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**Ministry of Education
Curriculum Development Unit**

**Proceedings
of the
Environmental Education
Teacher Training
Workshop**

**September 14, 1992
Oasis Motel**

**Supported by:
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INTRODUCTION

The first Environmental Education Teacher Training Workshop was held on September 14, 1992 at the Oasis Motel, Tlokweng, Botswana. The participants had been invited from the four Primary Teacher Training Colleges at Francistown, Lobatse, Serowe and Tlokweng and from the two Colleges of Education at Molepolole and Tonota. The selection had been made by the Teacher Education Department to ensure representation from each of the 12 teaching subjects in the curriculum. In addition, the participants had been identified as leaders in their respective subjects with experience in curriculum revision and development. (Appendices A. and B.)

The purpose of the workshop was, first, to report the results of a needs assessment study directed toward environmental education in the teacher training curriculum and, second, to identify some strategies for incorporating the needs assessment findings in the existing curriculum. It was anticipated that the workshop deliberations would provide valuable insights for beginning a systematic review of the current syllabi. Such a review provides the foundation for future revision of the subject offerings. (Appendix C.)

Ms. Felicity M. Leburu, Principal Curriculum Development Officer, officially opened the workshop. Ms. Leburu noted that this Workshop, the first of its kind, was designed to help teacher educators make specific plans for the careful review and revision of the subject syllabi currently taught in the Primary Teacher Training Colleges and the Colleges of Education.

As an introduction to the activities, a report was provided of the findings from a recent environmental education study in which Botswana teacher trainers, primary school teachers and junior secondary school teachers indicated topics and concepts that they believed should be in the curriculum. These findings were presented to the workshop participants to inform them of topics of special interest to curriculum developers. It was also hoped that the participants would use the identified topics as a guide for their subject panels when they reviewed the syllabi in the future. In this way, it might be possible to identify neglected, but important environmental issues. These additional environmental concepts could be infused into the teacher education curriculum to provide a more complete approach to the nation's environmental concerns.

The participants provided valuable feedback as they discussed the findings. The suggestions and comments will be presented in a later section of the report.

Following the consideration of the needs assessment findings, the participants were expected to consider a specific set of questions pertaining to curriculum review in environmental education. To make the task more manageable, the teacher educators were divided into three teams and two questions from a list of six were assigned to each team. The teams discussed the two questions and reported their findings to the entire group in a plenary session at the end of the day. Their written reports have been presented in the last section of the proceedings. (Appendix F.)

NEEDS ASSESSMENT - PARTICIPANT OBSERVATIONS

1. The analysis would have been easily understood if further information had been given regarding the origin of the categories and topics. The report should have made the point that the categories chosen for classifying the responses had been arbitrary and based on a consensus derived from an inspection of the responses to the first needs assessment of junior secondary schoolteachers.
2. The validity of the first needs assessment was questioned because of the use of Peace Corps Volunteers as subjects. It was agreed that this group might have a special view of the issues in the Botswana context, however, their Botswana

counterparts had also contributed to the data base for this portion of the total needs assessment.

3. The validity of the questionnaire items was questioned on the basis of a possible bias of the persons who devised the questionnaire. It was suspected that the drafters of the questionnaire might not have been certain of the components of environmental education.
4. A number of participants felt that an acceptable definition of environmental education was essential for the development of a needs assessment questionnaire and that the definition should be among the first statements of the analysis.
5. The questionnaire concentrated on the identification of environmental issues rather than the nature of environmental education. Other items should have been selected that would have given greater emphasis to the problems associated with the teaching of the issues.
6. It was observed that the Colleges of Education had been overlooked in the data gathering process. Though it might be possible to accept the findings as similar to the beliefs of the Colleges, it was agreed that a similar study should be made by gathering the impressions of the lecturers from the Colleges of Education.
7. If the Ministry of Education has accepted the teaching of environmental education as one of its major initiatives, what activities have been undertaken by the Curriculum Development Unit to implement this initiative? It was pointed out that the Curriculum Development Officers were already engaged in a review of the existing primary syllabi to identify the concepts and activities that were included and, as a result, it would be possible to identify omissions if they exist.
8. The Primary teacher Training Colleges and the Colleges have incorporated some environmental topics and issues in their syllabi, but full implementation has not been realised due to the reality of other teaching objectives and responsibilities.
9. There is an critical need to determine the status of the training programmes at other institutions such as the Botswana Agricultural College and the Nursing Programme at the National Health Institute and Ministry of Health. Should a needs assessment be conducted at these establishments?
10. The revision of the school curriculum was seen as the most important objective. There was, however, some question about where the beginning efforts should be concentrated. Should revision begin with the syllabi of the teacher training colleges or with the syllabi of primary and junior secondary schools? Would it be plausible to begin both simultaneously?
11. It was indicated that the effective communication of the progress stemming from all revision efforts must be of first priority. A communication network must be established as soon as possible to guide and assist all training personnel.
12. A communication network should help revision and development workers to avoid needless repetition and should serve to provide coordination among the different subject groups and academic levels.
13. There was a stated need to conduct training workshops, seminars or conferences to provide experience in the methods of integrating environmental education into the curriculum.

14. Doubt was expressed concerning the advisability of forcing an environmental emphasis in all school subjects. It may be appropriate to select specific subjects for greater involvement in environmental education.
15. The point was strongly made that the task of integration of environmental concepts into the curriculum is a continuous and on-going activity in the same manner as other aspects of subject evaluation and revision. Therefore, the process should not be viewed as one that has an ending.
16. Repetition of the introduction environmental concepts and treatment of environmental issues within the curriculum was viewed by some participants as a problem needing coordination. Others indicated that planned duplication could provide important reinforcement and should be incorporated in a spiral curriculum.

CURRICULUM REVIEW PLANNING - SMALL GROUP DISCUSSION

1. **Syllabus Review Techniques** - What would be the syllabus review techniques that would be most efficient for identifying environmental topics and concepts?

When reviewing the syllabus for a given subject, it might be most effective to identify the broad categories treated in the subject and then list the specific topics treated under that category. In this way it would be possible to identify topics that have been touched upon more than once in the syllabus. Such topics could be reconsidered with an eye to removing redundancy or enhancing reinforcement if the topic was believed to be especially important. Another approach might be to review the syllabus superficially by listing all the topics encountered and then classify them according to broad environmental categories. Again, this would permit the reviewers to see areas of emphasis and possibly note deficiencies as well.

When similar information can be acquired from other subjects, it may be possible to set up a concept net. Central to the net would be a specific environmental topic. Around the topic would be arranged the concepts and/or activities in all the curriculum subjects. By inspection, the reviewers could identify missed teaching opportunities in some subjects and, in the same vein, identify areas that were taught excessively or with a redundant emphasis across the subjects.

2. **More Effective Teaching** - How can we make the environmental education concepts and topics that are in the syllabus more effectively taught?

We believe that teaching of environmental education can be made more effective if the instructor would use the project method involving more hands-on or practical work. This would create an investigative atmosphere where students would have greater opportunity to solve problems through exploring, gathering and organising data and deriving conclusions based on their findings. By means of field work and trips, students could have first-hand experiences which would make the learning especially meaningful to them. On other occasions, demonstrations by the teacher, or by the students themselves, might be employed to add to the information gathering component of the project. It was felt that the teachers should strive to use audiovisuals whenever they are available as vicarious experiences, especially when the class can not experience an event or visit a site associated with the topic. Of course, all this information can be summarised and evaluated through the discussion method or by using a carefully planned question and answer session. There are times when special information can be provided by the teacher or by a guest expert through a lecture or a special presentation. A good means of summarising and demonstrating what has been learned can be obtained through role playing. Role playing permits others to learn from the presentation also.

3. **Adding Concepts and Topics** -List the environmental management concepts and topics that might be added to your subject syllabus. What current environmental issues might be used to enhance the content of your subject?

Because our teaching subjects were not the same, it was difficult to select topics and concepts that might be added to a single syllabus. However, there are some topics and/or issues that we felt might have a broad application to several different syllabi. Where possible, we have included in parentheses some associated concepts that might apply to the treatment of the issues.

- dredging (supply and demand, soil erosion)
- poaching (supply and demand)
- deforestation (soil erosion)
- overgrazing (soil erosion)
- culling (malnutrition)
- afforestation (windbreaks, renewable energy)
- veldfire control
- fencing and paddocking
- natural disasters (their impact on human, animal and plant life)

4. **Integration of Concepts and Topics** - How could additional environmental management concepts and topics be integrated into your subject?

It was decided that the issues identified in Question 3 could be integrated into the teaching of English and Setswana in several ways. Many of the issues would make splendid topics for the development and writing of compositions. Because of the timeliness of the issues, current literature should provide a variety of newspaper reports, magazine articles and books related to the topics. These sources would provide the foundation for dealing with debate and critical analysis as well as grammar. With the background information derived from these sources, units on poetry writing could be pursued and the issues elaborated. Further practice in communication skills could be provided using the issues as a basis for interviews, dramatisations and puppetry.

5. **Examination of Concepts and Topics** - Should the identified concepts and topics be examined? What argument should be used to justify the decision?

It was our belief that environmental concepts and topics should be examined. If environmental concepts and topics have been integrated into the regular subjects taught in the colleges, then the attainment of these ideas should be evaluated like any other content within a subject. It is important that we become aware of the level to which students have mastered all of the content of a subject, including environmental education ideas, as a measure of our teaching success. This information can be used to improve teaching strategies and lead to more meaningful classroom experiences.

6. **Classroom Use of Concepts and Topics** - What strategy should be used to assure that the new primary and junior secondary teachers use the environmental education they have gained in their training?

The team pointed out that most classroom theory taught in the colleges should be followed by a practical aspect. For example, if pollution is the topic taught, the class should be taken out to collect, classify and measure the kinds of litter; evaluating its sources and the means that would reduce littering. It should be possible to coordinate activities across subjects or departments so that other subject activities associated with the topic could be started at about the same time. In this way, art could conduct poster making activities, music might design a song and English could create a dramatisation, etc..

The teaching of project methods would be simplified by using environmental issues as project resources. If the project approach would be used as suggested throughout the college, students would acquire the prerequisite skills and might emulate staff members as role models. Of course, it is essential that environmental education resource materials be readily available for teacher preparation and for student research if projects about the environment are to be fully realised.

Teacher training college syllabi, primary school syllabi and junior secondary school syllabi (nine-year syllabi) should be thoroughly reviewed to make sure that the pertinent environmental topics have been included. The syllabi and teacher guides should also be examined to ascertain that there are sufficient details provided for environmental teaching activities so that teachers will feel confident that they can provide adequate lessons and practical learning opportunities.

There may be a need to develop an environmental education specialisation area in the training programmes so that teachers will have a resource person in the school that they can go to for help. If the appropriate Ministry of Education personnel (Chief Education Officers, Headteachers and Field Education Officers) can be fully informed of the environmental education emphasis, the task of environmental education implementation in the schools will be simplified and the deployment of specialists enhanced.

Although the National Science and Mathematics Fair does have an environmental education component, it may be beneficial to initiate a National Environmental Education Fair that would contribute outstanding projects to the national fair. Publicity associated with both events would enhance awareness in schools and communities throughout the nation.

CLOSING OF THE WORKSHOP

Following the reports by the discussion groups, Mr. P. Richard summarised the comments and questions stemming from the Needs Assessment Report and the findings of the review strategy discussion groups. Sets of environmental education concepts were distributed and a sample of how these concepts might be selected for a specific topic were provided for the participants. (Appendices D. and E.)

CONCLUSIONS

The participants responded to the activities in a positive and professional manner. It appeared that they recognised the coming review task as an appropriate undertaking and one to which they had already given thought. Their suggestions for improvement and extension of the Environmental Education Needs Assessment were constructive and pertinent to the issues at hand. This was also true of the reports made by the discussion groups who had considered the components of a review strategy. Their suggestions will serve as a foundation for a system-wide consideration of environmental education in the curriculum.

Of particular importance to the application of the needs assessment findings were the observations pertaining to the scope of the study. The participants felt that some segments of the education community had not been sufficiently surveyed. It was suggested that the Colleges of Education had been overlooked in the study and that their opinions would make a significant contribution to the total portrait of environmental education in Botswana. Similarly, it was suggested that the Botswana Agriculture College and the Nurse Education Programme at the National Health Institute should be sampled as well.

There seemed a consensus regarding the priorities associated with the review process. It was emphasised that revision of the school curriculum was of paramount importance, but that this revision would not be effective unless a communication network was also established across institutions and subjects so that needless repetition and redundancy could be avoided. Training programmes were believed to be essential to assist the lecturers in their efforts to streamline the

curriculum to include greater emphasis for environmental education. Thus, the three 'C's', Cognition, Coordination and Communication, seemed to be of greatest concern to the participants for conducting the review process.

It was unfortunate that the workshop had been confined to one day. The small discussion groups felt that they had hardly begun the investigation of the assigned questions and that much more could have been done had the period been extended. However, the responses of the three groups provided important guidance for future specific activities with the subject panels and for the implementation of the revised syllabi stemming from their deliberations.

Many important ideas came from the discussions. It was pointed out that : (1.) an organisational schema could be set up to better understand the relationships among the content of the subjects; (2.) the content could be organised to better use a child-centred, activity-centred, project oriented approach to learning; (3.) it is possible to select appropriate topics for teaching both within a syllabus and across subjects; (4.) testing of the mastery of the concepts in environmental education is an important means for obtaining teacher feedback as well as measuring student success.

APPENDICES

APPENDIX A

SAVINGRAM

FROM: Ms. F. M. Leburu, PCDO
Curriculum Development Unit
Ministry of Education

for F. M. Leburu

TELEPHONE NO.

TO: Mr. C. July, Lecturer
Primary Teacher Training College
Serowe

REFERENCE NO: CD/4/8/92

September 2 1992

re : Environmental Education in Teacher Training Workshop Attendance

You have been nominated to attend an Environmental Education in Teacher Training Workshop which will begin at 0830 on September 14, 1992 at the Oasis Motel.

If it is not possible for you to attend, please select a person from your subject area to represent you at the meeting.

The purpose of the Workshop will be to report the results of a recent environmental education needs assessment and to discuss these findings in terms of their implications for teacher educators and curriculum planning activities. As a result of the discussions, it is hoped that we will be able to develop further strategies for curriculum development within the subject panels.

Your assistance in the discussions will be of considerable benefit to the continued development of environmental education in Botswana.

As in the past, accommodation has been booked at the Oasis Motel for those who travel from greater distances. Travel and per diem will be the responsibility of the College. Meals will be provided by the organisers. It would be appreciated if we could be informed about your accommodation requirements for the evenings of September 13 and 14 by September 10, 1992 so that we can confirm your stay. Please call Dr. Reed's office, 352990 - ext. 264 or leave a message with the telephone operator.

cc. Mr. G. Sechele, PEO - DTE
Mr. N. Winer, COP - NRMP
enc. - EETT Workshop Agenda

APPENDIX B.

PARTICIPANT LIST

ENVIRONMENTAL EDUCATION TEACHER TRAINER (EETT) WORKSHOP

<u>Name</u>	<u>Subject</u>	<u>College</u>
1. Mr. M. Adzina	Agriculture	PTTC, Francistown
2. Ms. E. Baakile	Curr. Development	CDU, Min. of Educ.
3. Mr. S. M. Baumake	Religious Education	PTTC, Lobatse
4. Ms. T. Chankuluba	Setswana	PTTC, Francistown
5. Mr. T. Chilambampani	Mathematics	PTTC, Francistown
6. Mr. L. Gasebonwe	Social Studies	PTTC, Serowe
7. Mr. F. Jeremiah	Music	CoE, Tonota
8. Mr. K. M. Joseph	Mathematics	CoE, Tonota
9. Mr. U. K. Ketshabile	Physical Education	PTTC, Serowe
10. Ms. F. M. Leburu	Curr. Development	CDU, Min. of Educ.
11. Mr. M. Masisi	Curr. Development	CDU, Min. of Educ.
12. Mr. T. C. Mawunde	Social Studies	CoE, Molepolole
13. Mr. J. Mensa	Arts and crafts	CoE, Molepolole
14. Mr. J. Mongologa	Music	PTTC, Francistown
15. Mr. N. Mwandila	Agriculture	CoE, Tonota
16. Ms. M. M. Ntsabane	Education	PTTC, Tlokweng
17. Mr. K. Opoku-Manu	Education	CoE, Molepolole
18. Ms. G. Phuthego	Curr. Development	CDU, Min. of Educ.
19. Ms. D. Ramatsui	Home Economics	CoE, Tonota
20. Dr. J. A. Reed	Curr. Development	CDU, Min. of Educ.
21. Mr. P. Richard	Curr. Development	CDU, Min. of Educ.
22. Mr. G. Sechele	Teacher Education	DTE, Min. of Educ.
23. Ms. C. Thipe	Science	PTTC, Serowe
24. Mr. G. M. Wills	Science	CoE, Tonota
25. Mr. H. Zimba	Education	CoE, Molepolole

APPENDIX C.

*MINISTRY OF EDUCATION
CURRICULUM DEVELOPMENT UNIT
ENVIRONMENTAL EDUCATION TEACHER TRAINING WORKSHOP*

AGENDA

<i>Time Period</i>	<i>Activity</i>	<i>Resource Person</i>
0830	Welcome	P. Richard
0845	Official Opening	F. Leburu
0900	Review of Procedures	M. Masisi
0915	Other Environmental Events	S. Makgothi
0930	Needs Assessment Report	J. Reed
1030	Tea	
1100	Assessment Report Discussion	M. Masisi
1200	Organisation of Small Groups	P. Richard
1215	Announcements	J. Reed
1230	Lunch	
1330	Curriculum Review Planning Small groups	J. Reed, M. Masisi, P. Richard
1500	Group Reports and Discussion	J. Reed, M. Masisi, P. Richard
1600	Summary and Closing	P. Richard

APPENDIX D.
ENVIRONMENTAL EDUCATION CONCEPTS

This set of concepts was derived from a study in which scholars were asked to react to items in a list on a five point scale of desirability for inclusion in the knowledge of every citizen. The resultant list may guide us in examining the curriculum to determine the areas of study already a part of our subject and those aspects that may have been omitted.

The concepts have been listed by specific topics in a descending order of rated importance. Only those concepts that were rated as unacceptable have been omitted from the list.

Overall

- | | | |
|----|--|------|
| 1. | Living things are interdependent with one another and their environment. | 4.85 |
|----|--|------|

Environmental Management

- | | | |
|-----|---|------|
| 1. | Man has been a factor affecting plant and animal succession and environmental processes. | 4.58 |
| 2. | The management of natural resources to meet the needs of successive generations demands long-range planning. | 4.42 |
| 3. | Environmental management involves the application of knowledge from many different disciplines. | 4.27 |
| 4. | Modern man affects the structure of his environment. | 4.08 |
| 5. | Esthetic resources and recreational facilities of economic and non-economic value are becoming increasingly important in leisure-time activities. | 4.08 |
| 6. | Man has the ability to manipulate and change the environment. | 4.01 |
| 7. | A knowledge of the social, physical and biological sciences and humanities are important for environmental understanding. | 3.98 |
| 8. | Social and technological changes alter the interrelationships, importance and uses for natural resources. | 3.93 |
| 9. | There are certain risks taken, and limitations experienced, when manipulating the natural environment. | 3.92 |
| 10. | Resource depletion can be slowed by the development and adoption of alternatives. | 3.84 |
| 11. | Environmental management has effects on individuals and social institutions. | 3.74 |
| 12. | Man's need for food, fiber, and minerals increases as populations expand and levels of consumption rise. | 3.67 |
| 13. | Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public. | 3.65 |
| 14. | A cultural and time lag exists between the development of knowledge in science and technology and the application of that knowledge to resource and environmental problems. | 3.44 |
| 15. | Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective. | 2.62 |
| 16. | The management of resources is culture bound. | 2.52 |

Management Techniques

1. Increased population mobility is changing the nature of the demands upon some resources. 3.61
2. Options available to future generations must not be foreclosed. 3.51
3. A variety of institutional structures are involved in planning and managing the environment. 3.49
4. Hunting regulations are useful in maintaining and restoring populations as well as in distributing the game harvest. 3.43
5. Multiple use is a practice in which a given land area functions in two or more compatible ways. 3.41
6. Management of habitat is considered to be an effective technique of wildlife management when the desire is to increase numbers of particular populations. 3.35
7. Architecture can be one of the positively persuasive influences in developing a congenial environment. 3.27
8. Zoning is a practice in which land uses are prescribed based upon value judgements regarding the needs of society. 3.20

Economics

1. Ready transportation, growing interest, money surpluses, and increased leisure time combine to create heavy pressures on existing recreation facilities and demands for new ones. 3.96
2. Outdoor recreation is an increasingly important part of our culture and our economy. 3.93
3. The economy of a region depends on the utilisation of its natural, human, and cultural resources and technologies over time. 3.79
4. Economic efficiency does not always result in conservation of natural resources. 3.79
5. The distribution or location of resources in relation to population, technological and economic factors are critical to problems of resource conservation and use. 3.73
6. The political and economic strength of a country is, in part, dependent upon its access to domestic and foreign resources and international relationships. 3.67
7. Conservation policy is determined by the interaction of science and technology; social and political factors; and aesthetic, ethical, and economic considerations. 3.61
8. Conventional benefit-cost analyses do not always result in sound conservation decisions. 3.54
9. A sound natural resource policy is dependent upon a flexible political system, pragmatically appraising and reappraising policies and programmes in terms of their effect upon the public interest and in light of scientific knowledge about the natural resources. 3.53
10. Consumption practices are constantly being expanded by our ability to produce and create wants and market, which affects the rate of resource use. 3.45
11. Individuals tend to select short term economic gains, often at the expense of greater long term environmental benefits. 3.27
12. Increasing population and per capita use of resources have brought changed land to man or resource to population ratios. 3.21
13. Goods and services are produced by the interaction of labour, capital, natural resources, and technology. 3.18
14. Long range planning for the use and allocation of natural and human resources is continually evolving. 3.17
15. Choices between needs (essentials) and wants or desires (nonessentials) are often in conflict. 3.15

16. Raw materials and energy supplies are generally obtained from those resources and places where they are available at least cost, usually in short economic terms. 2.96
17. Supply and demand, in relation to values held by society, determines what is a resource and its economic values. 2.86
18. The more efficient use of some resources is the result of technical and marketing improvements. 2.76

Environmental Problems

1. Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radio-active wastes, and heat, is important if the well being of man and the environment is to be preserved. 4.65
2. Pollutants and contaminants are produced by natural and man-made processes. 4.09
3. Increasing human populations, rising levels of living and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination. 4.01
4. Natural resources are interdependent and the use or misuse of one will affect others. 4.35
5. In any environment, one component like: space, water, air, or food may become a limiting factor. 4.22
6. Most resources are vulnerable to depletion in quantity, quality, or both. 4.17
7. The interaction of environmental and biological factors determines the size and range of species and populations. 3.84
8. Natural resources, water and minerals in particular, are unequally distributed with respect to land areas and political boundaries. 3.75
9. The renewable resource base can be extended by reproduction, growth, and management. 3.75
10. Natural resources affect and are affected by the material welfare of a culture and, directly or indirectly, by philosophy, religion, government and the arts. 3.58
11. The natural environment is irreplaceable. 2.96

Adaptation and Evolution

1. An organism is the product of its heredity and environment. 4.14
2. Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations. 3.80
3. The rate of change in an environment may exceed the rate of organism adaptation. 3.76
4. Organisms and environments are in constant change. 3.56
5. All living things, including man, are continually evolving. 3.49
6. The form of life present depends on the coincidence of the life needs and their availability in an environment. 3.25
7. Biological systems are described as dynamic because the materials and energy involved are parts of continuous cycles: inorganic materials and energy become part of organic materials and are subsequently broken down into simpler substances and energy as a result of the operation of organic systems. 3.09
8. Animal populations are renewable resources. 3.08
9. Succession is the gradual and continuous replacement of one kind of plant or animal complex by another and is characterised by gradual changes in species composition. 3.03

Natural Resources

1. Water supplies , both in quantity and quality are important to all levels of living. 4.39
2. The earth and life on it are greatly affected by the atmosphere. 4.29
3. Water is a reusable and transient resource, but the available quantity may be reduced or quality impaired. 4.17
4. As populations increase competition for the use of water increases resulting in a need for establishing water use priorities. 4.13
5. The amount of precipitation that becomes available for use by man varies with topography, land use, and applied management practices. 3.52
(Minerals)
6. Mineral conservation involves the utilisation of all known methods of using the minerals of the earth's crust that will cause them to serve more people for a longer time. 3.27
7. The nonrenewable resource base is considered finite. 3.27
8. Soil is classified as a renewable resource, but, because it may take a few years to thousands of years to be "renewed," it is more practically termed a depletable resource. 2.94
9. Minerals are nonrenewable resources. 3.87
(Soil)
10. Maintaining, improving, and, in some cases, restoring soil productivity is important to the welfare of the people. 4.25
11. Geological processes like erosion and deposition modify the landscape. 3.61
12. Soil productivity can be maintained by utilising known agronomic, mechanical, and chemical processes. 3.51
(Plants)
13. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies. 3.56
14. Plants are renewable resources. 3.44
15. Energy is supplied to an ecosystem by the activities of green plants. 3.36
(Animals)
16. Wildlife refuges, undisturbed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool. 3.99
17. Wildlife populations are important economically, aesthetically, and biologically. 3.69
18. Wildlife is considered to be a public resource. 3.26

The Socio-cultural Environment

1. Man has responsibility to develop an appreciation of and a respect for the rights of others. 4.38
2. Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles. 4.29
3. Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups, and all levels of government and education. 4.16
4. Man has moral responsibility for his environmental decisions. 3.94
5. Knowledge of social structures, institutions, and culture of a society must be brought to bear on environmental considerations. 3.75
6. The relationships between man and the natural environment are mediated by his culture. 3.65
7. Man is developing the technical and sociological knowledge needed to control population growth, modify environments and alter resource use patterns. 3.58
8. Social values and mores influence personal conservation behaviour. 3.34
9. Public opinion constitutes a control over the use of conservation practices. 3.11

10.	In a democracy, a basic theory is that increasing restrictions on resource allocation and use are imposed by the consent or insistence of the people.	2.92
Culture		
1.	The culture of a group is its learned behaviour in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.	3.49
2.	Man has psychobiological and biosocial needs.	3.27
3.	Human resources include the physical and mental abilities with which man is endowed and the knowledge he has generated.	3.26
4.	Historically, cultures with high technological development have used more natural resources than those with lower levels of technological development.	2.98
Politics		
1.	Individual citizens should be stimulated to become active in the political process.	3.85
2.	We have "legal" ownership of some resources like real estate and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.	3.75
3.	Policies, including natural resource policies, came about as the result of interacting social processes: science and technology, government operations, private interests, and public attitudes.	3.51
4.	Conservation policies are often the result of group action.	3.51
5.	As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resources as he wishes decreases irrespective of the form of government.	3.44
The Family		
1.	Family planning and limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.	3.88
2.	The individual must develop his ability to perceive if he is to increase his awareness and develop environmental perspective.	3.63
3.	Individuals perceive different self-roles depending upon their position in the social and environmental context.	2.99
4.	Man has the capability of improving society through sociology, psychology and science.	2.95
5.	Man is a high animal form because of his ability to reason.	2.83
6.	Man is continually developing an ethical base for making value judgments.	2.65
7.	Man performs some tasks at a high physiological cost.	2.62
Psychological Aspects		
1.	Opportunities to experience and enjoy nature are psychologically rewarding to many and are important to mental health.	3.60
2.	The need of man to turn inward for self renewal can be stimulated by his external esthetic experiences.	2.79
3.	Resources have a psychological impact on people.	2.78
4.	Emotional reactions can be elicited by exposure to physical objects and geometric forms.	2.54

From:
Roth, Robert E., "Fundamental Concepts for Environmental Management Education",
Environmental Education, Vol 1, No. 3, 65-64, Spring 1970.

APPENDIX E

APPLYING CONCEPTS TO AN ENVIRONMENTAL ISSUE

SOIL CONSERVATION - AN EXAMPLE

The following concepts were selected because it was felt that they could be taught in connection with the topic - Soil Conservation. All of the concepts were taken from a much larger concept set originally evaluated and ranked by a group of educators. The number in the right hand column represents a relative value given the item through the collective opinion of the group. Some concepts apply more directly to the topic than others and the importance rating should be viewed only as a general consideration. Many, if not all, of the topics would be taught in other topics and subjects. The broad application of some concepts to all aspects of environmental (and human) concern is obvious. This pervasive character may be a clue to the reason for their relatively high rating.

1.	Living things are interdependent with one another and their environment.	4.85
2.	Man has been a factor affecting plant and animal succession and environmental processes.	4.58
3.	The management of natural resources to meet the needs of successive generations demands long-range planning.	4.42
4.	Natural resources are interdependent and the use or misuse of one will affect others.	4.35
5.	Maintaining, improving, and, in some cases, restoring soil productivity is important to the welfare of the people.	4.25
6.	Most resources are vulnerable to depletion in quantity, quality, or both.	4.17
7.	Modern man affects the structure of his environment.	4.08
8.	Man has the ability to manipulate and change the environment.	4.01
9.	Increasing human populations, rising levels of living and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.	4.01
10.	There are certain risks taken, and limitations experienced, when manipulating the natural environment.	3.92
11.	Resource depletion can be slowed by the development and adoption of alternatives.	3.84
12.	Economic efficiency does not always result in conservation of natural resources.	3.79
13.	We have "legal" ownership of some resources like real estate and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.	3.75
14.	Man's need for food, fiber, and minerals increases as populations expand and levels of consumption rise.	3.67
15.	Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.	3.65
16.	Geological processes like erosion and deposition modify the landscape.	3.61
17.	Soil productivity can be maintained by utilizing known agronomic, mechanical, and chemical processes.	3.51
18.	Options available to future generations must not be foreclosed.	3.51
19.	Conservation policies are often the result of group action.	3.51

20. As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resources as he wishes decreases irrespective of the form of government. 3.44
21. Zoning is a practice in which land uses are prescribed based upon value judgements regarding the needs of society. 3.20
22. The management of resources is culture bound. 2.52
23. The natural environment is irreplaceable. 2.96
24. Soil is classified as a renewable resource, but, because it may take a few years to thousands of years to be "renewed," it is more practically termed a depletable resource. 2.94

APPENDIX F

Curriculum Review Planning Small Group Discussion Questions

1. Syllabus Review Techniques



What would be the syllabus review techniques that would be most efficient for identifying environmental topics and concepts?

2. More Effective Teaching



How can we make the environmental education concepts and topics that are already in the syllabus more effectively taught?

3. Adding Concepts and Topics



List the environmental management concepts that might be added to your subject syllabus. What current environmental issues might be used to enhance the content of your subject?

4. Integration of Concepts and Topics



How could additional environmental management concepts and topics be integrated into your subject?

5. Examination of Concepts and Topics



Should the identified concepts and topics be examined? What argument should be used to justify the decision?

6. Classroom Use of Concepts and Topics



What strategy should be used to assure that the new primary teachers use the environmental education they have gained in their training?