Environmental Management and Biodiversity Conservation of Forests, Woodlands, and Wetlands of the Rufiji Delta and Floodplain

Experiential Ecology Course for Teachers and Education Leaders at Mbunju Mvuleni Woodlands and Wetlands 27th October – 4thNovember 2001

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[1] The Rufiji District Council implements Rufiji Environment Management Project with technical assistance from IUCN – The World Conservation Union, and funding from the Royal Netherlands Embassy.

Rufiji Environment Management Project – REMP

Project Goal: To promote the long-term conservation through 'wise use' of the lower Rufiji forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area's inhabitants are secured and enhanced**.**

Objectives

- To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and Floodplain.

- To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on wise use principles.

- To promote awareness of the values of forests, woodlands and wetlands and the importance of wise use at village, district, regional and central government levels, and to influence national policies on natural resource management.

Project Area

The project area is within Rufiji District in the ecosystems affected by the flooding of the river (floodplain and delta), downstream of the Selous Game Reserve and also including several upland forests of special importance.

Project Implementation

The project is run from the district Headquarters in Utete by the Rufiji District Administration through a district Environmental Management Team coordinated by the District Executive Director. The Project Manager is employed by the project and two Technical Advisers are employed by IUCN.

Project partners, particularly NEMC, the Coast Region, RUBADA, The Royal Netherlands Embassy and the Ministry of Natural Resources and Tourism, collaborate formally through their participation in the Project Steering Committee and also informally.

Project Outputs

At the end of the first five –year phase (1998-2003) of the project the expected outputs are:

An Environmental Management Plan: an integrated plan for the management of the ecosystems (forests, woodlands and wetlands) and natural resources of the project area that has been tested and revised so that it can be assured of success - especially through development hand-in-hand with the District council and the people of Rufiji.

Village (or community) Natural Resource Management Plans: These will be produced in pilot villages to facilitate village planning for natural resource management. The project will support the implementation of these plans by researching the legislation, providing training and some support for zoning, mapping and gazettement of reserves.

Established Wise Use Activities: These will consist of the successful sustainable development activities that are being tried and tested with pilot village and communities and are shown to be sustainable

Key forests will be conserved: Forests in Rufiji District that have shown high levels of plant biodiversity, endemism or other valuable biodiversity characteristics will be conserved by gazettement, forest management for conservation, and /or awareness-raising with their traditional owners.

Executive Summary

This report covers the first Experiential Learning training carried out in Rufiji by a team of international technical personnel in Environmental Education. The principal focus of this training was to:

- Raise the awareness of the participants on environmental issues
- Facilitate participants to appreciate the ecological beauty and diversity of their surroundings.
- Facilitate participants to adopt practical ways of using the local woodlands, lakes, and wild habitats as educational sites and tools.
- Facilitate the participants to choose and make materials for nature/eco education for the teacher, school and non-school going children.
- Impart and facilitate practical art, story telling poetry and dramatic methodologies and ideas for nature appreciation and education.

Key recommendations

- The follow-up programme should be done after 8 months. A team of 4 of the participants should be trained on the follow-up techniques by the consultants. They should develop Questionnaires for the follow-up programme; develop a local based training manual and an action plan for Rufiji District.
- The selected team should be equipped with adequate knowledge on EL to enable them become Trainers and be the key persons in the implementation of the action plan.
- REMP should play a key role in the implementation of all the awareness activities recommended in the awareness programme to ensure they support each other in a synergistic relationship.
- Experiential Learning should be tested in the schools that the participants come from until a follow up programme is implemented.

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Acronyms

DC	District Commissioner
EE	Environmental Education
EL	Experiential Learning
IUCN	The World Conservation Union
MEK	Mratibu Elimu Kata
REMP/MUMARU	Rufiji Environment Management Project
TRCC	Teachers' Resource Centre Coordinator
WEC	Ward Education Coordinator

Acknowledgements

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1 Introduction

This report covers a detailed analysis of experiential learning procedures used during the training carried out by two consultants from Uganda (Living Earth Foundation) on behalf of Rufiji Environmental Management Project. It also points out the key recommendations and highlights the process of the follow- up programme. The methodology used during the training was participatory and all the notes from the participants are available under Appendix 4.
The workshop took place in the scenic village of Mbunju Mvuleni within the REMP Project area starting from the 27th October – 4th November 2001.

Participants included teachers, Ward Co-ordinators, Resource centre Leaders, education staff, Village Chairpersons, and school pupils (9 -14 year olds).

1.1 Background

This training builds on the recommendations of the Awareness Programme Design Report (Living Earth 2001). Experiential learning is one of the functions of Environmental Education. Living Earth believes that one of the most powerful learning experience is personal experience and reflection, and for this reason we facilitate learning rather than teach.

Taking the participants through a process of EL which emphasis is exploring the nature using the five senses builds up a strong appreciation of nature and the teachers are expected to appreciate the simple ways of learning. EL is characterized by play, games, music and drama, which the participants go through as an experience. The children appreciate the experiences rather than taking lessons as class work. Children are the future custodians of their environment therefore if they have a strong appreciation and free interaction with the environment eventually there will be a change of attitude towards proper utilization of natural resources.

The methods used are participatory and fun; the participants identify with them more and therefore learn more. The hand on skills introduces them to practical skills that they could practice at their respective places. This builds a strong linkage between awareness and practice.

Reflection is an important component of the experiential learning cycle – without this there is only activity rather than learning. Solitude gives participants an opportunity to reflect on how they are feeling particularly in relation to the environment around them – i.e. they reflect on the affective components of the programme. Group discussions at the end of the day provide collective reflection no the factual/cognitive aspects of the programme as well as the affective/emotional aspects. In this way, participants build their new experience onto their existing stock of experience. By publicly reflecting, they also provide the leaders with an opportunity to note down what the participants claim to have learned (this may not be exactly what the leaders intended to teach). This is a key monitoring tool for the programme. Assuming participants have increased their knowledge, skills, motivation and self-confidence during this programme (i.e. their action competence), it would be logical to expect them to take actions in their own lives in order to make positive changes. The pledge making activity encourages them to think about this possibility and to make their own decisions about what they would like to do differently. It is this decision-making aspect that is a crucial component of action competence. When the participants return home, any number of external factors will affect their ability to carry out their pledges – this should not therefore be the principal focus of any follow-up visit. The impact on the participant may be in terms of attitude or emotional state rather than any obvious physical outcome. Where attitudes have been shifted, changes in physical action will normally follow, however, there is no rule that says this must happen in the time frame of any follow-up programme. For this reason it always worth keeping in touch with communities who have provided participants; the long-term impacts on individuals and the environment may emerge several years later and often in combination with other factors.

1.2 Tasks undertaken

To achieve the above the consultants carried out the following tasks:

1. Prepared and conducted a six day out door camping experiential learning training with teachers resource centre leaders, Ward education coordinators, teachers, education staff, village chairpersons, scouts and school pupils.
2. Designed outdoor trails to facilitate nature exploration and enhance outdoor experience.
3. Set up an out-door camp in the village forest of Mbunju Mvuleni next to Lake Uba.
4. Conducted excursions into the forest with participants and explored the environment by maximum use of the "five senses".
5. Exemplified and explained major ecological concepts through play, drama, magic and songs.
6. Demonstrated hands on skill practices collectively while ensuring individual participation.

1.3 Expected Outputs

- To raise awareness and importance of ecological beauty and diversity.
- Develop hands on skills, material for nature eco learning.
- Introduce practice art, drama, magic and poetry in environmental learning process.
- Raise a cadre of enthusiastic environmental educators within the Rufiji area.

2 Detailed Four-day Programme

2.1 Introduction

The four-day programme is based on an experiential learning programme developed by environmental education leaders at Mt. Elgon National Park exploration centre in Uganda. The focus of the programme is to give opportunities to the participant to explore nature using ones senses. The theories are based on earth education, acclimatization and sun ship earth. Major components include building concepts, sharpening senses and providing opportunities for solitude and total immersion into nature. Approaches are characterised by play, song, drama and magic with an eventual aim to create appreciation, and positive attitude to the environment.

The typical programme is characterised by: -
Arrival of participants to camp, exploration or self-introduction to site and sharing expectations. Second day: a short trail in order to knowing what exists around the camp. The Third day goes deeper into the surroundings and the fourth day concentrates on developing and sharing hands on skills climaxed by a pledge making ceremony and a good-bye camp occasion.

During the field exploration trips, participants' minds are opened up to basic ecological concepts their significance in conservation, their position, and impact of man's activities on the environment. The 4 W's on positive action to the environment. What can we do? Where, When, Why. How???…….. The challenge is enormous – But – we promise to "Think globally and act locally".

The major principles of earth education in experiential learning which are used during the course are:

- Senses – Using ones 5 senses to explore the environment to a deeper understanding.
- Concepts—Basic ecological concepts, their functions and inter relationships.
- Mechanics—The methods of conveying information about the ecological concepts.
- Solitude -- The power of isolation.
- Magic—Using imaginative ways of revealing the wonders and the functions of the earth.

<u>DAY 1:</u>

Arrive at Mbunju Mvuleni village, introduction to village leaders/REMP officials, school management.

- Identifying the site
- Setting up the camp
- Settling in
- New home with a new family.

Introduction to the camp

- Investigate what exists around the camp.
- Evoke curiosity!!

Night Life

- Walk into the night from the camp.
- Who is our neighbour – Night sounds (Listening to the night)
- What wakes up when the others go to sleep?
- What goes on around a lake in the night?
- A clear sky above - the moon, stars, - "Light of the night".
- A wild pig dashes out of the boggy mashes!!! – Surprise, excitement the place is alive!!!

*Discussion on nocturnal and diurnal species.

Good night! Briefing on:

- What will happen on the next day
- Time to wake up
- Meals
- Dressing and what to carry.

DAY II:

5.00a.m.: Wake up time - a whistle is sounded.

Good morning forest

- A silent walk into the woods.
- Everybody sits at a chosen spot and with dead silence listens, feels, sees, smells the immediate surrounding. " The forest is dark".
- For one and a half hours:-

- Each individual narrates the experience ranging from sounds, feelings, smells and sighting.
- All culminate into a conclusion that indeed members of different families have woken up.

- Like any village made up of many homes and families mornings are characterized by early raisers, a noisy climax and eventually quiet.

The forest is a HOME – a habitat that is important to various forms of life; birds, insects, reptiles, etc.

- What is happening around?
- What are the major reasons why a home (forest) should be protected?
- What do you feel, smell, see and hear?

Scavenger hunt

- Each individual returns to camp on a home journey equipped with instructions to find something within the forest that has no use "(something useless") and also find something that is 'useful".

*Individual debate - mind jogging.

- What is useless?
- Why is it useless?
- What is useful?
- Why is it useful?

Grouping: living and non-living things.

- Why in the two groups?
- Relationship – is there any?
- What is the significance of the relationship?

*Discussion and debate is generated:

- Is anything useless in nature? Around us – within our environment there is nothing useless.
- In one way or the other everything around us is beneficial.
- Examples; animal dung fertilises the soil, snail shell is habitant to some insects and significant in nutrient cycling, stone wears down slowly into soil in chemical/physical reactions.

Short trail (~3km)

Wetland bog, swamp lake, etc.

- What do you see?

- Animals identified – monkeys, baboons, etc
- Plants/flora identified –
- Birds identified (consult bird/field guides to identify) -

NB Don't focus on learning names – this is NOT experiential learning. Discussions on this point may include:

- Names are arbitrary, they cannot sum up the plant or animal adequately
- The children should identify organisms – what are they called locally?
- The fact that they also have names in Latin and English helps people from around the world to know that they are talking about the same specie when they are trying to exploit or conserve them.
- WE will not be testing you on names of things because we are learning about the environment as a whole – how it works.
- If you are interested in names and understanding more about the different species, pay attention in your Biology lessons!

*Discussion.

- What are the uses of wetlands/lakes?
- What are the dangers of wetlands/lakes?
- How should we protect them?

Games

We eat – energiser e.g. To identify what we eat or don't in a flush of a moment.

- It awakens the participant and rekindles group dynamics.

It may be modified to identify:

- Domestic animals
- Wild animals and where they are found.

Seed tag Game- To illustrate conditions necessary for seed germination.

Location – under a seeding tree

- What do seeds need to germinate? -- Cards with conditions written on.
- What are the enemies of seed? --- Individuals act roles of different enemies.
- How difficult it is for seeds to germinate? -- Mark a dead garden and a live one separately.
- Even after germination, seedlings are still in danger – what danger?
- What can you do to defend/protect the eventual survivors - the existing forest?

" It is not easy out here"- says a mature tree "MAN" – you must have very good reason to interfere with my life – Do you understand me, I mean you!!

Uses of the forest.

- Is the forest useful?
- How/why?

***Debate.**

A long list of benefits and reasons why participants look at the woodland trees as important.

Note: It is about noon and temperatures are past 36 degrees walking in the woods most trees had shed their leaves when the group arrived under a huge leafy tree – a sign of relief- what a huge umbrella! It is cool here, what a SHADE. How real these benefit is……

" Imagine a lecture in a classroom, maybe an air-conditioned lecture theatre. Shade provided by trees is very important to man… come on! get out of that class goes out there and experience it!!"

Energy Flow Game

- Two unequal races
- Where do we get our energy from?
- What process does it take to reach us?

- When we eat meat, what is the process?
- When we eat ugali, what is the process?

The Energy Race

- If the source of energy is the sun (represent with bucket of water)
  - Sun- plant - man - store
  - Sun- plant - cow - man - store
  - With leaking jugs, collect and store as much energy as you can.

***Discussion**

- Who collects the most energy &why?
- Who impacts on the environment & why?
  - What happens in actual life?
  - How much meat do you eat a day/week?
  - How much ugali do you eat per day/week?

Camp fire – evening

- Re-cap of days activities.
  - Participants discuss what the day's activities were.
  - What was your experience?
  - Comments on outdoor learning.
  - What were the days learning points?

NB They will tell you what THEY have learned – do not demand to hear about what YOU have taught. By asking what the participants have experienced and what they learned, we can monitor the learning that is going on throughout the course – it will be slightly different for each group. Keep records of this feedback – this is the only proof you have that they learning until they start to do things differently at home but that can take months and will depend on other external factors.

Story Telling: (building on the knowledge of the participants).

- Type of stories at a camp.
- Facts contained in a story.
- Relating the evening stories with the day's activities.
- The art of story telling.
- Example; the Great Elephant story
  - How long does an elephant live?
  - What is its weight?
  - Birth weight?
  - Gestation period?
  - How much foliage does it consume in 24 hours?
  - How much water in the same period?
  - If the chairman weighs, 70 kg how many chairmen would therefore make one elephant (a mature elephant weights up to 7000 kg)?

NB These are told as amazing facts to instil wonder about elephants. They are not facts to be drilled – there will be no test on this later. Just let the facts speak for themselves and let the sense of wonder will remain with the children. Again, if they would like to memorise all this stuff, they should study Biology.

Back to camp.

- Celebration
- Peace offering.
- Special announcement
- Bee keeping
- Introduction to follow up
- Preparation for pupils

DAY III:

Long trail (approximately 10km)

Preparation for the long trail
- Early rise
- Camp cleaning
- Breakfast.
- How to dress
- What to carry
- Getting prepared for a long day.

All set out
- Expectations high
- Participant's morale very good.

Game I: Breathing trees game under "miombo" tree shades.

- What air do we breathe in?
- What air do we breathe out?
- Where does it all come from?
- What manufactures oxygen?

Lets try breathing at plant spots only Then a Dar-es-salaam timber dealer enters the woods, chops all our breathing spots. Disaster to all even the timber dealer. What a strong relation we have with plants.

Game II: Food Web – To illustrate interdependence in ecology:

- What animals exist in these woods? – Children draw and name them
- What plants exist around us?
- What do these animals feed on?
- What feeds on them?

With each participant representing an animal and a string linking who feeds on what, a detailed discussion elaborates how we are all dependant on one another and the impact felt when a small or big member in the circle(web) is affected. The great impact especially when a tree is cut in the web as most members in the circle are linked to it.

The Termite Home

In the woods termite hills raise above the grasses.
- Why are these mounds so high?
- What is the social organisation – "who is who"?
- What do they feed on?
- Why some animals feed on termite mound soil- even pregnant women!!!

Bird Identification

Identifying a few bird species in the woodland.
- What is their role in the habitat?
- What is the local name?
- Cultural significance e.g. totems?

Game III: A Strange Encounter – To dramatize the values of the forest hence the need for a guardian to safe guard it.

- Instructions, preparations and strange costumes to be organized by the teacher depending on the circumstances.

All of a sudden as we walk in the woods, a loud strange voice commands:

- Who are you?
- What are you doing?
- You must be poachers!
- You must have set the fire that destroyed the vegetation around.
- Answer me, I command!!!

Scared, shocked, perplexed, running, hiding and confused we all are… A few composed participants answer back in shaken voices.

- We are learning about the forest
- We are helping to protect it.
- We realise how important it is
- We are not poachers
- Neither did we set the fire.

Others even continued to volunteer answers.

- We are not charcoal burners.
- We did not cut the trees!!

One member threatens to go near and attack the god of the forest. Others protest – No, no, no. Do not go. You will bring us more trouble.

The god of the forest eventually understands that we are good people! We are helping to protect his HOME!!, it demands for water, soil, a leaf and selects a brown lady. Bring them to me!

A powerful message is magically set by the god to all of us what we should do when we get back to the villages, our homes and schools. An order to depart the area and continue our learning and that we are protected and no one to look back at the bush were the god is.

A detailed discussion of what, who, why, how, where, what happened, etc took place in the woods. Every one of us is convinced that the woods have a supernatural protector. " A strong message with magical power strongly associated with what we are learning", commented one participant. " I will live to tell this story to all. This is a reality", said another.

The Soil Factory

A short break, some chocolates go round and then we all sit around the remains of what must have been a huge elephant, the skull and some bones litter the ground. A fallen tree lies near. It has all disintegrated into pieces.

- What is happening around here?
- Where is the rest of the elephant? Imagine what used to be 7000kg.
- What about the tree?

The huge gate of a factory opens. The gatekeeper allows us in and after some clear introductions we are guided in.

- What a busy factory!
- The noise is deafeningly loud – we have to shout to hear one another.
- The machines chatter away a complex industry.
- The workers in their thousands moving in all directions.
- Various by-products being broken down by the machines. We have arrived at
- The end of the factory huge trucks being loaded with a final product – well Packaged.

Samples are given to us. We analyse the composition critically. What a wonderful product.

- But, is this product important to us?
- Why, how?

After a long discussion sensible conclusions are drawn on the process of soil formation and its significance.

- How indispensable it is?
- What can we do to protect it?
- How to ensure it is productive?
- But, can we make our own soil?

What an impossible task. The reason why we should guard it jealously.

Game IV: Blind Fold Game - Feel An Object

Participants pair up randomly with blindfolds. One of each pair is blindfolded and led to an object e.g. a tree. Through the sense of feeling, he/she explores the characteristics that the individual tree possesses, carefully records this information and is then led away in a confusing manner. The blindfold is removed and participant told to get back to his/her tree/object

- What a challenge!!!

*Lessons learnt

While things look the same each individual has specific identifying

- Characters
- The ability for one to use his\her senses when others are non functional
- Individual in nature deserve their respect because you don't get some character replicated easily.

Along the trial we all come across a fallen tree, recently cut down. Some body had harvested honey. The remains of sting less bee hives existed. The tree was dead, the bee colony was absent - others died, the rest migrated. The particular hole (habitat) on the tree truck had been damaged through bad honey harvesting practices we concluded after a length discussion.

Mzee Suns Hotel -- To illustrate how all the energy we need comes from the sun

A warm welcome to Mzee son's hotel. A surprise meal in the middle of the wood. It is time for lunch – every body is told. Mzee "Sun" sits in the middle under the shade of a huge tree, with a big bright yellow dish of food, beaming with delight. All sit scattered around him and with green plates receive service from Mzee sun – serving ugali, beans, fish, greens- even water for a wash down. All are full up and lazily lie under the shade of trees and shrubs- lunchtime siesta. Mzee sun well done - good job!

*Lesson

- A deeper understanding that all that we animals feed on originate from Mzee Suns hotel, the SUN – powering several cycles in nature.

Rainbow Chips – To illustrate diversity of colour in nature

NB This game is a great opener for the short or long trail - it starts with a magical story and gets the participants looking at the minutiae, the finer details in the environment.

When you arrive at the spot, begin to recount how, the last time you came here, it had been raining – and now then the sun came out. What happens…?

After the siesta and thanking Mzee sun for the nice meal, we walked deep into the woods- in an open area a few trees that had shade their leaves had new bright green and orange to purple shades a wind blew and the sun rays filtered through the branches, the woodland floor littered with dry leaves reflected a myriad of colours.

- This is so beautiful
- Observe nature's magnificent display
- What else has so many colours in nature

One of us throws into the air small pieces of chips made of different Colours. It is a like a big rainbow has just shattered down. All the different colours have disappeared and they are stack on leaves, flowers, bark of trees branches, etc.

Hey!! Lets collect them - as many colours as you can

Discussion:
What are the colours of the rainbow? – Red, Orange, Yellow, Green, Blue, Indigo and Violet. (ROYGBIV Run Out Your Girl Betty Is Vomiting)

- How many colours have we collected?
- What is the significance of flowers?
    - When we are happy
    - When we are sad
    - In textile industry.

Nature is beautiful, the reasons why we ought to jealously look after it. Is there any one of us who hates beautiful things and destroys them wherever they are?

Magic Water/ Smelly Soups – To illustrate plant diversity through a variety of smells of different plants in the forest.

A nice evening walk takes us to the lakeside. As the sunrays strike the water surface a breeze blows over the lake. Small waves reveal the vegetation of water lilies, which are in flower. Several wetland birds hop from plant to plant. Fishermen row a small canoe towards the edge of the lake. A special admiration for the lake and the life that goes with it. One of us tries to collect some water – Hey!!! Be careful, there are crocodiles in there. He quickly comes out but with something in the hand, some thing resembling a bottle - very weird looking with algae on it. An old broken rope around its neck attracts a lot of attention. There is some liquid inside.

"Gosh!! It looks like witchcraft", exclaimed one member. "Be careful". He almost dropped the bottle but took courage. The liquid inside looked like…can't describe… "Oh! I have an idea this must be magic…MAGIC WATER", Oh yes, MAGICAL indeed.

It has been a long day. What about a party? – Yes good idea. We need plenty of soup for a good party. With small cups each one receives a few drops of "MAGIC WATER" and picks leaves or flowers that have a good smell, crushes them to make the best soups for the evening party.

A long walk from the lake to the camp with each one concentrating on soup making. Back at camp – it is now dark every body has had a sniff of one soup with wonderful names. All soups are put together and the names combined into one long, funny name. The soups made by the participants were given a strange name ' MAKAMULI NGASWESWE NGAVANGA MANJENJEMULI MZUMBASHABIBO MTONDOZI NYUNGU YA MAWE MAZINGIRAMBUNJU TONDOLONI JABWALI MTAMBALIKE LIPOYA MNAFE soup'.

Everybody is happy and there is singing. It was a nice day as people suggest what we do with this final soup. Offer to the God of the forest that emerges ghostly from the darkness and makes the exact loud cracking sound it made in the stranger encounter. Surprise!!! A hooded figure appears, singing continues and the loud voice demands the very brown lady who brought soil, leaves, etc. There is great applause as the lady takes the MAGIC soup to the God of the forest. "An environmental prayer to the God is said loudly". The god is very happy and re-emphasizes the message of the day and slowly reveals its true character.

Laughter, singing are the climax of the day

Hands on skills -- To impart basic practical techniques to use in implementation of environmental activities
Several hands on skills may be undertaken e.g.

- Bird habitat protection
- Fire precautions
- Selection of trees in the forest for future development
- Woodland rehabilitation
- Wetland protection

For the purposes of this workshop- tree growing and beekeeping were chosen.
For example: Ways of tree growing: -

1. How seed is collected from the wild
2. How seed is germinated
3. How soil is selected for potting
4. Improvising of potting material
5. How to pot seeds/ seedlings
6. Selecting seed under natural trees
7. Pricking out seed
8. Watering procedure
9. Care for seedlings
10. Eventual planting and care

Many seedlings/ saplings occur naturally around our school and homes.
What we can do to care for them?

Bee keeping

A local expert in bee keeping gives a practical demonstration of various beehives and how they are used. (See Appendix 4 pg 25 & Participants Notes)

Recap of the Programme

The participants were divided into two groups by having them name the two most famous animals in the area i.e. Tembo and Nyati.
Each group was assigned tasks to:

- Recap all the days learnt skills and experiences.
- Develop a lesson plan using the learnt skills (expressing an ecological concept)
- Lay out strategies on how they would handle a class of pupils who were arriving next day.
- Organise materials for the activities with the pupils.
- Define trails in woods and activities that they would perform together with the pupils

Pupils Participation

A team of 20 pupils comprising of pupils from Std 4-7 were selected from the neighbouring school – Mbunju Primary School.
Activities:

- Introduction to the camp by the consultants.
- Individually choose to be a Tembo or Nyati that formed the groups that joined the teachers groups.
- Were led to the woods by the teachers with each group having a consultant – Charity or Kissa as an observer.

NB See Appendix 4 pg 22 – Teachers Practical experiences with the pupils.

Consultants Comments on Teacher / Pupil Field Exercise

- Teacher / pupil attitude was minimized to a great extent. The traditional classroom teaching methods were less evident.
- There was participatory learning and the teachers cultivated the morale towards learning among the pupils.
- Pupils felt more confident when the teachers did the same exercises with them e.g. falling on the ground.
- A general mood of excitement existed as the lesson gained momentum. This would indicate pupils' appreciation of a different simple ways of learning.

- Pupil's responses to questions were well above average indicating a high level of assimilation. They were able to recap confidently the activities and lessons learnt during the exercises.
- The methods that the teachers were using during the exercises were not duplicates of the trainers' methods but the same information brought out within the context of the pupils levels of understanding. This was a good indicator of using EL as the way of understanding.

Pledge making ceremony

This is usually the climax of the four-day programme. It is a time of reflection and making decisions. They have seen, experienced, appreciated and assessed the extent of destruction or the level of properly managed habitats within their environment. At lasts the decision to practice or not - the 5 W's. But the questions still linger in their minds. WHAT CAN WE DO? WHO IS GOING TO DO IT? WHEN CAN WE DO IT? WHY SHOULD WE DO IT? AND WHICH ONE CAN WE START WITH?

- At this point every participant pledges\promises what he\she is going to do either to improve on the environment where he\she stays or at school or anywhere else OR maybe to rectify an environmental problem that he is aware of at a particular place. The pledges are individual and are done at a free will.
- All this pledges are recorded in a big pledge book with all the details of the 5 W's for each participants
- The pledges are characterized by a better understanding of their local environment (See appendix 5)

This is the basis of a follow-up programme.

3 Follow-Up Programme

It is partially based on pledges made by the participants on the last day of the four-day programme.

It involves teachers\leaders who led the group through the four day programme, following the individual participants to their school, home, village and interacting with them and eventually assessing the impact the programme has had on the individual, the participating group, the teachers, parents, brothers, sisters, the community where the participant comes from.

Note: Implementing the pledge is one of the follow up highlights and NOT the major achievement or target. Children must not be castigated for not implementing the pledge.

Important issues that MUST be addressed in the follow up include:

1. The technique of interaction with participants.
2. The questionnaire design
3. Qualitative analysis of information collected as opposed quantitative-data.

A Typical Follow-up Programme

a) The recommended period between the first EL training course and the follow-up programme should be between 4 months- 8 months.
b) Development of Semi-structured questionnaire to assess the impact of the participants overall experience for: - pupils, teachers, and head teachers' parents.
c) Composing a team to carry out the follow-up activities and define their roles.
d) Development of a work plan specifically for the follow-up.
e) Carrying out the planned activities.
f) Evaluation of the questionnaires.
g) Giving feedback to the participants.
h) After the evaluation and assessment developing an action plan that will address the continuity of the programme.

NB During the follow up programme assessment is made on the overall teacher/head teacher adoption in the application of EL techniques on the day to day teaching and pupil management.

4 Recommendations and Conclusion

Recommendations:

1. The follow-up programme is paramount to the success implementation of EL programme. It should be done after 8 months as agreed with the participants especially the pledges made.
2. A team should be comprised from the participants and be facilitated by the trainers to carry out the follow- up programme, develop a training manual and an action plan for Rufiji District.

It is important to note that though all the participants went through the training successfully, the skills are still not mastered. However the consultants noted a few persons who have the art and could be led to excellence. . (It is recommended that such a team to comprise of: - Juma Mapande, John Naggar, Ratha Rwambo, Herman Mkunde and to be coordinated by Oswald Kombe.) During the follow up programme the identified team will get an in depth knowledge and skills in EL to be able to carry out training of teachers within REMP pilot area.

3. REMP should ensure that all the activities recommended under Formal sector programme in the awareness programme final report support each other for effective awareness raising in the schools.
4. For future plans it is recommended that Rufiji district establish an environmental education centre where Experiential learning would act as a resource base. This centre would be run by individuals identified among the participants but would be exposed to an in-depth environmental education.

Conclusion:

The art of teaching using outdoor materials and practical experiences has no guidelines or a scheme of work that can be followed for a specific location. It all depends on the trainer\teacher to come up with the appropriate materials\apparatus because they are all there within the environment.

5 Appendices

Appendix 1: Terms of Reference

1. Prepare and run a nine day experiential workshop with;
2. Target teachers, coordinators and community leaders.
3. Carry out an evaluation of the training workshop.
4. Report on workshop with recommendations regarding follow up actions.
5. Produce a report which inter alia:-
   Outlines the course content.
   Evaluates the training workshop.
   Detail recommendations regarding follow up actions Who and Why?

Appendix 2: Consultants' Itinerary

27th October
Travel to Dar es salaam
Purchase materials.

28th October
Travel to Mbunju Mvuleni
Debriefing with Rose and introduction to local leaders.
Set up the camp site

29TH October
Short trail with participants

30th October
Long trail with participants

31st 0ctober
Train on hands on skills
Group work to design the programme for pupils

1st November
Short trail with the pupils
Evaluate the participant's performance

2nd November
Hands on Skills with the pupils
Pledge making ceremony

3rd November
Travel to Utete
Debriefing with REMP officials

4th November
Travel to Dar
Prepare notes

5th November
Travel back to Kampala.

Appendix 3: List of Participants

Full Names	Sex	School/ Ward	Designation
Abdallah Simba	M	Jaja	Teacher
Saidi Mbaruku	M	Twasalie	H. Teacher
Neema Mrindoko	F	Msona	Teacher
Fahamu Mtambo	F	Msona	Teacher
Secilian Dominician	F	Mtanza	Teacher
Ratha Rwambo	F	Ikwiriri TRC	TRCC
Juma Mapande	M	Nyamtimba	TRCC
Gimbu Mohammed	M	Chumbi TRC	TRCC
John Naggar	M	Mwaseni	W.E.C
Evangelister David	F	Mtanza	Teacher
Lazaro Martin	M	Mkongo	W.E.C
Athmani Mkinda	M	Mkongo	Councillor
Herman Mkunde	M	Nyaminywili	TRCC
Peter Ngaiwa	M	Mbunju	H. Teacher
Mwanja Shekalage	F	Mbunju	Teacher
Hadija Ali Ngingo	F	Mbunju	Scout
Hashim Salum	M	Mbunju	Village Chairman
Oswald Kombe	M	Mbunju	Village Chairman
Rose Hogan	F	Rufiji	T.A REMP

Appendix 4: Participants Feedback Notes

Expectations

1. Possibility of making teaching materials concerning his/her environmental surroundings.
2. To get technique and tactics of teaching and learning the environments.
3. To meet different type of people in order to exchange ideas.
4. To get the knowledge and skills about the course.
5. To see the Environment of Mbunju Mvuleni village.
6. To increase my income.
7. To see different types of wild animals.
8. To know how to protect deforestation.
9. To expand knowledge on the geography of Rufiji District.
10. To know things that are found in our Environment.
11. To acquire knowledge and educate the community on sustainable use of Natural Resources.
12. To know the names of animals and trees.

Appendix 5: Evaluation of Experiential Learning (STRONG POINTS)

NYATI GROUP PRESENTATIONS

STRONG POINTS

1. It triggers / raises the interest of learning among the learners/ pupils.
2. It involves all learners during learning.
3. It builds a lasting memory.
4. It builds relationships among the learners.
5. It makes the teaching easier for the teacher.
6. It cultivates/commands attention of the learners.
7. The learners are involved more than the teachers therefore it removes 'Teachers, Talking, Too much' (T.T.T).
8. It helps the teachers to be creative.
9. It sharpens the senses of the pupil.

WEAK POINTS

1. It requires a lot of time to teach.
2. It is difficult for children with disabilities like lame, Albino etc.
3. It requires a lot of vigilance or careful observance especially by the teachers.

TEMBO GROUP PRESENTATIONS

STRONG POINTS

1. The pupil uses more than one sense to learn.
2. It builds in a learner a long lasting memory.
3. It involves many learners at a go during learning.
4. It builds self-confidence, creativity and intuition of a learner.
5. It makes it easier for a teacher to teach.
6. It makes the learners enjoy the lesson.
7. It raises the interest of learning among the learners.
8. Any environment can be used for learning.

WEAK POINTS

1. It uses much time during teaching/learning.
2. It tires both the children and the teachers.
3. Sometimes it can make the learners fearful.

Appendix 6: Teachers Practical Experience with Pupils

Recap of the 1-day exercise with the pupils (pupils' feedback)

1st Lesson

1. WETLAND/SWAMPY AREA

a) Uses of a Wetland

- Area where you can grow vegetables throughout the year.
- A home for animals and insects e.g. worms, fish.
- Provides food for animals e.g. water lily fruits, worms.
- Stores water for home consumption and animals.
- It purifies the water.

2nd Lesson

Animals

- To identify domestic and wild animals.
- To differentiate animals by their physical features, their dug, sounds etc.

3rd Lesson

SEED TAG GAME

- Conditions necessary for seed germination i.e. Water, Warmth and Air.
- To identify the enemies of seed germination e.g. animals, insects, burning of the forests etc.

4th Lesson

SENSES (Blind fold Game)

- To identify different things by using one sense i.e. Touch
- To differentiate different features of things by touching.

5th Lesson

A HOLE IN A TREE (its uses)

- A home for animals, insects or birds e.g. snakes, bees, birds etc

6th Lesson

A HOLE USED for CUTTING TIMBER PLANKS. (Observations and what it indicates)

- Destruction of environment/ forest.
- Indicates cutting of trees.
- Uses of trees (Timber, firewood, charcoal, poles of construction, oxygen/ fresh air.

7th Lesson

NATURAL POWERS OF THE FOREST

- The Natural power insists on taking care of the forest/ environment.
- It builds a lasting memory of the learnt lessons.

8th

LISTENING

- To listen to sounds of animals, insects, birds etc.
- To differentiate different sounds in the forest.
- Helps identify different animals, birds, and insects living in the surroundings.
- Sharpens the sense of hearing.

9th Lesson

NON-LIVING THINGS

- These things help refertilise the soil.
- Human beings use them for various purposes e.g. firewood, making charcoal.

Participating Pupils

Name	Class
Moza Juma	VI
Zabibu Athumani	IV
Haji Saluum	VI
Asia Athumani	VI
Mohammed Yusuf	VI
Aziza Adam	VI
Tatu Hamisi	IV
Seifu Yaga	IV
Mwahija Rajab	V
Seif Rajab	VI

Teachers - All Nyati group members.

PUPILS RESPONSES
By Tembo Group

1st Lesson
SOIL EROSION
- Agents that cause soil erosion e.g. Water, Animals, Wind, Rain etc.
- How to control soil erosion e.g. Not to cut trees unmanageably, Not to burn vegetation cover, contour ploughing.
- Advantages and disadvantages of controlling soil erosion.

2nd Lesson
BREATHING TREE GAME
- How trees help living things by providing fresh air (oxygen)
- Disadvantages of cutting trees e.g. all living things could die.

3rd Lesson
FLOWERS
- Uses of flowers.

4th Lesson
TERMITES
- How termites make their house.
- How insects live in the soil

5th Lesson
COLLECTING USELESS THINGS (Scavenger hunt game)
- Learnt that all things are useful.

6th Lesson
FOOD WEB GAME
- All living things depend on each other for their survival.

7th Lesson
GHOST OF THE FOREST
- Learnt about the Natural Powers.

8th Lesson
SOIL FACTORY
- How insects like termite's help in making the soil.

9th Lesson
AN ANNOUNCEMENT (About Rice Growing)
Learnt that if the rice growing was stopped all people would die due to hunger which is the same as, if the bushes are burnt thus young tree seedlings, when the mature ones get finished then there will be no more trees then everything else will die.

Appendix 7: Recap of the 4-Day Programme

NYATI & TEMBO GROUP PRESENTATIONS

1st day – 28.10.01
VISITING THE NEIGHBOURHOOD ENVIRONMENT
Lesson: -

- To experience the neighbouring Environment.
- To know the different things that are at the neighbouring environment.
- There are living things that eat during the day or night and others day and night.
- To differentiate sounds of different living things that live in that environment.
- The neighbour was quiet and peaceful.

2nd day – 29.10
GOOD MORNING FOREST
Lesson: -

- Changes in climatic conditions according to time.
- Behaviours of insects, animals & birds.
- The forest is a habitat/home for insects, animals & birds.
- All these was done using the 5 common senses i.e. seeing, hearing, smelling, touching and tasting.
- The most used sense in this exercise were seeing and hearing.
- Everything in a forest is useful.

WETLAND AREA (BOGGY LIFE)
Lessons: -

- It is a storage of water.
- It sieves the water / it helps purify the water.
- Can be used for growing vegetables throughout the year.
- It is a habitat for living things.
- It provides food for animals.
- Insects that help in soil production are found there.
- Dangers of a wetland include mosquitoes and a habitat for dangerous animals.

'NYAMA NYAMA GAME'
Lesson: -

- An energiser
- Helps identify domestic and wild animals.

SEED TAG GAME / SEED GERMINATION GAME
Lesson: -

- The most necessary conditions for seed germination are - water, air and warmth.
- Enemies of seed germination and growth include - animals, termites, fire ants etc.

INTRODUCTIONS
Lessons: -

- To know one another and respect each other.
- To know people from different places and the different jobs that they do.
- Selecting a group leader and agreeing on his roles.

EXPECTATIONS
Lesson: -

- Everything that a human being does has its own expectations.

3rd day --- 29.10

ENERGY FLOW GAME
Lesson: -

- All the energy comes from the sun.
- Living things depends on energy in order to live.
- The dependence between a human being and plants is shorter than the dependence between plants—animals --- human beings in terms of energy.
- Take care of the forest and the forest will take care of you.

Additions from discussions: -

- The long energy flow line has more environmental impact than the short one.

CAMPFIRE NIGHT OF STORY TELLING
Lesson: -

- Behaviours of animals e.g. Elephant, Lion, Crocodiles

Additions: -

- Stories have to be factual.
- E.g. Elephant: - -Has a total weight of 7 tonnes.
  -Has a gestation period of 23 months.
  -Baby elephant has a weight of 150kgs.
  -It consumes about 200 litres of water per intake.
  -It consumes about 120kg of food (foliage or plants).
  -It lives for about 70 years.
  -It excretes about 15-20kg of waste per day.
  -It has a sharp memory.
  - It can perform other jobs like entertainment, transport etc.

4th day ----30.10
BREATHING TREES
Lesson: -

- Importance of the forests.
- Living things depends on the forests to get fresh air.
- If all plants/trees are cut all living things will die due to lack of air.

Additions: -

- Dangers of cutting trees.
- Desertification
- Lack of rain
- Lack of fresh air
- Soil erosion
- Lack of habitats for living things
- Elimination of living things.

FOOD WEB
Lesson: -

- Living things depend on each other
- All living things depend on plants to a large extent.

TERMITES
Lesson: -

- Behaviours of insects.
- Termites help in mixing of the soils.
- The architecture of their house is able to adapt to climatic conditions.
- The high level of coordination and cooperation between themselves.

MAGIC GAME (Strange Encounter)
Lessons: -

- When a sudden happening appears one becomes very attentive in listening to the message.
- The memories of that message have a long lasting effect.
- It is important to take precautions in any event.
- The natural powers insist on respecting and taking care of the environment.
- Offer of chocolate was morale raising for the participants.

SOIL FACTORY
Lesson: -

- Insects help in soil production to a great extent.
- The most important agents in the process of making soil are insects, water, dead animals and plants, warmth, etc.

BLIND FOLD GAME
Lesson: -

- One can be able to identify different characteristics of different things by using the sense of touch.
- Each living or non-living thing has different features from any other.

MZEE SUN HOTEL
Lesson: -

- All energy comes from the sun.

RAINBOW CHIPS
Lessons: -

- The rainbow has seven colours i.e. Red, orange, yellow, green, blue, indigo, violet (Run Out Your Girl Beatrice Is Vomiting)
- Uses of flowers.
- The seven colours can be found in plants.

MAGIC WATER/SMELLY SOUP
Lesson: -

- The soups made by the participants was given a strange name i.e.

‘ MAKAMULI NGASWESWE NGAVANGA MANJENJEMULI MZUMBASHABIBO MTONDOZI NYUNGU YA MAWE MAZINGIRAMBUNJU TONDOLONI JABWALI MTAMBALIKE LIPOYA MNAFE soup’.

EXPERIENTIAL LEARNING
Lessons: -

- Why and how to take care of the environment.
- It is important to do a recap at the end of days exercises.
- Make sure the exercise has been done.
- Make a lesson scheme or plan.

5th day --- 31.10
NEWS ANNOUNCEMENT on scrapping of Std. 1 Class in 2002.
Lesson: -

- If we destroy the young plants there will be a desert – there will be no life.
- We should take care and conserve the forests.

BEE KEEPING
Lesson: -

- Proper methods of Bee keeping.
- There are 2 types of beehives i.e. traditional and modern.
- Types of bees i.e. those that sting and those that do not sting.
- Advantages of bee keeping.
- Proper methods of honey harvesting.
- Types of Beehives.
- Importance of involving an expert in teaching of skills.
- Food for bees is nectar from flowers and water.

GROUP WORK
Lesson: -

- Involvement of all participants.
- Builds up relationships within the group.
- Builds up self-confidence.
- Raises interest of learning.

Appendix 8: Practicals in Lesson Planning

Lesson Scheme (an Example)

By Tembo group

Date	Subject	Class	Period	Time	No. of Pupils
1.11.01	Science	VI	2	2.40-3.20	

Main topic ----- Interdependence of Living Things
Animals, Insects and Plants.

Main Objective --- The pupil to be able to understand how Living Things depend on each other.

Materials ------ String and Pictures of living things.

STEPS	TEACHERS WORK	PUPILS WORK
Introduction	To ask pupils different questions e.g. a) Mention some of the animals that live within your environment. b) Mention the foods that those animals eat. c) Mention the types of fish that you know.	a) The pupils will answer the questions e.g. elephant, monkey, lion Food like maize, leaves fruits Fish like Kumba, Perege, Kambale
New Skills	To guide the children to mention the living things and how they depend on each other. Do a game by using the pictures of animals, plants, insects and a string.	Get involved in mentioning the names of living things and how they depend on each other. Get involved in the game.
	To ask the pupils questions from the game they've played e.g. a) What does an elephant feed on? b) What does a Lion eat? What do most animals eat? If all plants die what will happen?	The pupils will answer the questions.

Nyati Group

Lesson Scheme

Date	Subject	Class	Period	Time	No. of Pupils
1.11.01	Science	V	1	2.00- 2.40	10

Main Topic ----- Plants
Seed Germination

Main Objective --- The pupil to know about Seed Germination
The pupil to be able to mention the necessary conditions for seed Germination and its enemies.

Materials ----- Cards written Sun, Air and Water.
Teaching Aid ----- A Play Game

STEPS	TEACHERS WORK	PUPILS WORK
Introduction	Ask questions like a) Mention the plants that surround you. b) Mention fruit trees that you know. c) Mention animals that you know.	Listen and answer the questions.
New Skills	a) Request the pupils to mention necessary conditions for seed germination. b) Pupils to mention enemies of seed germination. c) Guide the children to play the game on enemies of a seed.	Pupils to answer the questions. Pupils to listen carefully, observe and play the game
	Ask questions from the game played like:- What are the necessary conditions for seed germination. Mention enemies of a seed. What have you learnt from the game.	Pupils to listen and answer the questions.
Exercise	Give the pupils questions to answer like:- What does a seed need to germinate? Mention things that make a seed not to germinate. Mention 3 seeds that you know.	Pupils to answer in their exercise books.

RECOMMEDATIONS BY THE PARTICIPANTS

1. Experiential learning should be made continuous and sustainable by involving all the stakeholders.
2. There should be a follow up programme to ensure implementation of this programme. REMP, Councillors, Education department, DC, MEK, TRCC, WEO, Head teachers and all participants of EL should do this.
3. All Stakeholders should facilitate the process of implementation of this programme.
4. EL skills to be disseminated in the whole district and the participants would be the trainers in collaboration with the consultants.
5. Education department should make an action plan with a time frame of how to carry on with the programme.

Appendix 9: A Note on 'Earth Education'

An important influence on environmental educationalists in the North over the past twenty years has been the theory and practice of Earth Education, a concept devised by the American educationalist Steve van Matre (1972). The programmes of the Earth Education Institute are copyrighted and run by members of the Institute. All organisations are invited to buy the Institute's publications and run their own programmes.

Although the programmes themselves represent a 'package' to be followed in its entirety, the principles underlying the approach are familiar to many teachers as 'good educational practice'. For this reason – and because some of the games are so effective – the Earth Education approach has had an influence well beyond the readership of the Institute's materials.

Five Principles of Earth Education:

Senses

We learn best when we use all our senses. Earth Education employs activities that encourage young people to use all the senses to explore and experience the environment.

Concepts

The key ecological concepts which underpin life on Earth represent the 'curriculum' of Earth Education; they are summed up by the mnemonic: EC-DC-IC-A

E - energy flow
C - cycles
D - diversity
C - community
I - inter-relationships
C - change
A - adaptation

These are 'explained' through games which illustrate the concepts.

Mechanics

This refers to the teaching method, i.e. a shift from the traditional *teacher/tutor* role (the distant provider of answers and instruction) to the role of *fellow explorer* – someone who is exploring with the children, sharing in their discoveries and sense of wonder.

Solitude

This is often overlooked but it is perhaps the most powerful element of all. Children are surrounded by noise and are rarely left alone. Having a spot to sit and contemplate alone for ten minutes can be unnerving for many children – but it is one of the things they are most likely to remember about a day of outdoor activity.

Magic

The secret ingredient, the glue that holds it all together. In this context we might translate 'magic' as the imaginative spark which the leaders bring to the programme; e.g. a sketch-map of an area might show a patch of scrub as *unexplored territory* and the leaders maintain their story that they have *never* been there themselves. In this way the sense of excitement is heightened and the children's recall of the day is enhanced (see *A Strange Encounter*).

Appendix 10: Descriptions of Games

Seed Tag or Seeds' Needs

Equipment:

- 4 x A4 sized labels with string to be worn around the neck: *Air, Rain, Soil, Sun*
- 4 sets of small cards (enough in each set for the whole class):
  Set 1 (given to the child with the *Air* label) should be white and marked *Air*
  Set 2 (given to the child with the *Rain* label) should be blue and marked *Water*
  Set 3 (given to the child with the *Soil* label) should be brown and marked *Food*
  Set 4 (given to the child with the *Sun* label) should be yellow and marked *Light* on one side and *Warmth* on the other
  (NB coloured card is optional)
- 2 large signs: *Garden* and *Dead Seeds*
- Costumes (optional) to be worn by the 'pests' (birds, rats, weevils, etc.)

To play:

1. Introduce the game by asking the class what they think seeds need in order to germinate and grow successfully; they should come up with: warmth, moisture, air, light and nutrients – although this may be in their own words.

2. Four children are selected to be the elements of *Air, Rain, Soil* and *Sun*. They wear the labels around their necks so they can be easily identified and take up position spaced apart around the edge of the play area.

3. Ask why each plant seems to have so many seeds. Again the class can list reasons (poor conditions for growth, lack of one or more of the elements, seeds are food for rats, birds, insects, etc.)

4. Two children are chosen to be the pests (birds, rats or whatever they choose).

5. The rest of the class are seeds. They will have to run from one element to the other to collect all they need for growth. If they are caught by one of the pests before they collect all their needs, they must go to the dead seed pile. If they have collected all five cards from the four stations they can go to the flowerbed.

6. The two signs, *Garden* and *Dead Seeds*, are placed at each end of the play area.

7. After giving careful directions, send the class off to collect their cards. After a few seconds announce the arrival of the pests. There now follows a game of chase or 'tag' with the pests running around trying to catch all the 'seeds'.

8. If the game works well (i.e. the pests work hard but are not too successful) there should be a few children in the flowerbed and a larger number in the dead seed pile.

9. After the game has been played once, reassign al the roles and play it again – it usually works better the second time as the children know exactly what to do.

6 Energy Flow Game (the original version)

Equipment:

- Large container of water (half an oil drum is ideal)
- Two square plastic collection vessels
- Five jugs (or large plastic mugs or tins) with holes drilled in the bottom

To play:
This is a game in which the cows never win.

1. Discuss with the class how plants and animals need energy to grow – where does the energy come from? (The sun). Plants make food using sunlight (through the process of photosynthesis) and animals get their energy by eating plants (or other animals). The eating of plants by animals is called a food chain – energy is lost as it is passed down the chain. Animals are quite inefficient at converting energy into growth (because they move around, excrete, generate heat, etc.) consequently it takes a lot more energy to grow a cow than to grow a plant.

2. Let's see this in action. The class is divided into two teams, *Cows* and *Maize*. Explain that for the purposes of this game, the sun's energy is represented by water. The large drum of water (more than we'll ever need for the game) is the sun. Player One in each team represents a plant. Can they get their energy directly from the sun? (Yes). They can fill their jugs/tins and run to their Player Two who is waiting down the line. Remember, energy is lost as it moves down the food chain, so these tins leak!

3. Position the Player Ones some ten metres from the drum with the Player Twos another ten metres further away.

4. On the Maize Team, Player One represents a maize plant and Player Two represents a hungry person.

5. On the Cow Team, Player One represents a plant and Player Two represents a cow. This team has a Player Three who is the hungry person. Can a cow or a human being go straight to the sun for energy? (No).

6. The rest of the class are lined up in their two teams to the side of the play area.

7. Player One in each team collects energy (water) from the sun (drum). They run as fast as possible to their Player Two and tip the water from their jug into Player Two's. Player Two now runs as fast as possible to the next stage. On the Maize team this is a collecting pot. On the Cow Team this is Player Three, the human being who must run another ten metres to their collecting pot.

8. As soon as each player has completed her/his task they run to the back of their team's line and the player at the front of the line takes their place. In this way, everyone gets to play a part.

9. The game ends when everyone in the class has had a go.

10. Now check the amount of energy (water) that each team was able to store during the game. The Maize team should always have more than the Cows.

11. Ask the children, who was more efficient at gathering energy, the cow or the plant? (The plant of course) but who uses more energy as they grow? (The cow) So was one plant enough to feed this cow? (No) So it would actually take a lot of plants to feed one cow – a cow is a very concentrated form of energy – that explains why meat is more expensive than maize! In the UK this game might discourage the consumption of beef-burgers. Here, the discussion is on the need for a balanced diet.

Modification to Energy Flow Game

That final discussion proved very difficult in Ghana and led to some confusion among leaders and pupils. The ecological concept was lost during the discussion on diet. This version looks at the same process but using plants, caterpillars and birds.

Play the game as normal first of all using plants - caterpillars - birds.

Once the principle of energy flow is established play it this way:

Rules: You can collect energy from your food source ten times - if after this time your container has not reached the 'life line' marked around the collection container then you've used far more energy than you have been able to acquire and you cannot survive.

1. To begin with one child (a small plant) gathers energy from the sun and puts it in the plant bucket - they can survive comfortably.
2. The caterpillar tries to gather enough from that partially filled plant bucket but there is not enough for the creature to survive. Discussion - how many small plants would we need to ensure that the caterpillar can survive comfortably?
3. Put four children in the plant role - now the caterpillar can survive. Discussion - can the bird live on this caterpillar?
4. Try it - no it can't. So how many caterpillars do we need? Put four in.
5. Now there are not enough plants for all those caterpillars to survive - we need more plants! Put in more plants so the caterpillars can survive - now we have a bird surviving.
6. Put the eagle at the end of the chain - can they survive? No.
7. Eventually you will have a widely spaced chain of four buckets. To make the food chain work successfully you should need (guessing here) 16 plants (green painted tins), 9 caterpillars (yellow tins), 4 birds (blue tins) and one eagle (red tin) i.e. a trophic pyramid - but not necessarily in those words (secondary school groups might use such terms).

This activity requires careful preparation to get the pyramid right - it all hinges on the spacing between the different food sources (elements of the chain).

Breathing Trees

Equipment:
No equipment required – just plenty of space, not good where the ground is wet or muddy as the children have to lie down.

To play:
Ask the class to take a deep breath – hold it – let it out. Then take another deep breath. Ask them, "When you took that deep breath, was it 'good air'?" (or, depending on age group, "When you took that deep breath, what were you taking in?" i.e. oxygen).

Ask if the air that they exhaled was also 'good air' (it wasn't as good, it was used – or it had more carbon dioxide).

Continue, "If we all breath out used air (carbon dioxide), how can we then breath in more fresh air? Where is it all coming from?" The class will tell you what they know about green plants breathing out oxygen – the term photosynthesis is often well beyond younger groups (hence the game).

In this game we will see what it would be like if we had no green plants or trees.

1. Divide the class so that one third are trees. The trees stand around the play area in a random pattern but using up al the space. They should stand still with their arms in the air, waving like a tree in the breeze. Tell them that if they are cut down then they are dead and they must lie down until the game is over.

2. The other two-thirds of the class are animals (telling them this usually gets a laugh – especially from their teacher). They are instructed to run around from tree to tree. For the purposes of this game they can only breath at a tree and they can only stay at a tree for a maximum of five seconds.

3. Demonstrate this to the class by taking a deep gulp of air at one of the 'child trees', running to another one while holding your breath and then gasping for another breath when you reach the next tree.

4. Explain that there is also a woodcutter around with a chain saw (if these are familiar – otherwise, with an axe). If a tree is cut down, then it is a dead tree and the animals cannot go there for air.

5. Start the game allow the animals to run a round for 30 seconds to get used to the idea – then the leader pretends to start a very noisy chainsaw. The leader runs and begins cutting down trees, shouting 'timber' or a local equivalent as each one falls. Also shouting, "Dead tree – you can't breath here!" just to emphasise the point and remind the class of the rules.

6. The leader runs menacingly from one end of the play area to other taking out trees here and there to ensure that the animals have further and further to run.

7. Eventually, the leader walks up to one of the last two trees and waits for it to attract most of the breathing animals. Then the tree is cut. Quickly the leader runs with the gasping children to destroy the last tree. Once this one is cut, the leader gasps for breath – for even the woodcutter must die because there is no air to breath.

8. The class exchange roles so all the trees are animals and half the animals are trees. Play the game again but at the last tree, if the leader takes his/her time to get to it and finds that the animals are in the way, the class may realise that they can actually save the tree by fighting off the woodcutter. Then they can be praised for being concerned conservationists and citizens and the tree is spared!

9. After the last round (two is usually enough), ask the children how they felt as the trees disappeared (I.e. it became difficult to breath). So you see, the environment is a lot more important to us than we sometimes realise – everything is connected in surprising ways.

Food Webbing

Equipment:

- Enough 2-3 metre lengths of string for each member of the class
- Labels with safety pins attached depicting various plants and animals including one tree (this should be geared to the local environment, an mvule tree works for forests, but a mangrove would be better in the delta plus prawns, fishes, a fish eagle, etc.)

To play:

This game can start with a 'twenty questions, who am I?' type game:

1. Show all the cards to the class and make sure that they are all identifiable to the children.

2. Each child then has a picture card pinned to their back without knowing what it is.

3. Form a circle and put one child in the middle who turns around so that everyone can see the picture on her back. Now she must ask questions to which the class can only answer 'yes' or 'no' (e.g. "Have I got legs? Do I have four legs? Have I got feathers? Do I have many legs? Do live on the ground? Am I a millipede?) Each child takes it in turns to identify themselves in this way.

4. Now hand out a piece of string to each child and ask them to hold one end and give the other end to a child that represents something that they eat or that eats them. Once they are

connected in this way they should stand apart so that the string is stretched tight. Other plants or creatures can connect up with more than one child, some may even hold the string between two creatures that they eat or are eaten by. Eventually all the children should be connected in a complicated web. The leader should ensure that everyone is connected and that no small sub-networks have been left out.

5. Now explain to the class how they are all connected but if a creature's connection to it's food source is lost, it will die. If you feel a tug on your string, this means that the food at the other end of the string has gone down and so you too must go down.

6. Now the leader cuts the tree down. As that child crouches down they tug on all the strings that they are holding. All the children's whose strings are pulled must also go down. Within a few seconds, the whole class will be down on the ground.

7. Ask the class what happened? Discuss how everything is connected to everything else – if we remove the mangroves or trees, all the life that goes with them will also be lost.

A Strange Encounter

Equipment:

- Cloth or costume to conceal the *Spirit of the Forest*

To play:
The *strange encounter* is with a mysterious figure (somebody who is dressed up in old cloth and leaves and hidden among the trees). He waits for the unsuspecting group to come along the trail and then berates them for making noise and coming into the forest to steal its plants and animals without care.

The initial reaction among the group is fear and panic followed by some indignation. They explain (often with the leader's prompting) that they care for the forest and they are here to learn more. The stranger asks them to bring him the 'ingredients of soil' to demonstrate what they know. They discuss the task and perform it accurately before being allowed to pass. The figure tells them he will be watching them…

Care should be taken to choose an actor from the same area as the group so that his dialect matches theirs. This convinces them that the 'spirit' is indeed genuine. After the trail, the leaders are asked about this encounter which is always the focus of that evening's discussion. The 'spirit' is always given a name by the group – one of their cultural spirits – the leaders never name it.

Sometimes the leaders are asked if the spirit is real but the question is turned back, 'What do you think?' On occasions when a teacher reports by letter that a pupil has done a great deal of positive work on their farm since following the programme, the leader should be sure to mention this when s/he turns up at the school for a follow-up visit. The pupils will be amazed that the leader knows so much – but s/he simply says, 'Someone around here let me know…' The children's imaginations take it from there…. ***Magic!***

Feel a Tree

Equipment:

- Enough blindfolds for half the class
- A variety of trees

To play:

1. Ask for a volunteer who will help with a demonstration. Blindfold the child and turn him around three times to disorientate him. Now lead him to a tree (the whole class follow quietly) and ask him to feel the tree carefully. Give plenty of prompts during the

demonstration: is it fat/thin, rough/smooth, is anything growing around the base of the trunk, can you reach any branches?

2. The child is lead back to the starting point and the blindfold removed. He must now walk around and identify 'his' tree (round of applause when he finds it).

3. Children are divided into pairs, each pair has a blindfold and they take it in turns to lead each other to a different tree.

4. NB Give clear instructions to the children to be very careful with their blindfolded partner – "you are their eyes, watch the ground," etc. This is also a trust-building exercise.

Rainbow Chips

Equipment:

- Brightly coloured pieces of card or chips wood

To play:

1. Decide on a special place along the trail where there is a variety of plants, grasses, trees, etc.

2. Tell the children that last time you were here it was raining quite hard. As the rain eased off, the sun came shining through and you know what you get when the rain comes through the sun… (a rainbow). But this rainbow was different – it grew brighter and brighter and brighter until it shattered into millions of tiny pieces which fell to the ground all around this place. What colour do you see when you look around? (Green) But there's much more than green here – we're going to look for pieces of the rainbow!

3. Either: give each child a coloured chip and ask them to collect examples of that colour, or: whisper a colour to each child and ask them collect it. Be realistic, give plenty of children the task of finding green, brown, yellow, red, purple. Blue is very difficult but a particularly smart/difficult character could be given blue.

4. Give suggestions: they should look for small – even tiny – examples such as the red stem of a dying leaf or the purple lines in a seed pod. Don't pick whole flowers. Flowers are seed factories in their own right and are needed to help the plant to survive. If your colour is yellow and you see a yellow flower, pick a little piece off one petal.

5. The children go of for about fifteen minutes trying to find examples of their colour.

6. Call the class back and stand in a circle (preferably around a patch of bare earth), the children put their finding in the middle of the circle – there should be a wide range of colourful objects. Ask, "Now does it just look green?" Remember, that there is much more to nature than you think – you only need to look.