderately sloping _____strongly sloping _____steep

3. Texture

	fine	medium	coarse	organic
Topsoil	_____	_____	_____	_____
Subsoil	_____	_____	_____	_____

4. Color

Topsoil _____dark brown _____brown _____light brown

Subsoil _____dull _____mottled _____bright

5. Erosion _____slight _____moderate _____severe

6. Permeability (inches per hour) _____slow _____moderate _____rapid

D. Biota Component of the Site

1. Soil organisms _____ _____ _____ _____

2. Aquatic organisms _____ _____ _____ _____ _____ _____

I

IV

3. Dominant plants ______________ ______________

______________ ______________ ______________

4. Dominant animals ______________ ______________

______________ ______________ ______________

III. Limiting Factors to Quality Environment

A. Use Suitability

_____excellent _______good _______fair ______unsuitable

B. Limiting Factors

1. Site location ____________ 7. Flooding ____________
2. Site suitability ____________ 8. Steep slopes ____________
3. Solid-waste litter ____________ 9. Soil serosion ____________
4. Water quality ____________ 10. Permeability ____________
5. Stream sedimentation ____________ 11. Animal wastes ____________
6. Air quality ____________ 12. Toxic materials ____________

IV. Suggested Practices and Corrective Actions

1. Monitor for pollution ____________
2. Stabilize stream banks ____________
3. Treat waste water ____________
4. Control weeds for pollen control ____________
5. Control litter in the vicinity ____________
6. Control erosion ____________
7. Install windbreaks ____________
8. Improve wildlife habitat ____________
9. Plant shrubs, trees to improve quality ____________