

## **SECTION – 2**

## **SECTION – 2: Processes in Environmental Education**

### **Introduction:**

Any curricular intervention at the school level, in the final analysis, depends upon teachers – their involvement, ingenuity, support and cooperation. This is true even for incorporating Environmental Education (EE) perspectives into the teaching of subjects at the school level.

Although teachers recognize the relevance of EE at the school level, a few of the most common concerns expressed by them vis-à-vis EE incorporation are:

- The school curriculum is already loaded
- There is no separate subject as EE
- Only contents in science subjects lend themselves for incorporating EE, and
- Teachers require training in EE incorporation.

A little reflection on these concerns would reveal that they pertain to more of How to infuse EE rather than Why EE?

This section aims at helping you as teacher educators in enabling your teachers to incorporate EE dimensions in their teaching without increasing their teaching load. For convenience, the Section is presented in two sessions.

**Sessions – 1**, presents the processes involved in analyzing contents from any discipline, identifying the concepts and mapping them for effective transaction.

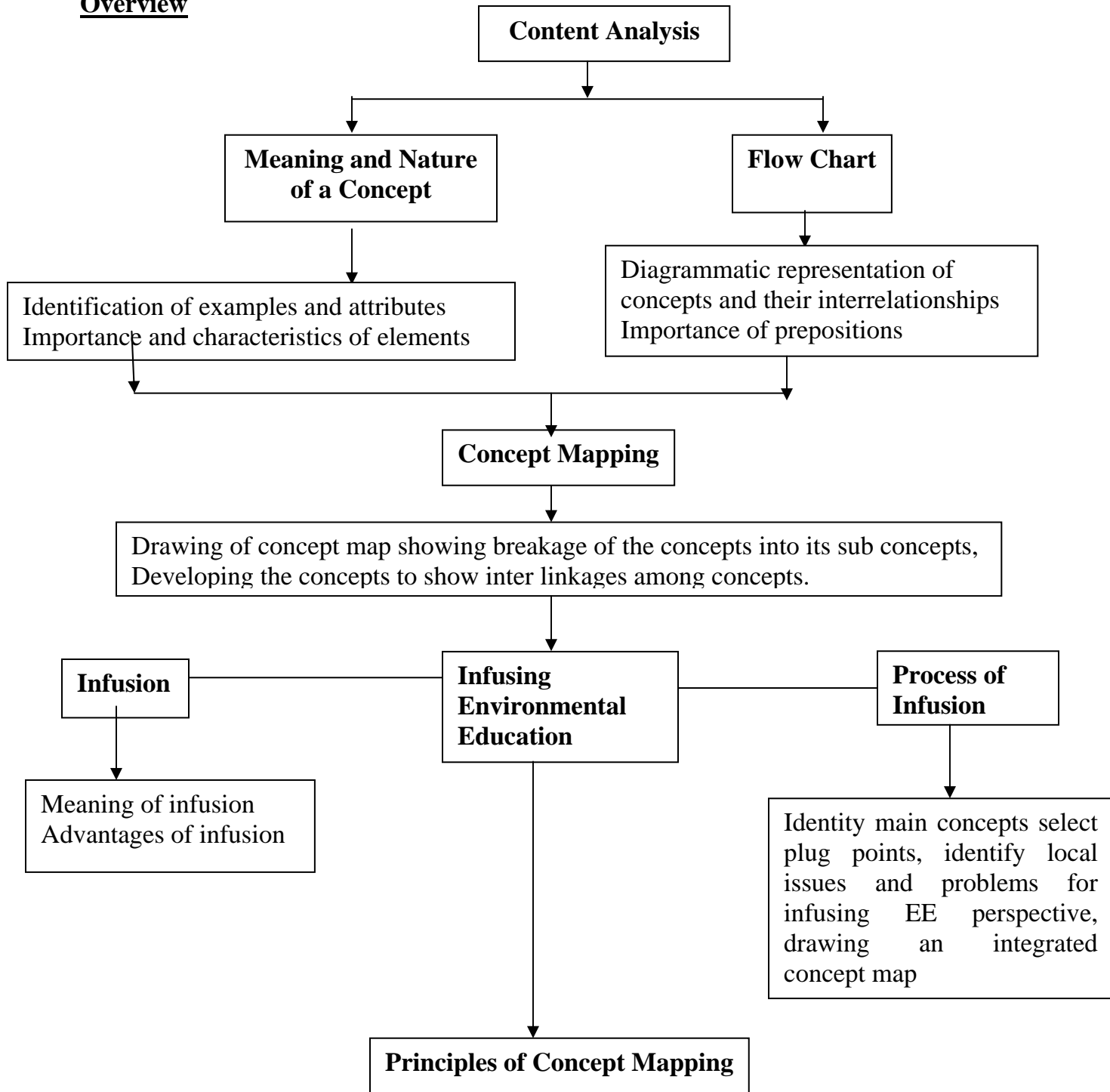
**Session – 2**, while mentioning the two different approaches to EE incorporation, discusses steps involved in infusing EE at school level.

You could use two sessions, each of one and half-hour duration, for providing this understanding. In the workshop schedule, these sessions have been indicated as:

- **The process of content analysis and concept mapping.**
- **The process of infusing Environmental Education.**

An overview of the contents covered in the two sessions has been provided in the flowchart.

**Overview**



**Before you begin, ENSURE that:**

- You have read this section carefully taking down the important points for highlighting, details of the activities to be conducted and transparencies to be used during the various sessions.
- You have all the TRAN Sheets; appended at the end of this section, photocopied on transparency sheets and arranged sequentially (Transparency sheets are available in any stationery shop). The process of photocopying is like any other paper that is xeroxed.
- You have arranged the overhead projector, trial run one or two transparencies to ensure proper focus of the visuals.
- You have all the stationery materials required for the various sessions – writing paper, chart paper, blank transparency sheets, OHP marker pens, felt pens, etc.
- You have copies of the Activity sheet-1 and Handouts 1 to 5 for distribution to the groups.
- You have social Science and the Science textbooks of the standard 3 to 7.

## **Session 1: Process of Content analysis and Concept mapping**

For effective teaching, an imaginative, creative and insightful analysis of the content into its concepts / elements (ideas) and specifying them in behavioural terms forms a pre-requisite.

Concepts play a critical role in the acquisition and use of knowledge. Once the concepts are identified and ordered sequentially, their interrelationships could be established using appropriate prepositions.

This process of analyzing the contents into its concepts and elements and arranging them in a logical sequence to achieve the desired objectives is called content analysis. The process of representing the concepts, their sequence and interconnections is known as concept mapping.

- Explain to the teacher the importance of content analysis in the teaching – learning process. Generate a discussion using the following questions :
  - **What do you understand by the terms concept and content analysis?**
  - **Why should teacher have to analyze the content?**
  - **What are the processes involved in content analysis?**
- Consolidate the various view points with the help of **TRAN-1**, and by recording some of the significant points of the discussion on a transparency sheet.
- Explain to the teachers that the first step in content analysis is identification of concepts, and to do so, one has to have an understanding of what a concept is?
- Using **TRAN-2** explains the meaning of the term concept and that every concept has attributes and examples.
- Put up **TRAN-3** and allow the teachers sufficient time to read the passage. Using **TRAN-4**, enumerate the **attributes** and **examples** for the concept “**Matter**”.
- Conduct the following activity to enable the teacher to identify the attributes and examples in the concept “Change”.

### **Activity**

Distribute **Handout-1** containing extracts from the lesson “Changes around us”.

Ask the teacher to read through the contents of the handout and identify the attributes and examples present in the concept “Change”.

(The examples suggested for the activities in this section have been taken from Karnataka State Textbooks. You may decide to use green textbooks or any other example or a passage from any other textbook for the activity).

- Put up **TRAN-5** and consolidate the discussion on attributes and examples in the concept “Change”.
- Discuss with the teachers that the next stage in content analysis is to establish the interrelationship between the concepts, their attributes and examples and represent it through a flow chart.
- With the help of **TRAN-6** define what a flow chart is and explain its importance in terms of arranging the ideas logically, giving a holistic picture of the content and a structure to the lesson.
- Put up **TRAN-7** and let the teachers read the passage “Living World”. Provide sufficient time for this.
- With the help of **TRAN-8** explain the analysis of the concept “Living World” into its sub concepts and elements and their arrangement to reflect the various interrelationships. Emphasize that some of the ideas presented in the flow chart, though not mentioned in the extract, are necessary to form the linkages. For instance, in the example, the sub concepts multi-cellular and unicellular organisms have been included to make the categorization of the animals and the plants broad based.
- Conduct the following activity to reinforce the understanding to teachers on the importance of flow chart and the need for sequential arrangement of ideas/ concepts to make the process of content analysis systematic.

### Activity

Divide the group into smaller groups of 5 to 6 members each.

Distribute **Handout-2** which containing an extracts from the lesson “Asia” to the different groups. Allow the groups enough time to read through the extract.

Provide each group with the *Activity sheet-1* and ask them to fill in the boxes that are empty and which-represent the important concepts present in lesson “Asia”.

Consolidate the findings of the groups with the help of **TRAN-9** containing the key to the flow chart on “Asia”. Explain how content analysis could be done from the environmental perspective.

Focus the attention of the participants to the boxes numbered 1-6 in transparency and explain that these are the main concepts and the boxes placed exactly below them represent the sub concepts or their elements.

- Highlight that some of the concepts included in the flow chart on “Asia” are not present in the extract. Explain how their inclusion could make teaching informative and effective.
- Using **TRAN-10**, explain the importance of prepositions in establishing linkages between and among concepts. Ask the teachers to indicate some of the prepositions used in the flow chart.
- Conduct the below mentioned activity to help the teachers understand the role of prepositions in a flow chart.

### Activity

Divide the teacher into 4 to 5 smaller groups as done earlier. Project **TRAN-11**. Ask the groups to examine the concepts and represent them through a flow chart by identifying appropriate prepositions. Ask them to include any additional concept/s to make the flow chart more meaningful and informative.

Let each group present their flow charts to the other groups, using either a transparency sheet or a chart paper.

Emphasize that each group, while explaining the flow chart, should mention how the use of certain prepositions has helped them in structuring the content and establishing linkages between concepts.

Discuss the importance of additional information in effective teaching.

- Project **TRAN-12** and ask the teachers to study the passage on “Matter” critically.
- Ask the teachers to identify and list the important concepts and sub-concepts present in the passage.
- Using **TRAN-13**, explain the meaning of the term Concept map, the process and principles involved in concept mapping. Illustrate the three principles of concept mapping, viz., progressive development, integrated relationships and hierarchical structures.
- Conduct the following activity to help the teachers understand how a concept maps could be developed based on the three principles discussed earlier.

### Activity

Divide the teacher into 4 or 5 smaller groups.

Distribute **Handout-3** on Population and Resources to the groups. Allow the groups sufficient time to study the extract.

Ask the groups to identify and list the important concepts in the passage and develop a concept map to show the interrelationships of concepts.

Let the groups share their concept maps with others to get their comments.

Conclude the session by recapitulating the importance of content analysis and the processes involved in developing a concept map.

## **Session 2: Process of Infusing Environmental Education**

- Recall to the teachers the processes involved in concept mapping, importance of a flow chart, prepositions and additional information in making the concept map meaningful.
- Explain that there are two basic approaches to infusing EE concepts in teaching, viz., interdisciplinary and multidisciplinary.
- Using **TRAN-14 & TRAN-15** explain the characteristics of these two approaches as applied to the concept “Pollution”. Generate a discussion on the practicability and feasibility of the two approaches with the help of the following questions.
  1. **What are the characteristics of the Interdisciplinary and Multidisciplinary approaches ?**
  2. **Which of the two approaches appeals to you and why ?**
  3. **Which of the two approaches do you think can be adopted for infusion of concepts in school curriculum and why ?**
- Using **TRAN-16**, consolidate the view points emerging from the discussion by bringing out the relative advantages of these approaches in the infusion of EE concepts.
- Explain how multidisciplinary approach is more frequently used for infusing the EE dimension compared to the interdisciplinary approach in the absence of a separate curriculum for EE.
- Conduct the activity to help teachers understand the meaning of the term Infusion and its various aspects.

### **Activity**

Divide the teachers into 4 to 5 smaller groups. Using **TRAN-17** define the term infusion.

Let the teacher examine the definition and reflect on the need for Infusion in the teaching of EE.

Provide **Handout-4** on “Dakshina Kannada” to the groups. Allow sufficient time

for them to read through the extract and list the major concepts in it. Using **TRAN-18** help the group consolidate the list of concepts.

Explain the meaning and importance of plug points and how they could be identified to infuse environmental perspective.

Using **TRAN-19** help teachers identify the plug points in the concept map and the environmental perspective infused.

Consolidate the discussion with the help of **TRAN-20**.

- Conduct the following activity to reinforce their understanding on the importance of plug points in infusing EE perspective.

### **Activity**

Divide the group into 4 or 5 smaller group, as done earlier.

Put up **TRAN-21** and allow the groups sufficient time to examine the details of the Map.

Ask each group to identify a plug point from the concept map and explain how EE perspective could be infused using it.

Let each group present its ideas. Consolidate the Points emerging from the presentation with the help of **TRAN-22**.

- Recall that how by inserting additional information ; a concept map could be made informative and substantial. Mention the different sources of additional information – from observations made on the environment, newspapers, radio and television bulletins, environmental journals, case studies etc.
- Conduct the following activity to bring home to the teachers the importance of additional information in infusing EE perspective and making it locale-specific.

### **Activity**

Divide the teachers into 4 to 5 smaller groups and distribute a copy of the **Handout-5** to each group.

Ask the groups to study the case report critically and list the problems and issues that are discussed in it.

Using **TRAN-23**, consolidate the EE issues and problems. Ask the teachers to add to the list and make it comprehensive.

With the help of **TRAN-24** demonstrate how an issue could be analyzed into specific problems, concepts and sub-concepts.

Ask each of the group to choose one issue from the list enumerated earlier for the case study and analyze it for specific problems, concepts and sub-concepts.

Let each group present their analysis.

Put up **TRAN-19** and recall to the teachers the concepts map worked out for “Dakshina Kannada”. Ask the teachers to relate the concepts that have emerged from the analysis of the case report with the concepts mapped for “Dakshina Kannada”. Help them to develop an integrated map for the topic.

Using **TRAN-25**, consolidate the discussion.

- Let the teachers undertake the following activity to develop an integrated concept map for the topic “Our State – Life in Districts” (Std. 3 Social Science textbook) by infusing concepts related to local environmental issues / problems of their respective districts.

### **Activity**

Ask the teachers to group themselves in terms of the districts they come from.

Ask the group to critically examine the content related to their respective district, identify the concepts and develop a concept map. Guide the groups to discuss and identify the various environmental issues or problems pertaining to their respective districts. Let them analyze these issue or problems for concepts and sub-concepts.

Keeping the concept map developed for their respective district and the concepts and sub-concepts emerging from the environmental issue / problem analysis, let the groups identify appropriate plug points for infusing environmental concepts and develop an integrated map for their respective district.

- Conclude the session by recapitulating the following :
  - Concept and concept mapping.
  - Content analysis and flow charts.
  - Process of infusion – multidisciplinary and interdisciplinary approaches.
  - Developing integrated maps for infusing EE.

## TRAN – 1

### Definition of content analysis

Content analysis is defined as the process of breaking down of contents of a topic into its sub concepts and elements and arranging them in a logical sequence. It involves the process of analysis and synthesis.

#### **Content analysis helps in –**

- Identifying concepts and establishing relationships among them.
- Providing a structure to the content to be taught.
- Helps to identifying and choosing appropriate teaching methods and learning experiences.
- Making teaching – learning logical effective.

## TRAN – 2

### Definition of a concept

- A concept is a generalized idea or a notion and may include a name, an example and an attributed.
- The **name** is the term given to the concept. Names are given to objectives, processes and events.
- Example refers to situations, objects, events having similar characteristics. These characteristics are termed as attributes, which help in categorizing these examples under appropriate concepts.

## TRAN – 3

### Extract from the lesson “Matter”

“Matter consists of several materials. Any things which we can see, touch, smell or taste or feel is called matter. What are the main characteristics of matter ? In our surroundings, there are solids, liquids and gaseous substances. These indicate the three states of matter. The states of matter can be interchanged. For example, ice melts into water. Water can be converted into steam by heating. Steam condenses into water. Water becomes ice on cooling”.

## TRAN – 4

### Attributes and examples for the concept – Matter

<b>Concept:</b>	Matter				
<b>Attributes:</b>	See	Touch	Smell	Taste	Hear
<b>Examples:</b>	Water	Jar	Stone	Air	Pulses

Key for the attributes and examples in “Change”

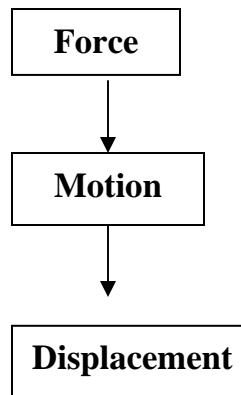
**Concept:** Change

**Attributes:** Part of nature, occurs all the time, differs from place to place.

**Examples:** Seasons, Sun, Seed grows (any other example from the passage can be listed).

Flow chart on the concept – Force

A flow chart is a diagrammatic representation of concepts in a logical and sequential manner. The flow of ideas is indicated with the help of soft lines. This is enumerated in the example for the concept “Force”.



**Extract from the lesson “Living World”**

“When we observe our surroundings, we can notice a variety of living beings – plants and animals. Every organism has a definite shape and size. They have different structures and colours. How do they differ?”

Some animals live on land. Birds and some insect fly in the air, while fish live in water. Frogs and Salamander live both on land and water.

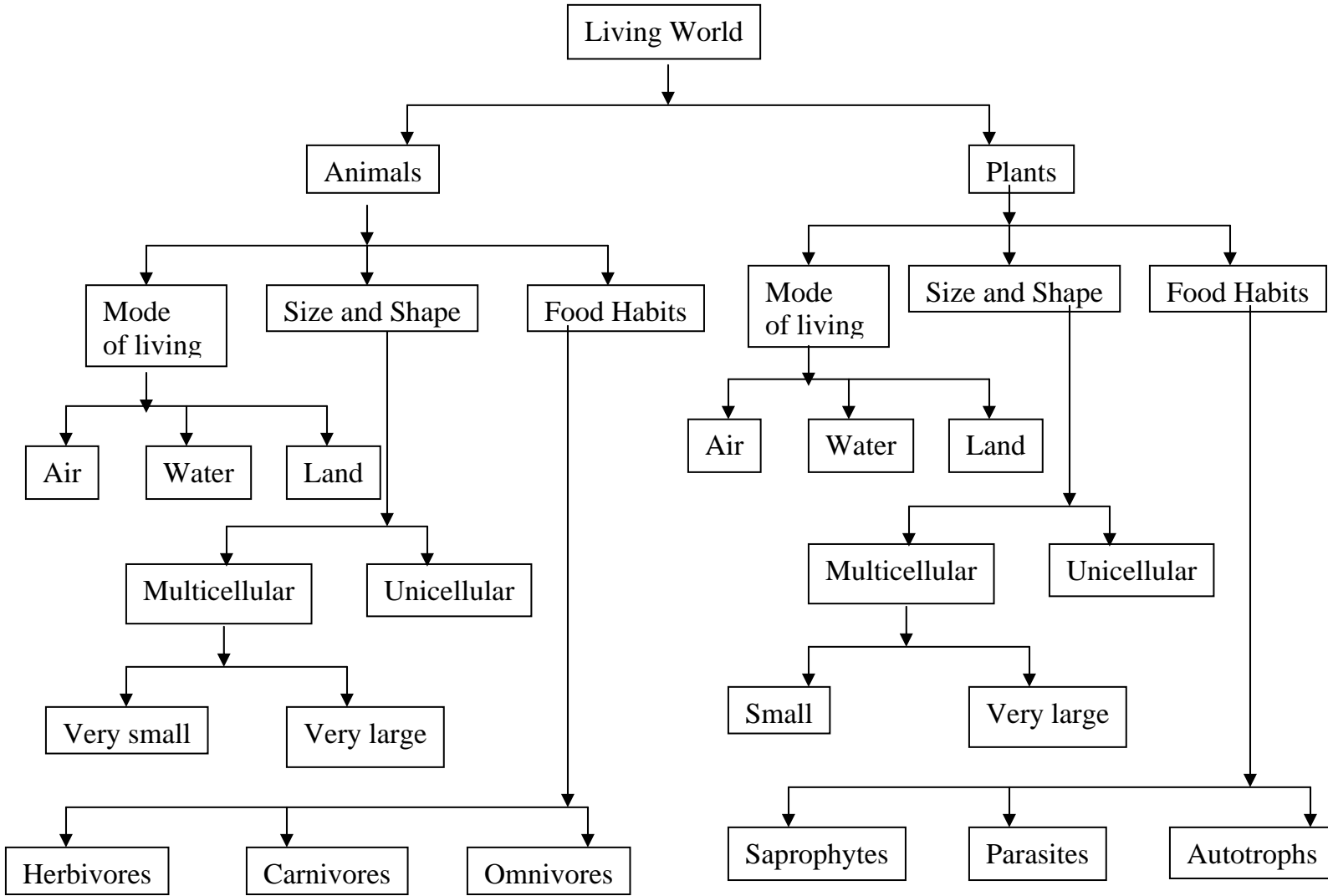
Each organism has a preference in its living surroundings. Birds live on trees. Honey bees live in hives. Spiders spin webs and live in them. We live in houses. There are small, big and very big animals. Shapes and sizes of animals differ.

Amoeba is a unicellular organism. It is so small that one can't see with naked eyes. It has no definite shape. On the contrary, we can see an ant with our eyes and also an elephant. No other animal on land is bigger in size than an elephant. But a whale that lives in the sea is bigger than the elephant.

In the same way, we can notice diversity of sizes among plants also. For example, a tomato plant and a Banyan tree.

All animals do not feed on the same type of food. Cow, rabbit or deer feed on plants. They are herbivores. Lion, tiger, wolf or cheetah feed on other animals. They are carnivores. Cockroach, cat, dog or man feed on both. They are omnivores. Thus we can group the animals based on their food habits”.

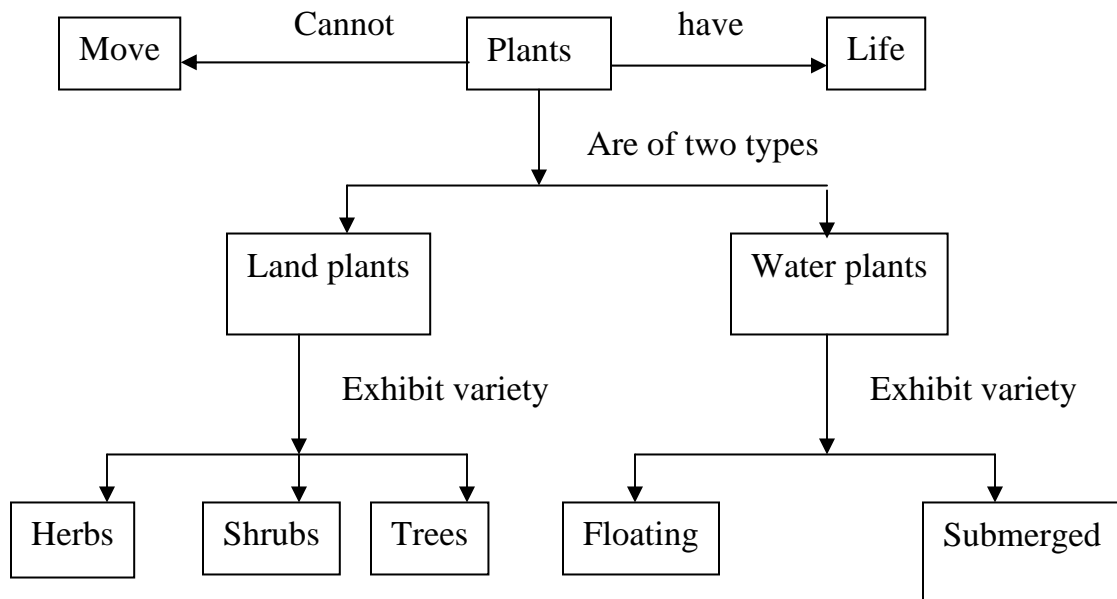
**Concepts in the lesson “Living World”**



**Key to the flow chart on “Asia”.**

<b>Key</b>			
1. Diversity	2. Continent	3. Altitude	4. Climate
5. Vegetation	6. Population	7. Fauna	8. Flora
9. Culture	10. Largest Area	11. Continent of Contrasts	
12. Mount Everest	13. Rain Fall	14. Mawsynran	15. Chirapunji
16. Thar Desert	17. Arabian Desert	18. Tropical Ever Green Forests	
19. Monsoon Forests	20. Equatorial Forests		21. Deserts
22. Temperate Grasslands		23. Temperate Forests	
24. Mediterranean Forests		25. Tundra Vegetation	
26. Mosses	27. Lichens	28. India	29. Arabia
30. Siberia	31. Coniferous forest		32. China

**Flow chart on Plants – importance of prepositions**



**Concepts for preparing a flow chart**

<b>Stem</b>	<b>Leaf</b>	<b>Plant</b>	<b>Root</b>	<b>Sunlight</b>
<b>Petals</b>	<b>Water</b>	<b>Air</b>	<b>Soil</b>	<b>Oxygen</b>

**Extract from the lesson “Matter”**

“The substances can be found in the form of a compound or an element. Molecules of the substances are made up of still smaller particles called atoms. The molecules of a compound consists of atoms of different types. For example: a molecule of water consists of one atom of oxygen and two atoms of hydrogen, but the molecules of an element consists of the same type of atoms. For example, in a molecule of oxygen, there are two atoms of oxygen. Atoms of the same elements are alike and atoms of different elements are different”.

**Definition of concept map, concept mapping and its principles**

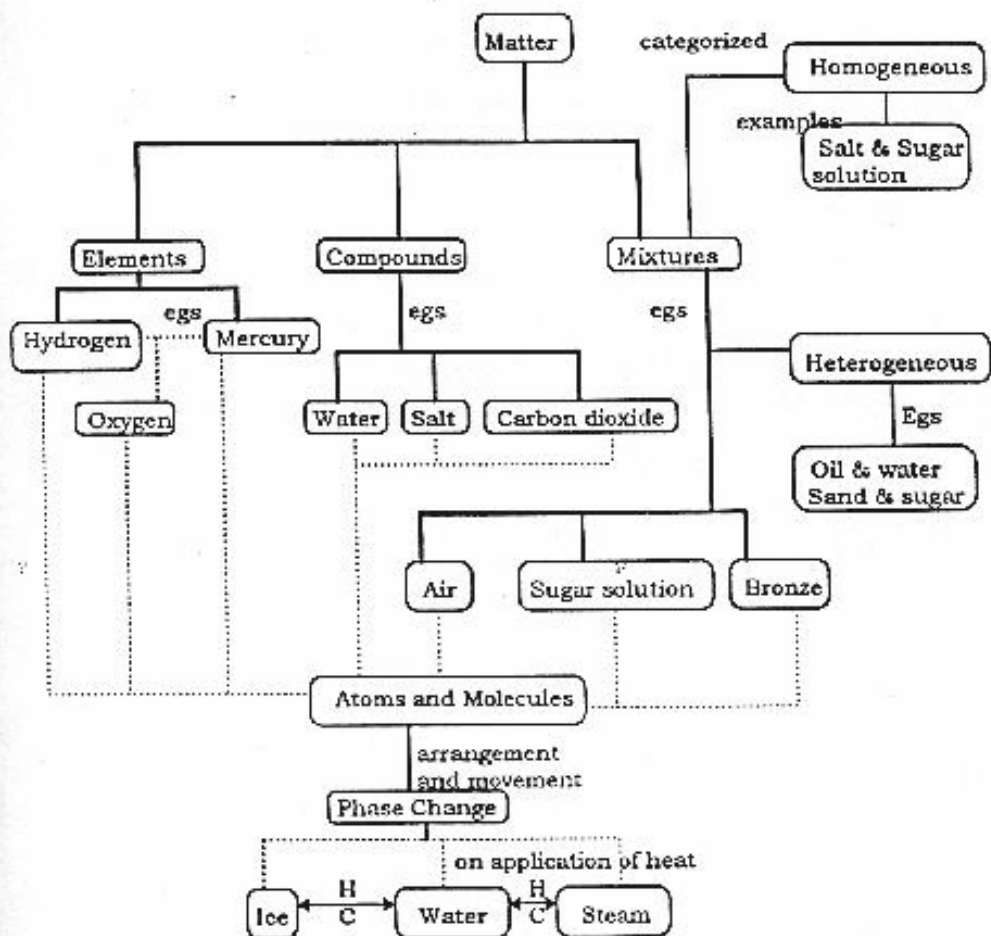
Concept map is a flow chart that represents concepts / elements and their interrelationship.

Concept mapping is the process of diagrammatically representing concepts with their interlinkages using appropriate prepositions.

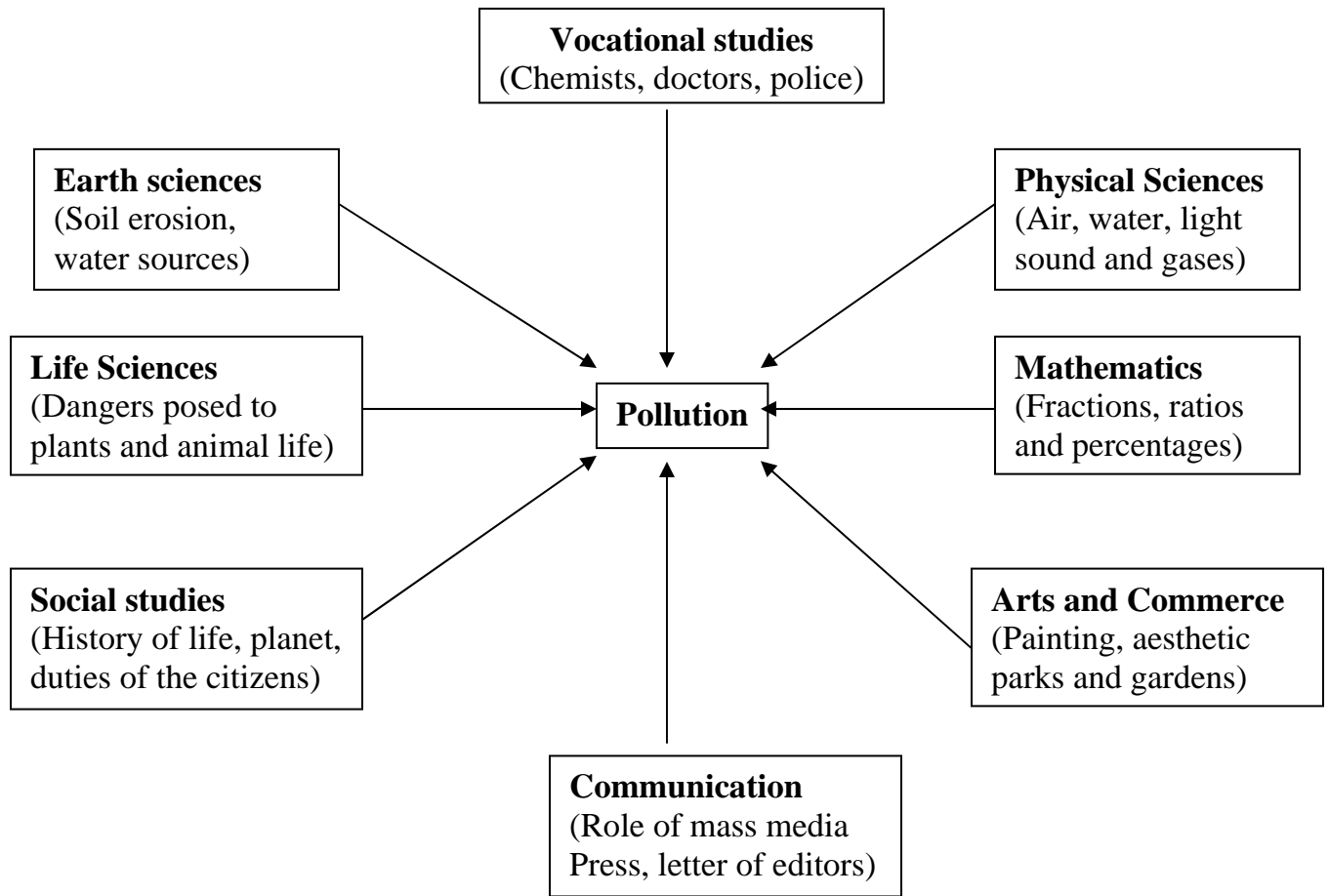
Concept mapping relies on three fundamental principles:

- Hierarchical structure
- Progressive development
- Integrated relationships

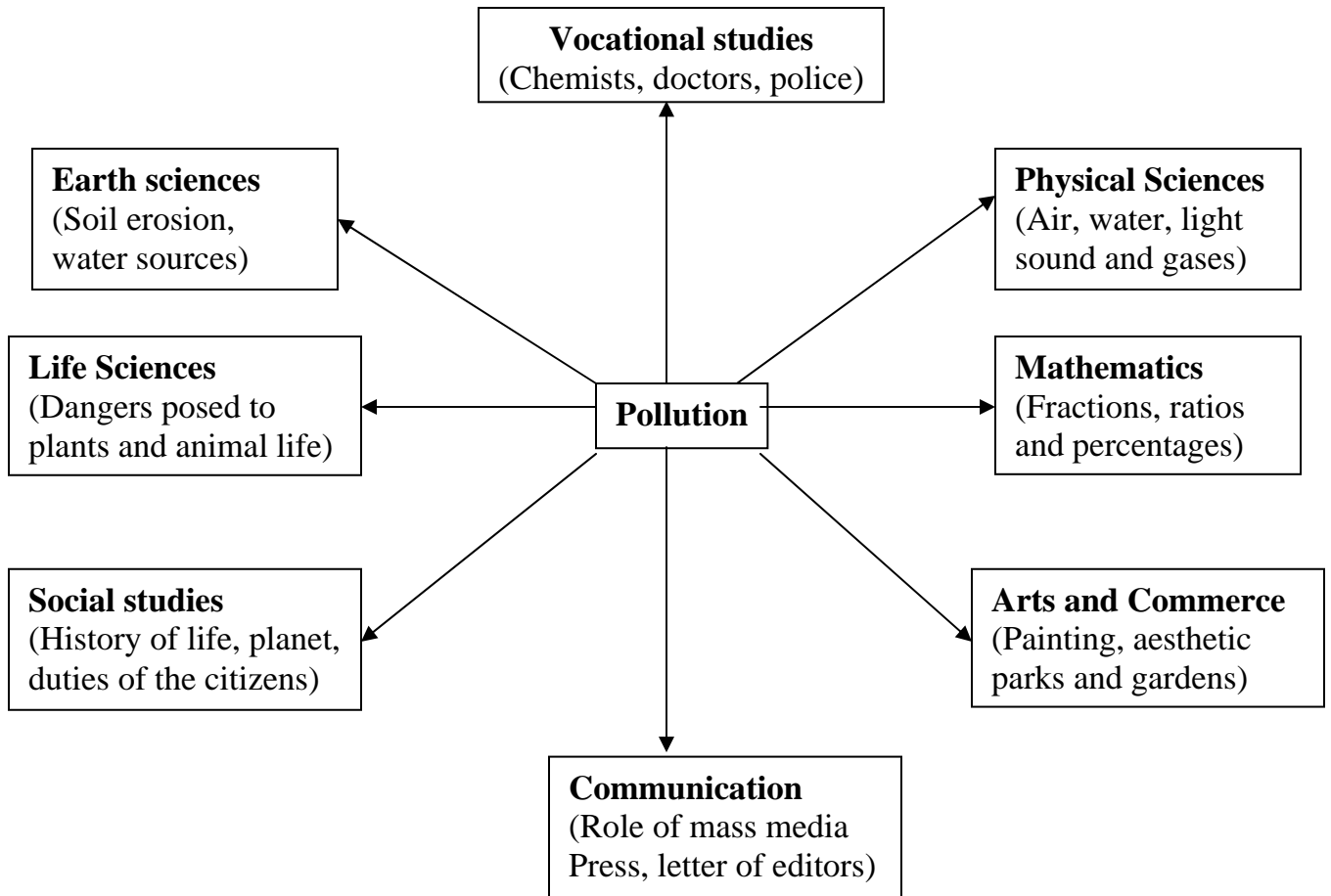
Concept map on matter



Interdisciplinary approach for infusing Pollution



Multidisciplinary approach to infusing Pollution.



**Relative advantages of the two approaches**

<b>Interdisciplinary approach</b>	<b>Multidisciplinary approach</b>
1. Easier to implement as a single subject if the time permits in the curriculum.	Requires that more teachers be trained; requires less time content in the existing curriculum.
2. May required fewer teachers more in depth training in EE.	Requires that teachers of all disciplines be competent to adapt and /or use EE materials although perhaps not to the same depth as in single subject approaches.
3. Requires addition of this discipline to an already crowded curriculum.	May be effectively implemented with minimum demands on existing curricular load.
4. Components easier to identify and sequence.	Components must be effectively identified, sequenced, and accommodated by the existing curriculum.
5. May be more appropriate at secondary than elementary levels.	Appropriate at all age level with some exceptions at secondary and tertiary levels.
6. More difficult to use in effectively teaching in transfer.	Teaching for transfer is inherent in this approach when properly used.

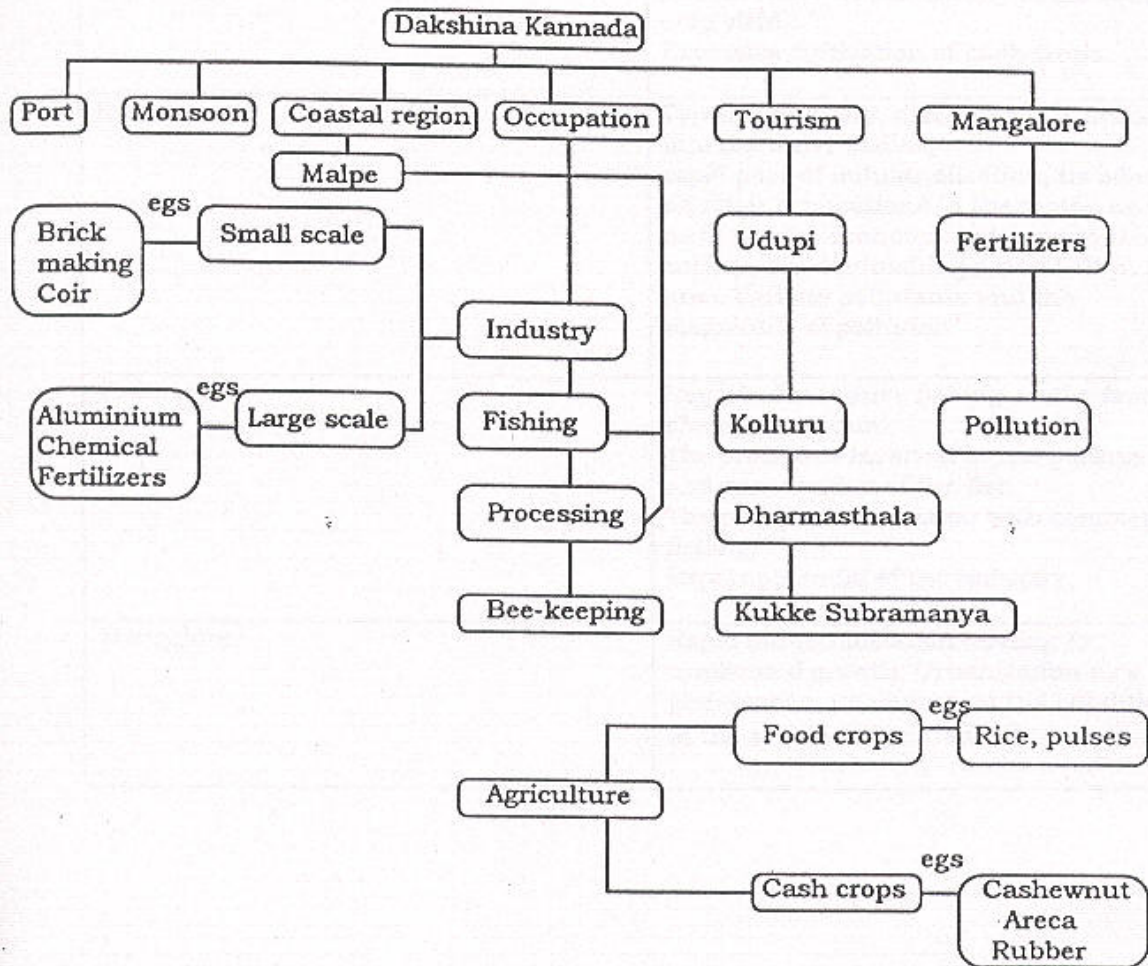
**Definition of the term Infusion**

Infusion is defined as the process of integrating a new dimension or perspective into contents of the existing courses in order to highlight its significance without jeopardizing the innate nature of the course/s.

**Concepts in Dakshina Kannada**

1. Agriculture
2. District
3. Port
4. Coastal region
5. Industry
6. Mangalore
7. South-West monsoon
8. Fishing

Concept map of Dakshina Kannada

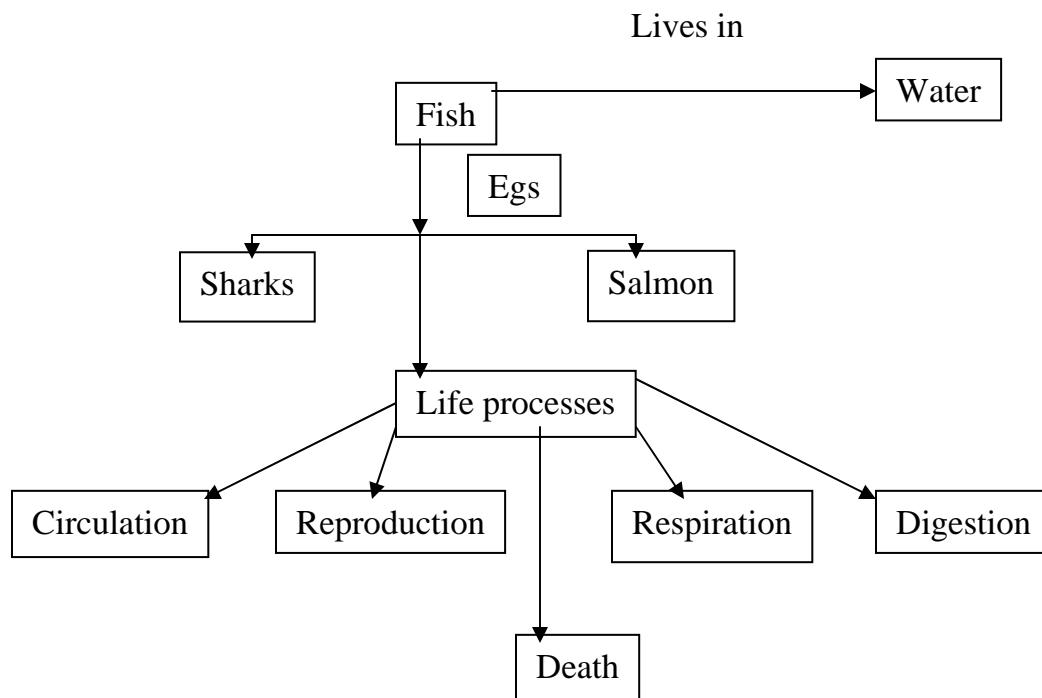


Concepts in the lesson which provide scope for infusing EE dimension are called as plug points. The plug points in this extract are - Agriculture, Port, Fishing, Industry, Mangalore.

**Integration of environmental perspective in the lesson on Dakshina Kannada**

<b>Concepts</b>	<b>EE Perspective</b>
<b>Agriculture</b>	Continued use of fertilizer pesticides and its effect on the fertility of the soil, crop yield. Excessive cultivation of cash crops.
<b>Industry</b>	Types of Industry, discharge of effluents into the water bodies, rapid pace of industrialization, its effect on other occupations in the region as well as the socio-economic patterns in the society, the diminishing green belt in the area. Various pollutants and the magnitude of pollution.
<b>Fishing</b>	Impact of excessive fishing on the food chain, ecosystem. The processes involved in the packaging and preservation of the fish. The problems associated with commercial fishing. Export potential of the industry.
<b>Mangalore</b>	Rapid industrialization leading to unplanned growth. Urbanization as a phenomena, its impact on the conditions in the society, migration.

**Concept Map on fish**



**Plug points in the lesson “Fish”**

<b>Concepts</b>	<b>EE Perspective</b>
Fish	Part of the food chain, impact of fishing, drawbacks of excessive fish culturing.
Water	Pollution of water and causes, habitat for aquatic organism
Shark, Salmon etc.	Diversity and variation in fishes, adaptation
Life processes	Locomotion, respiration, etc. and different physiological aspect concerning life.
Death of Fish	Cause for death (excessive dumping of chemicals, Commercial fishing nets, Organisms hunted for game) Biodegradation and increase in the nutrients.

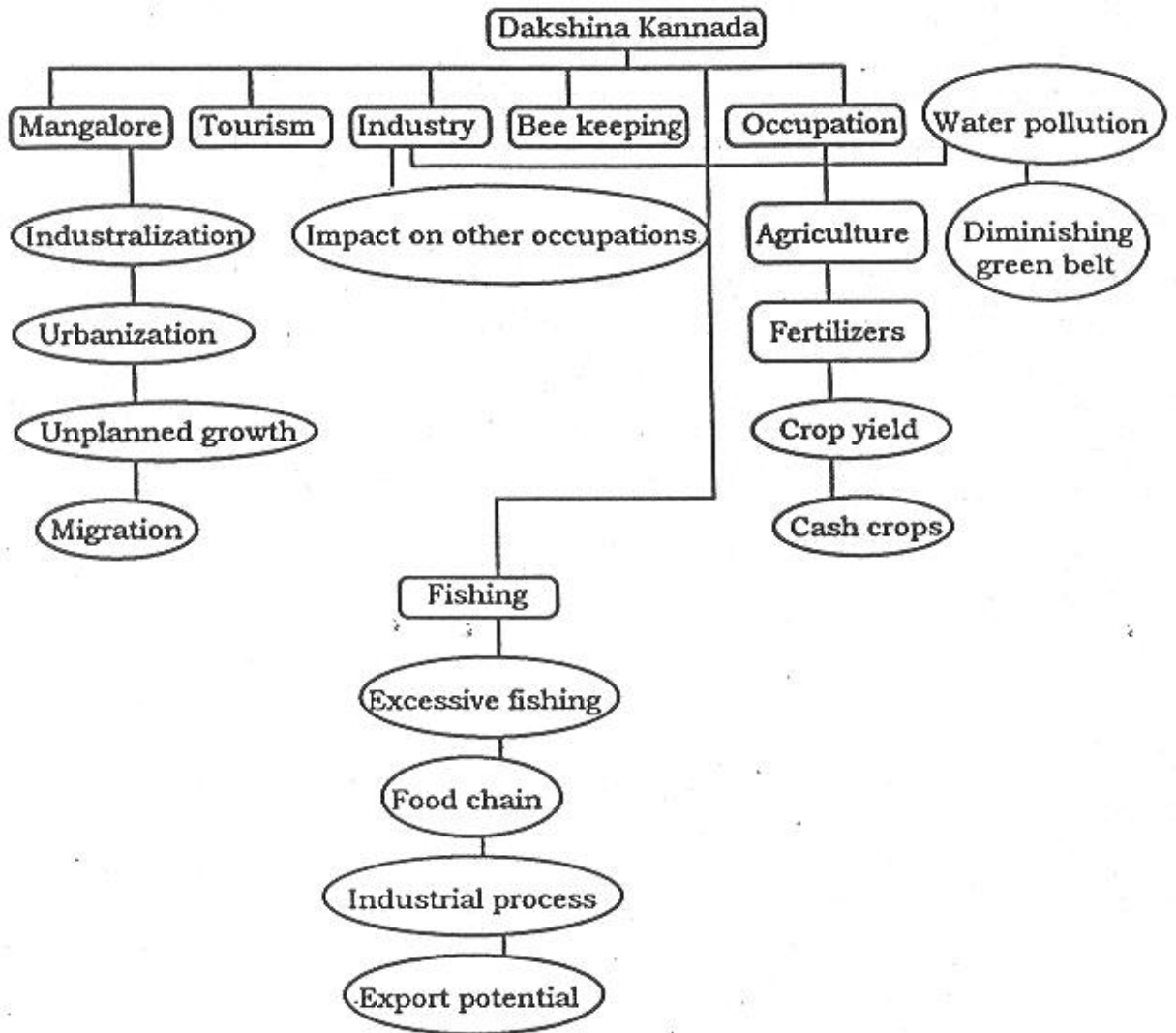
**Important issues or problems emerging from the case report on Mangalore.**

1. Rapid industrial growth and related environmental problems such as pollution, congestion, etc.
2. Increase in the generation of solid and hazardous wastes.
3. Increase in the urban population and related urbanization.
4. Shrinking of agricultural land and green belt.
5. Displacement of workers from the agricultural sector (farm labourers and cultivators).
6. Increased demand for potable water.

**Issue analysis for a concept from the Mangalore case report.**

<b>Environmental Issue</b>	<b>Ideas / Concepts that emerge from the issue</b>
Rapid industrial growth	<ol style="list-style-type: none"> <li>1. Pollution – water, air, land, noise</li> <li>2. Migration of labourers, development of slums, congestion.</li> <li>3. Health and hygiene, unhygienic living conditions, spread of diseases.</li> <li>4. Encroachment of public places.</li> </ol>

**Integrated concept map of Dakshina Kannada**



## **Handout – 1**

### **Extract from the lesson “Changes around us”**

“Change is a part of nature and occurs all the time. Stars, Sun, Moon, Earth change positions. Time changes, seasons change, change touches everything. We are all born as babies, grow old and die. A seed grows into a tree. Iron rusts, clouds condense and drop as rain. A glass tumbler when dropped breaks into pieces. But we notice that changes can be different”.

## **Handout – 2**

### **Extract from the lesson on “Asia”**

“Asia is the largest of all continents. It has an area of 4.84 crore sq.km. It is called a continent of contrasts. There are great contrasts in altitude, climate, vegetation and population.

The highest peak in the world, namely Mount Everest and the lowest part below the sea, namely and Dead Sea, are found in Asia.

Mawsynram, near Cheerapunji in Meghalaya, gets the heaviest rainfall, while the Thar Desert and the Arabian Desert get the lowest rainfall. The hottest and the coldest regions are also found in Asia.

We find in Asia dense tropical evergreen forests and also regions where mosses and lichens grow.

China and India are thickly populated and have the world’s highest population while Arabia and Siberia are thinly populated.

The people of Asia belong to different ethnic groups and speak many languages. Asia has given birth to many religion – Hinduism, Judaism, Jainism, Buddhism, Christianity, Islam and Zoroastrianism”.

**Extract from the lesson “Population and resources “**

“Just as soil, water, minerals and forests are the natural resources of a country. Population is also a resource. It is called the human resource. Population is an important factor in the Progress and development of a country. But for this, people should be healthy and properly educated.

Food, clothing and shelter are the basic needs of man. Facilities for maintaining good health are also necessary. Only after these necessities are fulfilled, people can be educated and trained. The population of a country depends on the natural resources that are available there.

As population increases, more food, more clothing and more houses are necessary. More hospitals and schools are also necessary. Similarly, we will need more and more goods of daily use. This means, more industries which produce these goods would have to be set up. Man moves from place to place for various reasons. As population increases, transport facilities would have to be increased.

But, is this possible ? Certainly not. The facilities needed by man cannot be endlessly increases. As a result, at one stage many people will not get even basic needs. When our country became independent our population was a little more than 34 crores. Now, there are 87 crore persons in our country. That is, within forty five years after independence our population has more than doubled. It is increasing constantly.

As population increase, the facilities for life also have to be increased. When we try to do this, our environment becomes polluted. People will become unhealthy. Unhealthy people are weak. When we have weak people, our nation is also weak. In such a situation, our country cannot progress.

Within a family also the same conditions exist. All the members of the family have to be provided basic facilities. Adequate facilities can be provided only if the family is small. If the family is large it will be impossible to provide them all the facilities for good life. A small family is a happy family.

Our country is facing many problems. Most of them are related to the increasing population. The growth of the population has to be checked. This is possible only by proper education.

We have to urgently conserve our natural resources. We should also protect our environment from becoming polluted. We have to prevent the destruction of our forests to maintain a balance in the environment. If our forests are destroyed animals and birds which live there will also become extinct. Our government is

taking steps to conserve and preserve forests. Animals and bird sanctuaries have been established in various places in India”.

#### **Handout – 4**

#### **Extract of Dakshina Kannada from the lesson “Our State – Life in districts”**

“Dakshina Kannada is one of the two district of coastal region. The Nethravathi is an important river of the district. The Kumaradhara, the Varahi and the Gauri are the other rivers of the district. South west monsoons cause very heavy rains. The summers are hot.

Agriculture is the important occupation of the district. Rice and pulses are important food crops of the district. Rubber, Areca and Cashew are the important commercial crops. In the coastal areas of the district, fishing is an important and essential occupation. Malpe is famous for fish processing. The Popular entertainment games are – the race of bison’s called “Kambala” and cock fight.

Aluminum, Rubber sheet manufacturing, brick making, Coir products, bee keeping and collection of honey are some of the other industries of the district. Recently, the Indian Government has started a Chemical and Fertilizer factory at Mangalore. This is an important port in the western coastal area. The first daily of Kannada Language “Mangalore Samachar” was published from Mangalore in 1843. This district is famous for regional folk dance drama i.e., “Yakshgana”. Udupi, Kolluru, Dharmasthala and Kukke Subramanya are the important pilgrimage centres of the district. Udupi is famous for its Sri Krishna temple”.

#### **Handout – 5**

#### **Case report**

#### **Environmental Degradation in Mangalore – A Case Study (reported in Deccan Herald, 13.4.1995).**

Dakshina Kannada district which is all set to undergo a sea change in industrial environment in the next few years with the establishment of eight large scale and thirty small scale industries may pay dearly on the environmental, ecological and agricultural fronts unless necessary precautionary measures are immediately taken to arrest the trend.

The bleak future has been outlined by a recent study “Environmental master plan – study for Dakshina Kannada district” conducted jointly by the government of India and the Ministry of Foreign affairs, Denmark.

The study which has initiated in January, 1993 and aimed at preparing the environmental Management Plan for the district has suggested various plans for integrated management of natural, human and economic resources.

The new large scale industrial projects envisaged for the Mangalore area include an oil refinery, a steel plant, a chemical factory and a copper smelting unit and also the doubling production of the existing steel plant and iron ore company. It is projected in the next five to seven years the district will have approximately 17,000 small scale, 60 to 80 medium scale and over 17 large scale industries. This is in addition to 1000 MW thermal power plant and an expanded New Mangalore Port on which the work has already begun. Besides an additional 400 Hectares of land has been earmarked for industrial use part from areas demarcated in the Mangalore comprehensive development plan for the same.

The study warns that this rapid industrial growth planned for the Mangalore area may pose a great threat to the green belt and agricultural land, as open areas may be indiscriminately diverted for industrial use. About 2000 Hectares of picturesque rural land in Mangalore, taluk, extending from the estuarine part of the Gurupur river to the uplands near the airport will be transformed into an industrial belt leading to increased air pollution emission by a factor of nine.

Pointing out that the 2000 Hectares of picturesque rural land in Mangalore taluk would be transformed into an industrial belt, the study sees the threat of acid rain looming large over the region. The increase industrial pollution could have an adverse impact on the bio-diversity and ecology of the western ghats, it adds.

Waster water discharge from industry may increase by a factor of 5. Further by 2002, the generation of solid and hazardous wastes could increase to around 14 million tonnes per year. These wastes, consisting mostly of fly ash, oil and toxic sludge, threatens to degrade water quality, riverine ecosystem and coastal water if not managed adequately.

The study has projected that the urban population may increase by an astounding 1.5 per cent compared to a relatively moderate growth of rural polulace.

Regarding the agricultural sector, it says that the area of agriculture land, as measured by the net area sown, has significantly increased over the last two decades. This trend is expected to continue an area of 3,50,000 hectares in 2002 as compared to the present 2,86,000 hectares. The present common lands coverage of 18 per cent of the district may decline to 10 per cent.

The direct effect of industrialization on rural areas is a possible loss of good agricultural land, common and grazing lands and the displacement of households. Further, it would influence migration of labour from rural to urban areas, leading to a decline in the area sown under labour intensive crops.

Another startling factor indicated by the study is that while employment opportunities may increase in secondary and tertiary sectors – totaling an estimate of 70,000 mainly in Mangalore and Udupi areas, simultaneously around 45,000

farm labourers and cultivators may be displaced from the agriculture sector. The net employment created over the next decade is estimated at 25,000.

The district's per capita income is likely to increase by 50 Per cent in real terms. Highlighting the likely adverse impacts of the unrestrained industrial and urban growth, the report says that there would be an additional fresh water demand of about 40 million gallons a day due to new industries coming up in Mangalore, udupi taluks. This is a very large quantity of water, given the Mangalore city corporation and Udupi town municipality together currently consume about 13 MGD, while irrigation accounts for about 200 MGD in these talus.

At present, the near-term source of the additional 40 MGD is uncertain ; if surface water in Magalore and Udupi are exploited further then there may be a reduction in water availability in these cities, increasing the intrusion of saline water. At present water flow in the Netravati river is practically naught during certain months in a year and increase withdrawal of water can have a negative impact on the riverine ecosystem.

The population in Mangalore and Udupi urban agglomerates is expected to reach 6,00,000 and 3,15,000 respectively in the next seven years. The water supply, sewage and solid waste collection systems in these areas which are already over loaded or ineffectively managed, would come under further pressure leading to the further deterioration in human living standards apart from the contamination of soil, ground and surface water.

Activity sheet-1

**Activity for representing concepts from the lesson "Asia"**

