

## **OUR ENVIRONMENT**

### **Simulated Classroom - An Experimental STUDIO RECORDING**

#### **Announcer**

Hello, everybody. I welcome you all to this simulated classroom session on easy now. I request the chairman of National Institute of Open Schooling, Mr. M.C. Pant to say a few words regarding the activities of National Institute of Open Schooling.

#### **Shri. M.C. Pant Chairman, NIOS**

Open learning system provides opportunity to a learner for life-long education. It provides the opportunity of learning according to his own choice, his own pace of learning as well as his aspirations of learning.

The child learns from environment and the education system provides him an opportunity to enhance his competence with different modes. We live an environment where we continuously interact with natural forces as well as those which we develop through our own evolving systems. The systems provide us an opportunity for our own development as well as, they provide us an opportunity, if we make them sustainable keeping in view their optimum utilization. So, learning systems all make us competent enough to use human resources as well as natural resources up to the optimum and open learning system provides an opportunity where the learner can get assistance of learning from different sources. They may be human resource, they may be information and technology, they may be interacting with the nature and under these circumstances when we develop our content, when we develop our competencies, when we interact with nature we feel that there is enormous potential for enlightening the people by themselves with the help of nature. We in NIOS, are trying to provide the opportunity to each learner for lifelong education whether he is neo-literate or he is literate or he is having some qualification or he wants to enhance his qualification or he is in the area of work

or he may be studying somewhere or he may be working on his own that is the basic premise on which the open learning system works.

### **Announcer**

I, now, request Dr. R. Sreedher, Director, Commonwealth Educational Media Center For Asia to say a few words about the “Easy Now” project.

### **Dr. R. Sreedher, Director, CEMCA**

Commonwealth Educational Media Center For Asia, popularly known as CEMCA, is a unit of Commonwealth of learning located in Vancouver. Commonwealth of learning as of you all know is a inter-governmental agency. At CEMCA, we have a mandate to promote technology enabled open and distance learning. And as you know technology is always there but it is under utilized. So,

we in CEMCA, are trying to develop new systems to use the existing technologies to the best of its ability and through this project of “EasyNow” in collaboration with National School of Open of India, we propose to show to the teachers, that with one attempt, that is with one electronic source, we will be able to get nine or more deliverables. “EasyNow” , **NAV** in Hindi is nine. For example, one deliverable may be a text or one may be an audio, another one may be a video, another mayl be interactive multimedia and so on and so forth. So this is a pioneering effort and we are happy that we are collaborating with NIOS and if this pilot succeeds, then, we propose to take this experiment throughout Asia.

### **Announcer**

The lecture will be on our environment. As we all know in general, understanding of the environment is very crucial. The lesson will be delivered by Ms. Purnima Joshi, who is a biology teacher at St. Andrews Scott School, Patparganj and she will be interacting with a group of tenth standard students who are present here. So, over to Ms. Purnima Joshi and her class.

### **Ms. Purnima Joshi, Biology Teacher, St. Andrews Scott School**

Teacher: Good Morning students. In the previous class we discussed about the natural resources and the flow of energy and environment. Today, we shall discuss about our environment in detail.

Today's topic is “our environment” .

Let us begin the topic with a very simple question, which planet in the solar system, supports life?

Students: Earth

Teacher: O.K. And what is all around us, which affects us every moment?

Student: The environment

Teacher: Right, OK.

So, the topic of today is our environment.

One more question which is very relevant right now, which Indian has been recently in the news for his findings in the environment sciences?

Student: Dr. Rajendra K. Pachauri

Teacher: Why?

Student: Actually, he and his team were awarded the nobel peace prize for their findings on global warming and other climatic changes.

Teacher: Right. Very good. OK.

Let's begin with the environment. Now let us, see the environment. It supports life. So, as such environment consists of living forms as well as non-living factors like air, water, soil, etc, So, if you want to understand environment, if you want to preserve life on this planet Earth, we must understand our relationship, a kind of function between the living and non-living factors of the environment. So, this relationship between the living forms and non- living factors of the environment has been given the name as Ecosystem. So, now let us see, what is Ecosystem?

The interaction between all the living organisms with their physical surroundings is known as Ecosystem. Let's see what are the various parts of the Ecosystem. The Eco-system has two components which are named as abiotic components or abiotic factors. Abiotic factors include air, water, soil, temperature etc, Secondly, biotic factors or biotic components which are basically living factors which are plants, animals and various kinds of microorganisms. So, we can see that we can categorize broadly the components of ecosystem in two major categories, abiotic factors and biotic factors. Abiotic factors we can say in simple words is that they are all the non-living factors while the biotic factors are all the living factors. Right. These two components are there. Right. Let's see what is the relationship shared between abiotic and biotic factors. Can we find a

relationship between these two factors ? Yes. Now, let's see how the abiotic factors and biotic factors, how these animals, plants and their non- living surroundings are dependent on each other and how they constitute an ecosystem. Right. O.K. Let's see now the relationship in an ecosystem between the abiotic and biotic components. What is the relationship between these? As you know that is the producers of the food on this planet earth are the green plants. They are the source of food and because of the green plants only the other living being also survive. So, let's see now how we can categorize animals, plants and the microorganisms in the ecosystem and how do they depend upon the non-living and physical surroundings. O.K.

Let's take an example here of green plants. Green plants as we know, with the help of sunlight, carbon dioxide, water, and minerals as well as a very unique pigment called as the chlorophyll prepare their food by the process of photosynthesis. So, green plants can prepare food by utilizing these natural resources by the process of photosynthesis and green plants in their turn are a big source of food to the animals. How can we categorize the green plants and the animals in the different categories depending on their relationship. First is, green plants can be taken as producers. They produce the food for the entire population you can say and the producers are eaten by animals and grouped as consumers. Let's see now into how many categories we can categorize consumers. O. K. Depending on the kind of food they feed on we can divide consumers into primary consumers, secondary consumers and tertiary consumers and so on. The producers are green plants. Primary consumers are those who feed on producers and their product. Examples, insects, like grasshoppers, and animals like cows, rabbits. Secondary consumers are those who feed on primary consumers like frog and tertiary consumers are those who feed on secondary consumers. For example, snake. So, in this way we can categorize the consumers. There can be another category of organisms which are grouped as decomposers. A group of microorganisms are called as decomposers, which act upon dead bodies of organisms in order to draw energy from them and in doing so they release the minerals from the bodies of organisms which mix with the earth. Besides this, we have another category of consumers who are labelled as parasites and who live on a living host.

Example, tape worm, lice, etc. Let's see whether we can draw a relationship between the producers, consumers, decomposers, the parasites, in order of who eats whom. Yes. We can draw a relationship between producers and consumers on the basis of who eats whom and that is called as a food chain. Let's see what is a food chain?

Food chain, actually is a relationship between various components of an ecosystem on the basis of who eats whom. For example, green plants are consumed by say for example grasshopper and it is consumed by say frog and frog is eaten by snake and snake is finally eaten by big bird. Can we categorize this food chain in terms of producers and consumers? Yes.

Green plants can be called as producers. Insect, Frog, Snake, Bird all fall in the category of consumers. Insects since they feed directly on the producers are called as primary consumers and frog can be labelled as secondary consumers and similarly snake as tertiary consumers and bird as quaternary consumers.

Now, this is a relationship between various biotic components of an ecosystem. Where do abiotic components play their role i.e. biotic components like green plants can prepare food only by drawing energy from abiotic sources. That is the green plants prepare their food with the help of carbon dioxide, water, minerals and chlorophyll. These you can say are abiotic factors which come into being. Green plants prepare their food by utilizing the abiotic factors and once they become the producers they serve as the source of the food for the next trophic level of the food chain and this way the food chain functions.

Fine. After these producers and consumers die, what is the role played by another set of organisms called as the decomposers? Like here, suppose insect, birds, snake whatever category they belong to and after their death they are acted upon by decomposers who feed on their dead bodies to release minerals, to release chemicals from their body so that they can go back to earth and thereby they play a very important role in regulating biogeochemical cycle. So, this is the way we can understand a relationship between biotic and abiotic components of the eco system. Now, let's see over here that is an example of an ecosystem in our surroundings. Let's take the example of a garden. In the garden we find abiotic and biotic components. Can you name some components of a garden? Garden can be an example of terrestrial ecosystem. Terrestrial

ecosystem is where we find many animals like insects are there, frogs are there and lizards are there and the plants like flowering and non flowering plants are there and grass is there. So, garden can be ideal example of the terrestrial ecosystem. Terrestrial ecosystem is a system which is found on land. Similarly there can be aquatic ecosystem which is found in a water body.

Let's find out a relationship between aquatic organisms and find out the example of an aquatic ecosystem. That is in the water, free floating plants are called as phytoplanktons and phytoplanktons are eaten by fish. Small fish is eaten by big fish and big fish is eaten by large birds. Here the phytoplanktons, the free floating plants, are the producers and small fish are the primary consumers and the big fish are the secondary consumers and the bird is here the tertiary consumer. In this way the relationship between various biotic factors within the aquatic system goes on. Phytoplanktons are the other producers of the food. So they utilize the natural resources in order to be the producers for rest of the components of the food chain.

Now, the question is that with the increasing industrialization, with the need of the expanding and increasing population is man made activity disturbing the food chain somewhere or the other. Yes. Man made activities are disturbing the food chain in one or other way. Lets see now, what are those ways by which man made activities are disturbing the food chain. Let's see here, say for example, the excessive use of pesticides by the farmers. That is man made activities, affecting ecosystem as well as the environment. Let's see how increasing or excessive use of pesticides is disturbing the life or food chain in the ecosystem? Yes. This is resulting into a phenomenon that is called as biomagnification. Now, let's see what is biomagnification?

Here, say for example, water which is very contaminated with the pesticides and phytoplanktons consume the pesticides which accumulate in their body. As we follow the rule of the food chain they are eaten by small fish which are eaten by the big fish and which are eaten by the large size birds. So, the pesticides keeps on accumulating at each trophic level with the increasing amount that results into the death of the top most consumers and this is a very dangerous pattern. This increase in the amount of the pesticides in the water sample is called as biomagnifications or bioaccumulation. Right. O.K. Another effect is, for example,

desertification. Desertification is if at any of the trophic level the food chain is disturbed. Let's see here, if in any food chain green plants are eaten by primary consumers and primary consumers by the secondary consumers and so on. Say for example, if producers that are the green plants somehow if they are removed in order to clean the land. People are cutting trees at an alarming rate. Suppose that in any area the land is cleaned by cutting of the green plants. So the producers will be no more. In that case we will find over there that is there won't be any primary consumers left because of the extinction, killing of the green plants. There won't be any producers and when there will be no primary consumers, off course, so secondary consumers will also die. So, gradually the area which was a green lush area will result in a kind of a desert. So, this will be kind of effect of man made activity and this called as desertification. Right. O.K. Now you can ask your queries and questions which you have based on the topic that I taught you.

**Student: Mam, what are these biogeochemical cycles all about? How are they important to us?**

**Teacher:** Biogeochemical cycle as their name suggests is the bio, geo, chemical cycle. Bio pertains to living, geo pertains to the earth and chemicals of course the minerals. So, biogeochemical cycle means all the minerals which are used up by the green plants in making up their body.

All the chemicals which are used by the green plants in making their body from the natural resource go back again to mineral pool of the earth but in a cyclic manner. The plants or producers, when they are eaten up the consumers and when the consumers die, they are decomposed by a set of organisms which are called as decomposers. Decomposers utilize the decomposed organic substances of a consumer's body and then they release the minerals or chemicals that go back to the mineral pool, where the plant grows. The new plants can utilize these chemicals to make up the new body, and its new body once again gets into the cycle.....

So, this is how the biogeochemical cycle runs. Next question.

**Student: In your lecture, mam, you mentioned the increase in amount of pesticides in each of the trophic levels..... How can they get accumulated and increase at each level....? I did not understand that.**

**Teacher:** Let me explain. That is what is known as bio-magnification? That is an increased amount of the pesticides at each successive trophic level, may end in a lethal level to the consumers. For example, when farmers are using pesticides in their field, the excessive pesticides may be washed away with the water and may go into other water bodies and may mix with the water and contaminate the water. This water may be used by the phytoplankton in making their bodies through their food. So, the contaminated pesticides enter in their body. Fine. Say for example, 10-15 phytoplankton are consumed by two or three small fishes. So, you can say the entire accumulated amount of 10-15 phytoplankton reaches in the body of the two or three small fishes which may be eaten by big fishes, which are in turn eaten by the birds. So you can say that 10-15 phytoplankton which were consumed initially by the small fish the entire content of the pesticide reaches in the body of a single you can say, topmost single consumer. So that may result into an increased amount and that may reach, you can say lethal limit and it can cause the death also because it was observed long back in the case of pelican birds in the Michigan Lake. They died because of the increased concentration of the pesticide. This pesticide was DDT and that happened because of bio-magnification.

**Student: Mam, in the ecosystem, what is the concept of the food web?**

**Teacher:** In the ecosystem we have just discussed example of one food chain. There can be many food chains existing in the ecosystem and these food chains may be interrelated. In what way can they be interrelated? That is, at producer level similar plants are there, that may be eaten at one level by many consumers. That is, plant is the same, but the consumer levels are different – but at the top carnivore, that is top consumer level we find the similar consumers that can result into many food chains, but they are interrelated in their intermediate levels, you can say the primary consumers and secondary consumers. Such interrelated food chains may find the common producer and the common topmost consumer, that results into a food web.

Many food chains are interrelated in the ecosystem, and they form a food web. Next question please.

**Student: Why can't we have a very long food chain?**

**Teacher:** Very good question. That is why can't we have very long food chains?

See over here, in the food chain a very important process takes place. That is the transfer of food from one level to another. Exactly the same time transfer of energy takes place from one food level, that is, one trophic level to the next trophic level. Right. So what happens as per the rule of the thermodynamics, the transfer of energy is never efficient, that is whenever energy is transferred from one system to another, that is, from one trophic level to another, hundred percent transfer is not possible because large amount of energy gets wasted. Only a very small amount of energy, that is calculated as ten percent energy, is transferred from one to the next trophic level.

So, if we go as per the ten percent law, we find over here, that, whatever the energy is transferred, from that only ten percent gets transferred and as it happens, by the time the energy reaches the last trophic level the amount of energy which is left for the last consumer is so less, it is absolutely negligible. That is why nature does not allow a very long food chain. The maximum it can have is seven levels or generally it has four or five levels.

The remaining part of the lecture will be discussed in the next class.

### **Announcer**

I would like to thank Ms Purnima Joshi and the students who are present here, for the interactive and lively session on our environment. I would also like to thank, all the NIOS officials and experts who are present here, for sparing their valuable time. Thank you all.