

Environmental Education Module

Biological Diversity

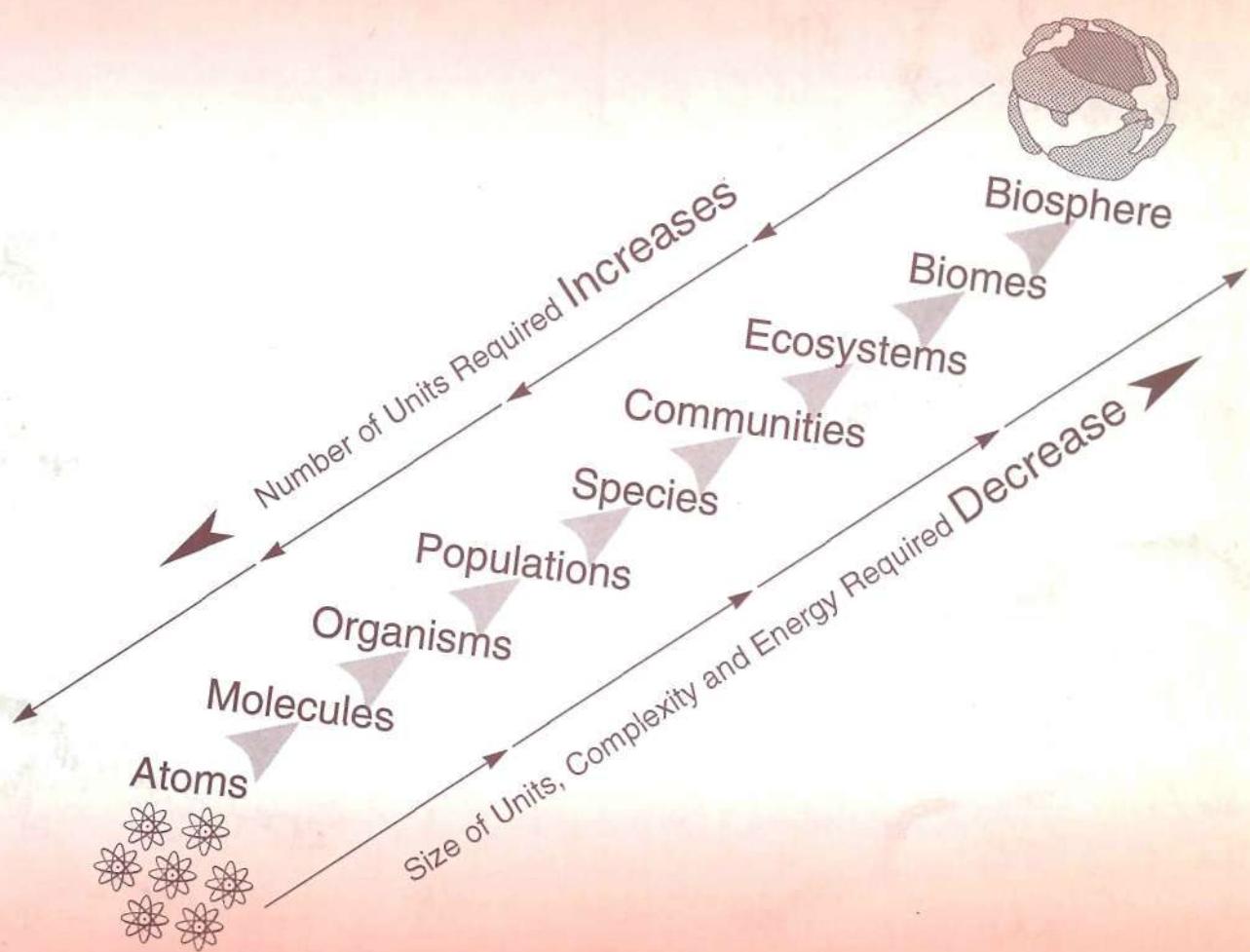


Table of Contents

Section 1: Introduction to Environmental Education and Biodiversity	1
CHAPTER 1: Introduction to Environmental Education and Biodiversity	1
Who The Module is For	1
The Objectives of the Module	2
How the Module is Organized	3
Limitations of the Module	3
CHAPTER 2: Biodiversity as a Goal of Environmental Education	4
The Need for Environmental Education	4
The Development of Environmental Education	5
Achieving the Goal of Positive Environmental Behavior Changes	7
Can Environmental Education Influence Citizen Behaviors?	7
Effective Strategies for Environmental Education	10
Biodiversity as an Environmental Education Topic	13
Section 2: An Educational Framework for Biodiversity: Ecology, Problems and Issues ..	18
CHAPTER 3: The Nature of Biodiversity Problems	18
What is biodiversity?	20
Genetic Diversity	22
Species Diversity	22
Ecosystem Diversity	23
What is the distribution of biodiversity in space and time?	24
Geographic scale	24
Distribution in space	24
Distribution in time	26
Why is biodiversity important?	28
Ecological importance of biodiversity	28
Stability of ecosystem functions and processes	28
Genetic diversity	29
Species interactions	29
Nutrient cycling	30
Stabilization of Climate	31
Direct importance of biodiversity to humans	32
Medicines and drugs	32
Alternative foods	32
Energy sources	33
Building supplies	33
Local income generating livelihoods	34
What are the threats to biodiversity?	35
Habitat destruction and fragmentation	36
Climate change and global warming	37

Species ranges and mortality affected by precipitation and temperature	37
Plant and animal interactions	37
Fixed location of present refuges	37
Pollution and chemicals	38
Introduced species	38
Direct human intervention	39
 CHAPTER 4: Managing for Biodiversity	41
What Can be Done to Manage Biodiversity?	41
Gene Banks	42
<i>In Situ</i> Conservation in Protected Areas	43
Government and Nongovernment Organization (NGO) Programmes	44
Conserve habitat	44
Control of wildlife products market	46
Curb pollution	47
Captive breeding and reintroductions	47
Status of science and technology	49
Taxonomy, genetic diversity, and life history	49
Ecosystem function	49
Biogeography and climate change	50
Traditional practices and sustainable use	50
 CHAPTER 5: The Nature of Biodiversity Issues	51
The Developmental Nature of Issues	51
Identifying Some Critical Components of Biodiversity Issues	54
Status of Our Scientific and Technical Knowledge	54
The Status of Stakeholder Beliefs and Values	56
The Role of Beliefs in Issues	56
The Role of Values in Issues	58
Why is Biodiversity Management Difficult?	65
What Does the Nature of Biodiversity Issues Mean for Environmental Education?	66
 Section 3: Environmental Education Strategies for Biodiversity	67
 CHAPTER 6: Infusing Biodiversity/Environmental Education	
in the Curriculum	67
Where and How Do We Teach Biodiversity?	67
A Coordinated Infusion Model	69
How Do We Evaluate Our Efforts At Biodiversity/Environmental Education?	77
Measures of Student Achievement in Biodiversity Education	78
Cognitive Gains	78
Affective Gains	82
Assessing Curriculum and Materials Design	86
Assessing the Implementation Process	86
 CHAPTER 7: Model Teaching Activities for Biodiversity\Environmental Education	87

Activity #1: A Moral Dilemma	88
Activity #2: Defining/Observing Biodiversity	93
Activity #3: Biogeography (People, Places and Biodiversity)	98
Activity #4: The Nature of Change	105
Activity #5: Prairie Restoration, A Values Education Case Study	111
Activity #6: Folklore to Fact (Text Analysis for Biodiversity)	118
Activity #7: Ethnobotany	122
Activity #8: Biodiversity in Action	126
Activity #9: Selling the Public on Biodiversity	132
 CHAPTER 8: Implementing the Environmental Education Module on Biodiversity	137
Developing Biodiversity Curriculum Materials	137
Providing Teacher Training in Biodiversity\Environmental Education	140
Recommended UNESCO-UNEP/IEEP References	142
 CHAPTER 9: CONCLUSION	144
 BIBLIOGRAPHY	146

List of Figures

Figure 1. Goals, objectives and guiding principles of environmental education	6
Figure 2. A model of factors which influence environmental behaviors of people	8
Figure 3. A comparison of the infusion and interdisciplinary models	11
Figure 4. An application of environmental education goals for biodiversity	14
Figure 5. Life is organized into a continuum of levels	21
Figure 6. The location of tropical rain forest "hotspots" in the world	27
Figure 7. Species interactions in an old-growth Douglas Fir forest of northwestern North America	31
Figure 8. Most biodiversity issues proceed through stages to become more intense, political and difficult to resolve	52
Figure 9. A simplified analysis of the African elephant issue to illustrate conflicts in beliefs.	57
Figure 10. An illustration of the role of values in a biodiversity issue.	58
Figure 11. Basic domains of attitudes regarding animals and the environment. The attitudes reflect basic values which are useful in understanding biodiversity issues.	61
Figure 12. Attitudes towards wildlife resources among professional wildlife managers (BLM), teachers and citizens of the U.S.A.	61
Figure 13. Diverse attitudes support the same environmental behavior	62
Figure 14. A more realistic analysis of the African elephant issue which shows the role of value as well as belief conflicts in the controversy.	63
Figure 15. A model illustrating opportunities for teaching various biodiversity goal levels in a coordinated infusion framework.	71
Figure 16. Case studies may be used separately or in conjunction with the autonomous investigation and evaluation model	73
Figure 17. An overview of the autonomous learner model	127

Figure 18. A recommended process for developing an extensive environmental education curriculum.	139
Figure 19. A summary of UNESCO-UNEP/IEEP publications which provide useful detailed information for curriculum development and/or teacher training.	143

List of Tables

Table 1 Teacher/Student Roles in the Moral Dilemma Exercise	89
Table 2. Student Scanning Worksheet	94
Table 3. Worksheet: Scanning Diversity	95
Table 5. Estimated Numbers of Plant Species in Various Bioregions of the Earth	100
Table 6. Data on distribution of mammal species, forest and grasslands and economic status of nations	104
Table 7. Student Worksheet: Observing Change	107
Table 8. Examples of the Uses of Wild Plants for Medicine	124
Table 9. Stakeholder Analysis Worksheet	129