

Science

Grade 6

Teacher Instructional Manual

Department of Science, Health & Physical Education

Faculty of Science & Technology

National Institute of Education



PRINTING AND DISTRIBUTION BY EDUCATIONAL PUBLICATIONS DEPARTMENT

Science

Teacher Instructional Manual
Science
Part I

Grade 6

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Grade 6 - Part I

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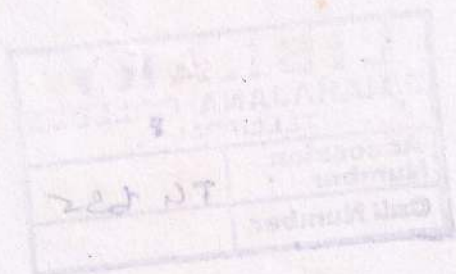
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Message of the Director General

The present Teacher's Instructional Manual will provide excellent guidance to teachers on the teaching approaches they should adopt in teaching their subjects.

This Teacher's Instructional Manual is provided to you in order to provide you with guidance on how you should organize your classroom activities so that they are student-centered. The organization of the classroom learning-teaching process based on the student-centered approach is not a new experience to either the Sri Lankan classroom or to the teacher. Nevertheless, the student-centered learning-teaching methodology has been provided a novel character through this new approach.

Not only does the present Teacher's Instructional Manual provide the direction necessary in planning lessons to ensure student participation but it also judiciously builds up the environment required for the purpose.

The basis of the guidance inherent in the Teacher's Instructional Manual is the philosophy that the teacher should be rather a transformer of knowledge than a mere transmitter of knowledge. As such, the activities here help transform the student into a learner who seeks knowledge and thereby generates new knowledge. Therefore, teachers are expected to direct and stimulate students to discover new knowledge through exploration.

It is believed that the underlying philosophy as well as the activities described in this Teacher's Instructional Manual will stimulate the teacher to break away from the shackles of traditional teaching methodologies and think. It is necessary that our teachers focus on new approaches and teaching methods. The new millennium has seen the birth and creation of an immense range of new knowledge. Therefore, there is a need to break away from traditional methods and concentrate on planning new activities of one's own.

What is expected through the information included in a Teacher's Instructional Manual of this nature is to direct the teacher to higher approaches while providing him/her with the basic instructions that he/she could employ in his/her teaching tasks. It is expected that teachers will make a study of this Teacher's Instructional Manual with that objective in view and utilize the know how in the classroom. As such, what is mainly expected through an endeavour of this nature is to raise the efficiency and quality of the classroom learning-teaching process.

I would like to thank the subject specialists of the National Institute of Education as well as external resource persons who contributed of their time and expertise in the preparation of this Teacher's Instructional Manual.

Professor Lal Perera
Director General
National Institute of Education

Preface

The first curriculum reform for the millennium implemented with the aim of preparing a powerful basis for a new Sri Lanka anticipates a visible transformation on of the teacher's role. The three main sections below are included in the Teacher Instruction Manual prepared with the objective of providing the teacher with the necessary support in this regard.

- Detailed Syllabus
- Activity Continuum that helps in the implementation of the syllabus
- Instruments for the extension of the learning teaching process.

Teachers have been provided the opportunity of understanding several basic matters that have been taken into consideration in the preparation of the curriculum for the detailed syllabus extending beyond subject topics and sub - topics. Competency levels that correspond to subject competency have been included in this section that commences with an introduction to the factors and subject aims that formed the basis of the new syllabus. One special features of this section is that, while the knowledge - base determined under competency level each student needs to develop has been introduced as the subject content the multiple learning and teaching methods employed in transmitting this section to the student has also been taken into consideration in determining the time frame with respect to each competency level.

The final part of the detailed syllabus presented under the heading "School Policy and Programs" need to be studied very carefully and understood by every instructional leader. This section provides school managers a range of valuable instructions to assist them in the allocation for teaching, subject - teaching assigning functions to teachers, implementing co-curricular activities as well as supervision of the teacher's task. The second section of the Teacher Instruction Manual has been prepared with the objective of providing teachers with clear understanding of the proposed learning- teaching methodology. This section commences with the introduction of the methods of planing activities under competency- based education as well as the change in the teacher's role. Although the activity continuum necessary for the implementation of the curriculum has been introduced next, the implementation of the proposed activity in the very same manner is not expected of teachers. The teacher should endeavor to make use of his/ her creative, as well as critical thinking abilities and adapt these activities in a manner that suits ones class, best. Although instructions have been provided on the constitution

of groups in keeping with the facets of the problems subject to exploration, the teacher is expected to take an intelligent decision on the number of groups based on number of students in the class.

Time has been allocated for activities to ensure achievement of the relevant competency levels. Therefore, teachers may have to exceed the 40-minute period. While each activity has been provided adequate time for the actualization of each competency level, the teacher is expected to make use of single or double periods in the time table and breakdown these activities, as suitable in implementing them.

For the success of the procedure it is essential that every time an activity commenced the previous day is carried over to the following day, that a brief summary of the part of the activity completed the previous day is presented to the class. Similarly, this decision will provide the school community with the opportunity of involving students in effective learning where teachers obtain leave of absence.

The final item in this section is a list of quality inputs necessary for the maintenance of the quality of subject learning and teaching, when taken as a whole. As such, the teacher has a choice of ordering out the necessary learning-teaching materials in time and having them on hand.

Included in the third part of the teacher Instruction Manual under the title

“Assessment and evaluation” are a number of important hints to ensure that the expected results of the exercise are realized.

This section has been so structured as to introduce matters related to the assessment and evaluation that should take place under each activity, extension of the learning and teaching that takes place based on activity groups and the nature of the questions that might be expected in general examinations. It must be pointed out that the primary responsibility of the teachers is to identify instances where assessment and evaluation can be implemented in the course of each activity and to carry out this task successfully on the basis of common criteria. The set of instruments prepared with a range of activities as the objective for the purpose of extending learning and teaching provide students with the opportunity of involvements in continuous learning outside the recommended classroom sessions. While it is the task of the teacher to regularly examine the learning students receive, based on these instruments, and encourage them, arriving at a correct decision regarding the final results of the activities and communicating that decision to the relevant parties is expected of the teacher. It is essential that a visible change takes place in general examinations for the success of the learning-teaching process. The national Institute of Education, with the assistance of the Sri Lanka Department of Examinations, has introduced

several prototype questions for educational levels that terminate with these examinations. Since this change in examination question papers has been suggested in order to direct students to learn through practice and experience, instead of resorting to mechanical approaches like memorizing or answering model question papers, the education of school students and parents about this change should commence at the beginning itself.

All teachers should realize that various activities can be developed for the achievement of any particular competency level. Accordingly, they should be prepared for more successful teaching through the use of better approaches, exploration, as well as instruments for the extension of learning and teaching.

The present Teacher Instruction Manual will give teachers right throughout the country the courage to effect a visible change in the teacher's role and prevent their becoming inactive in the presence of new approaches. Similarly, we expect to award certificates and provide numerous development opportunities to teachers who go beyond the activities to involve themselves in the innovation of novel creations. What teachers have to order in to become eligible to the awards is to improve these activities, using their creative thinking, and present them. Learning-teaching plans prepared in this manner outside the basic activity plan, should be forwarded to Assistant Director General (Curriculum Development), Science and Technology faculty, National Institute of Education, Sri Lanka. Selection of those entitled to awards will be made subsequent to the study of these activities by the relevant subject committees.

We have endeavoured in this manner, to bring learning-teaching assessment and evaluation on to the same platform through new methodologies. According to this, teachers will be provided substantial latitude to meaningfully handle the learning-teaching process, school-based assessment, as well as assignment of home-work. It is our firm conviction that the school system of Sri Lanka will, make maximum use of this aid and depart from orthodox learning-teaching approaches to enhance the thinking abilities, social abilities as well as the individual abilities of the sons and daughters of the country.

Dr. Indira Lilamani Ginige

Assistant Director General (Curriculum Development),

Faculty of Science and Technology,

National Institute of Education,

Sri Lanka.

Message of the Commissioner General of the Educational Publications

The government provides free textbooks for all the students in Sri Lanka with the objective of providing education for all. By compiling Teacher's Instructional Manuals parallel to the Textbooks, it is expected to have a qualitative development in the Learning - Teaching process.

It is the teacher who paves the way for the students to explore knowledge both in the classroom and beyond. Moreover, the teacher is the pilot who leads the students to achieve the competency levels expected in the syllabus. Assisting you to fulfil the aforesaid duty is the intention of compiling a Teacher's Instructional Manual. The responsibility of transmitting the Learning-Teaching process more effectively to the student population by reading and practicing the guidelines of this manual is conferred on you. You who are sensitive to that responsibility will undoubtedly be a precious resource.

You shoulder the responsibility of providing perfect citizens who have knowledge, attitudes, skills and competencies as well as strong social and intra-personal skills to the society. My expectation is that you will be able to build up a future generation who can face the challenges of the present world. I strongly believe that this manual will assist you to strengthen your ability to make that expectation a success.

W.M.N.J.Pushpakumara
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Introduction

Basis for School Science Curriculum Reform

Previous curriculum reform, aimed at teaching Science at secondary level through the subjects, Environmental Studies for grade 6 and Science & Technology for grades 7-11, faced following drawbacks.

- Lack of adequate opportunities for the students to acquire internationally accepted Science process skills.
- Omission of some essential basic scientific concepts in the course which hindered systematic development of scientific concepts.
- Fewer opportunities provided for students to engage in a learning- teaching process which enables proper comprehension of scientific concepts.

Furthermore, the following factors that prevailed in the school Science curriculum have also contributed to the decline in the quality of Science.

- Environment related activities subject at primary level has not contributed to comprehension of basic scientific concepts as expected.
- Deviation of the learning-teaching process from practical situations towards transmission of knowledge through text books.
- Examination oriented learning-teaching process resulting in students being diverted from exploration based learning towards mechanical learning.

Basically, the prime objective of the new curriculum reform is to alleviate these shortcomings and to minimize the curriculum gap between G.C.E. (O/L) and G.C.E. (A/L) as well. In order to achieve this objective, measures should be taken to avoid the separation of theoretical aspects from practical activities in Science.

Present curriculum reform is expected to introduce a new approach to provide opportunity to amalgamate theoretical aspects and practical activities.

New methodology is unique as the science curriculum has been developed according to the following distinctive features:

- Competency based
- Activity oriented
- Student centered

Science subject is introduced as a **common Science curriculum** for grades 6-9, and as a **subject curriculum** for grades 10-13. However, in the science curriculum for grades 10-11 the three main subjects of Physics, Chemistry and Biology are presented as three modules with equal weight for the G.C.E. (O/L) examination.

Science syllabi for grades 6-9 has been developed as a spiral curriculum based on the broad themes given below.

- Observing the environment
- Organisms and life processes
- Matter, their properties and interactions
- Earth and space
- Energy, force and work

The new curriculum reform consists of a set of competencies and competency levels, a continuum of activities together with a set of activities which provide opportunities to extend the learning-teaching process beyond the classroom environment.

Course Objectives for Grade 6 - 11 Science

On completion of this course, the student will be able to;

- develop scientific concepts and principles systematically through a joyful learning environment.
- develop competencies related to problem solving by using processes in science and scientific method appropriately.
- develop competencies pertaining to managing environmental resources intelligently by understanding the potential of such resources.
- develop competencies related to the usage of scientific knowledge to lead a physically and mentally healthy life.
- develop competencies pertaining to becoming a successful individual who will contribute to the development of the nation in collaboration, engage in further studies and undertake challenging job prospects in the future.
- develop competencies related to understanding the scientific basis of the natural phenomena and the universe.
- use appropriate technology to maintain efficiency and effectiveness at an optimum level in utilizing energy and force.
- develop competencies related to evaluation of day to day life experiences and information acquired through media by employing scientific criteria with a background of limitations and dynamic nature of science.

Course Objectives for Grade 8 - 11 Science

- On completion of this course, the student will be able to:
- develop scientific concepts and principles systematically through a joyful learning environment.
 - develop competencies related to problem solving by using processes in science and scientific method appropriately.
 - develop competencies pertaining to managing environmental resources intelligently by understanding the potential of such resources.
 - develop competencies related to the use of scientific knowledge to lead a physically and mentally healthy life.
 - develop competencies pertaining to becoming a successful individual who will contribute to the development of the nation in collaboration, engage in further studies and undertake challenging job projects in the future.
 - develop competencies related to understanding the scientific basis of the natural phenomena and the universe.
 - use appropriate technology to maintain efficiency and effectiveness in an optimum level in utilizing energy and force.
 - develop competencies related to evaluation of day to day life experiences and information acquired through media by employing scientific criteria with a back ground of limitations and dynamic nature of science.

Descriptive Syllabus

SCIENCE SYLLABUS - GRADE 6

First Term

Competencies & Competency Levels	Content	Time (minutes)
1.0 Observes the environment as a scientist. 1.1 Observes components of the environment.	<ul style="list-style-type: none"> • Scientific observations <ul style="list-style-type: none"> • Sense organs that assist observations • Instruments required to obtain observations • Components of the environment <ul style="list-style-type: none"> • Things • Events 	120
1.2 Observes to identify things in the environment.	<ul style="list-style-type: none"> • Natural/artificial • Living/non-living • Material/non-material (energy) 	120
1.3 Observes to identify phenomena in the environment.	<ul style="list-style-type: none"> • Kinds of phenomena <ul style="list-style-type: none"> • Recurrent/non-recurrent • Autogenic/non-autogenic • Related to biotic environment/related to abiotic environment 	120
2.0 Examines components in the environment quantitatively. 2.1 Uses measurements of length to describe objects in the environment.	<ul style="list-style-type: none"> • Length as a basic physical quantity • Units and sub-units of measuring length <ul style="list-style-type: none"> • Arbitrary • Standard • Instruments and strategies of measuring length 	120
2.2 Uses measurements of mass to describe materials in the environment where appropriate.	<ul style="list-style-type: none"> • Mass as a basic physical quantity • Units and sub-units of measuring mass <ul style="list-style-type: none"> • Arbitrary • Standard • Instruments and strategies of measuring mass 	120
2.3 Uses measurements of time to describe phenomena in the environment where appropriate.	<ul style="list-style-type: none"> • Time as a basic physical quantity • Units and sub-units of measuring time <ul style="list-style-type: none"> • Arbitrary • Standard • Instruments and strategies of measuring time 	120

Competencies & Competency Levels	Contents	Time (minutes)
2.4 Uses measurements of temperature to describe phenomena in the environment appropriately.	<ul style="list-style-type: none"> • Temperature as a basic physical quantity • Standard units of measuring temperature • Instruments and strategies of measuring temperature • Temperature measurements related to environment <ul style="list-style-type: none"> • Change of state • Body temperatures of animals and plants 	120
3.0 Investigates animal diversity. 3.1 Investigates similarities and dissimilarities among organisms.	<ul style="list-style-type: none"> • Need to identify diversity among organisms • Characteristics common to organisms • Characteristics common to plants • Characteristics common to animals • Differences between plants and animals 	120
3.2 Investigates animal diversity in relation to the environment they live in.	<ul style="list-style-type: none"> • Types of animals according to the environment they live in <ul style="list-style-type: none"> • Aquatic • Terrestrial • Tree living(arboreal) • Soil • Animal diversity based on the environment they live in 	120
3.3 Investigates animal diversity in relation to their external characteristics.	<ul style="list-style-type: none"> • External characteristics that favour diversity among animals. <ul style="list-style-type: none"> • Colour • Shape • Symmetry • Appendages • Animal diversity based on external characteristics 	120
3.4 Investigates animal diversity in relation to their type of food.	<ul style="list-style-type: none"> • Groups of animals in relation to their type of food <ul style="list-style-type: none"> • Herbivore • Carnivore • Omnivore • Animal diversity based on the type of food 	120

Competencies & Competency Levels	Contents	Time (minutes)
3.5 Investigates animal diversity in relation to locomotion	<ul style="list-style-type: none"> • Animal groups based on locomotion <ul style="list-style-type: none"> • Locomotion possible • Locomotion not possible (sedentary) • Methods of locomotion among animals <ul style="list-style-type: none"> • Flying • Creeping • Walking • Swimming • Animal diversity based on methods of locomotion 	120
3.6 Classifies animals using suitable criteria and methods	<ul style="list-style-type: none"> • Criteria for classification <ul style="list-style-type: none"> • External features • Environment they live • Type of locomotion • Nature of feeding • Classification based on dichotomous key 	120
Second Term		
4.0 Investigates plant diversity.		
4.1 Investigates plant diversity in relation to morphological features	<ul style="list-style-type: none"> • Morphological features in plants <ul style="list-style-type: none"> • Stems • Roots • Leaves • Flowers • Fruits • Seeds • Plant diversity based on morphological features 	120
4.2 Investigates plant diversity in relation to habitat	<ul style="list-style-type: none"> • Types of plants in relation to habitat <ul style="list-style-type: none"> • Mangroves • Hydrophytes • Sea shore • Xerophytes • Epiphytes • Plant diversity based on habitat 	120
4.3 Classifies plants using suitable criteria and methods	<ul style="list-style-type: none"> • Criteria for classification <ul style="list-style-type: none"> ▪ morphological features ▪ habitat • Classification based on dichotomous key 	120

Competencies & Competency Levels	Contents	Time (minutes)
<p>5.0 Makes investigations to identify the nature of the earth and space.</p> <p>5.1 Investigates phenomena in relation to motion of the sun and the moon.</p>	<ul style="list-style-type: none"> • Concept of apparent motion • Apparent motion of the sun and related phenomena • Apparent motion of the moon and related phenomena • Lunar phases • Solar eclipse and lunar eclipse 	120
<p>5.2 Investigates to identify the structure of the earth</p>	<ul style="list-style-type: none"> • Basic components of the earth <ul style="list-style-type: none"> • Hydrosphere • Atmosphere • Lithosphere • Distribution and characteristics of the components 	120
<p>5.3 Investigates to identify the nature of hydrosphere</p>	<ul style="list-style-type: none"> • Criteria that describe hydrosphere <ul style="list-style-type: none"> • Physical states of water • Sources of water <ul style="list-style-type: none"> • Marine (ocean/sea/lagoon) • Fresh water (rain/rivers/springs/tanks/lakes/reservoirs/ponds/ground water/glaziers) • Modes of precipitation <ul style="list-style-type: none"> • Rain • Mist • Dew • Sleet • Frost • Snow 	120
<p>5.4 Investigates the existence of hydrosphere</p>	<ul style="list-style-type: none"> • Hydrological cycle <ul style="list-style-type: none"> • Stages (ground water, surface water, water within organisms, water vapour, clouds) • Processes <ul style="list-style-type: none"> • Evaporation and transpiration • Condensation • Absorption • Run off and infiltration 	120

Competencies & Competency Levels	Contents	Time (minutes)
5.5 Investigates the contribution of water for the existence of organisms.	<ul style="list-style-type: none"> • Amount of water in plants and its function • Amount of water in animals and its function • Soil water and its function • Atmospheric water vapour and its function 	120
5.6 Investigates the utilization of water in diverse fields and the consequent impact on water resources.	<ul style="list-style-type: none"> • Various fields where water is utilized <ul style="list-style-type: none"> • Agriculture • Industries • Transportation • Recreation/sports • Domestic • Impact on the water resource due to human activities <ul style="list-style-type: none"> • Favourable impacts • Unfavourable impacts • Strategies for the prevention of water pollution 	120
5.7 Manages domestic water consumption.	<ul style="list-style-type: none"> • Per capita water consumption • Domestic water consumption • Instances of waste of domestic water • Instances of pollution of domestic water • Techniques of domestic water conservation 	120
Third Term		
6.0 Investigates properties interactions, and uses of matter. 6.1 Classifies matter in relation to their physical properties.	<ul style="list-style-type: none"> • Properties of matter <ul style="list-style-type: none"> • Colour • Texture • Lustre • Hardness • Brittleness • Flexibility • Elasticity • Plasticity • Transparency • Conduction of heat • Conduction of electricity • Magnetic properties • Criteria for classification <ul style="list-style-type: none"> • Conductor of heat/insulator of heat • Conductor of electricity/insulator of electricity • Transparency/translucence/opaque • Ductility/malleability/ brittleness • Elasticity/plasticity 	120

Competencies & Competency Levels	Contents	Time (minutes)
6.2 Selects appropriate materials for various purposes.	<ul style="list-style-type: none"> • Type of material for the purpose <ul style="list-style-type: none"> • Building materials • Materials in producing textile • Materials in making tools/appliances • Packing materials • Materials in making jewellery/ornaments • Materials in making pots and pans 	120
6.3 Investigates the changes of properties of matter	<ul style="list-style-type: none"> • Factors that affect the change of properties of matter <ul style="list-style-type: none"> • Physical factors • Chemical factors • Biotic factors • Instances where properties of matter change <ul style="list-style-type: none"> • Change of state • Tarnishing of metals • Decaying of organic matter • Weathering of rocks 	120
6.4 Conducts experiments to investigate the factors that affect rusting of iron.	<ul style="list-style-type: none"> • Essential factors <ul style="list-style-type: none"> • Water/water vapour • Air 	120
6.5 Investigates the factors that affect the rate of rusting.	<ul style="list-style-type: none"> • Effect of alkali, acids and salts 	120
6.6 Takes measures to control rusting.	<ul style="list-style-type: none"> • Techniques of control <ul style="list-style-type: none"> • Application of paint • Immersing in oil and grease coating • Coating with other metals 	120
7.0 Uses concepts, principles, and theories related to energy, work and force effectively. 7.1 Uses force in day to day life pursuits.	<ul style="list-style-type: none"> • Concept of force <ul style="list-style-type: none"> • Pull • Push • Instances where force is applied <ul style="list-style-type: none"> • to make a stationary object to move • to stop movement of an object • to change the direction of a moving object • to change the speed of an object • to change the shape of an object 	120

Competencies & Competency Levels	Contents	Time (minutes)
7.2 Uses energy to meet human needs.	<ul style="list-style-type: none"> • Sources of energy <ul style="list-style-type: none"> • Sun • Wind • Fuel • Nuclear energy • Potential energy of water • Electro-chemical cells • Instances where energy sources are being used. 	120
7.3 Investigates energy transformations	<ul style="list-style-type: none"> • Energy transformation <ul style="list-style-type: none"> • Kinetic energy → electrical energy • Electrical energy → kinetic energy • Electrical energy → thermal energy • Chemical energy → electrical energy • Chemical energy → thermal energy • Electrical energy → light energy • Light energy → electrical energy 	120
7.4 Constructs simple instruments using energy conversions.	<ul style="list-style-type: none"> • Simple instruments based on energy conversions 	120
8.0 Exhibits preparedness for the management of natural disasters and related risk situations. 8.1 Investigates natural disasters that Sri Lanka is subjected to and the related scientific background.	<ul style="list-style-type: none"> • Natural disasters faced by Sri Lanka <ul style="list-style-type: none"> • Floods • Droughts • Land slides • Cyclones • Thunderbolts • Tsunami • Scientific basis of natural disasters 	120
8.2 Makes contributions as a scientist to minimize the effect of natural disasters.	<ul style="list-style-type: none"> • Simple instruments to detect weather changes • Forecasting with regard to weather data 	120

School Policies and Programmes

- According to the proposed curriculum reform five periods have been allocated to teach Science for the grades 6-9 and six periods for grades 10 and 11.
- The learning-teaching process has been designed on an activity based approach.
- The expected learning-teaching methodology will be in accordance with the transformation role of the teacher. Activities designed on 5-E model have been provided through the Teacher Instruction Manual in order to implement the transformation role at classroom level.
- The prescribed time to conduct one activity at class room level will be more than one period. Therefore, it is emphasized that the Sectional heads and school management to should take in to account the importance of allocating two adjacent periods for the successful implementation of activities at classroom level.
- It is a crucial factor that there should be excellent planning at grade level for the successful implementation of activities. It is wise to organize the activities with the participation of all the teachers who teach science in parallel classes of a particular grade level.
- Principals/Sectional Heads are expected to provide instructional leadership to the teachers on developing plans to identify and obtain the necessary quality inputs and utilizing them before the commencement of each term.
- Some activities in particular need specific experimental setups and printed materials. It is therefore advisable to prepare and maintain a reserve of these materials with the participation of teachers in the parallel classes of a particular grade level to maintain learning-teaching process efficiently.
- According to the new approach, students are not engaged in separate theory and practical sessions. It is expected to establish concepts, principles and theories through hands on practical experiences by way of proposed activities.
- Laboratory equipment as well as improvised and adapted setups are needed to carryout proposed activities. School management is responsible in providing such services and assistance within the school and from outside resources.
- As a measure of recognition of the articles that students prepare during the course of proposed activities, it is recommended to organize term end or year end exhibitions. This will encourage the students on further inventions.
- With a view to extend learning beyond the activities done at classroom level and to highlight the students' special abilities, it is expected to involve students in co-curricular activities such as debates, wall newspapers, magazines, school science societies, science days, science exhibitions etc.

In deciding upon the learning teaching methodology relevant to the course, attention has been paid to the planning of learning-teaching activities so as to facilitate building up of student competencies based on exploration. In teaching for competency-based education, in this manner, an obvious change in the role of the teacher is expected.

The transmission role practiced in our classroom from way back and the more recently introduced transaction role is evident in the classroom even in the present day. When taking the transaction of the thinking skills, personal skills and social skills of school leavers into consideration, it needs no effort to understand that there is a need for the development of the learning-teaching methodology and how it should be effected.

In the transmission role while the teacher is considered an individual who knows everything, his task has become that of considering the student as one who does not know anything and of transmitting knowledge to him. This learning-teaching process that takes the cause of learners is restricted only to the flow of knowledge from the teacher to the student, does not make an adequate contribution either to the stimulation of student thinking or to the development of his

Teaching - Learning Process

The dialogue initiated by the teachers within the class is the initial stage of the transaction role apart from the ideas that flow from the teacher to the class and from the class to the teacher. These dialogues get gradually transformed into discussions as a result of the student-student interaction that takes place subsequently. The teacher is continuously involved in the task of questioning in order to take the student from the known to the unknown, from the simple to the complex and from the concrete to the abstract.

While, in competency-based education, student tasks occupy a powerful position, the teacher occupies the position of a resource person who mediates in order to provide every student in the class with at least the competency proximate to each relevant competency. For this purpose the basic functions the teacher is expected to perform include planning of a learning environment consisting of the materials and other facilities necessary for learning, close observation of how students learn, identification of student abilities and disabilities and the promotion of student learning through feedback and provision of feedback as well as the preparation of instruments of assessment for the extension of learning beyond the classroom. The teacher's role based eventually upon the tasks above is called the transmission role.

Introduction

In deciding upon the learning teaching methodology relevant to the course, attention has been paid to the planning of learning-teaching activities so as to facilitate building up of student competencies based on exploration. In preparing for competency-based education, in this manner, an obvious change in the role of the teacher is expected.

The transmission role practiced in our classroom from way back and the more recently introduced transaction role is evident in the classroom even in the present day. When taking the deterioration of the thinking skills, personal skills and social skills of school leavers into consideration, it needs no effort to understand that there is a need for the development of the learning-teaching methodology and how it should be effected.

In the transmission role while the teacher is considered an individual who knows everything, his task has become that of considering the student as one who does not know anything and of transmitting knowledge to him. This learning-teaching process that takes the guise of lectures is restricted only to the flow of knowledge from the teacher to the student, does not make an adequate contribution either to the stimulation of student thinking or to the development of his personal and social skills.

The dialogue initiated by the teachers within the class is the initial stage of the transaction role apart from the ideas that flow from the teacher to the class and from the class to the teacher. These dialogues get gradually transformed into discussions as a result of the student-student interaction that takes place subsequently. The teacher is continuously involved in the task of questioning in order to take the student from the known to the unknown, from the simple to the complex and from the concrete to the abstract.

While, in competency-based education, student tasks occupy a powerful position, the teacher occupies the position of a resource person who mediates in order to provide every student in the class with at least the competency proximate to each relevant competency. For this purpose the basic functions the teacher is expected to perform include planning of a learning environment consisting of the materials and other facilities necessary for learning, close observation of how students learn, identification of student abilities and inabilities and the promotion of student learning through feed back and provision of feed forward as well as the preparation of instruments of assessment for the extension of learning beyond the classroom. The teacher's role based eventually upon the tasks above is called the transformation role.

The series of activities that can be used in the implementation of the descriptive curriculum introduced in the first part of this course guide, has been included in its second part. Each of these activities has been developed so as to contain a minimum of three steps. It is expected to get the student involved in the learning process through the first step of the activities. As such, this step is called the "Engagement" step. As an introduction to this step, the teacher assumes the Transaction role and engages in a dialogue with the students. Later, along with the transformation of this dialogue to a discussion the students engage in exploration and are provided the opportunity to recall the pre-knowledge related to the basic competency they should develop and to acquire a hint regarding the future of the activity. The teacher possesses a host of strategies that can be used in these exchanges of ideas. Some of the devices at the disposal of the teacher for the exchange of these ideas are questioning/stimulants like pictures, newspaper advertisements and flash cards/use of puzzles or case studies/dialogues, role play, poems, songs and demonstrations, video tapes or audio tapes. In summary, the first step of the activities is implemented with the objective of actualizing the three objectives below.

- Winning over of the attention of the class.
- Providing the students with the opportunity for students' recall of the necessary pre-knowledge.
- Introducing the elements of the explanation the students are expected to be directed to under the second step of the activity.

It is with the objective of providing the students with the opportunity of Exploration that the second step of the activity has been planned. Students base their exploration on a special leaflet prepared for the purpose. The teacher has to plan this explanation to enable the students to engage in cooperative learning through the exploration of various aspects of the problem, in groups. Some of the most important qualities of this step are involvement in the conscious group discussions and the use of the resource materials provided. As a result of involvement in group activities through a long period of time, student will acquire the ability to develop a number of skills like self-discipline, listening to others, working cooperatively with others, helping them, management of time, obtain creations of high quality, honesty etc. In directing students to exploration, while the teacher should avoid taking decisions regarding leadership, he should build up the background necessary to surface. Accordingly, the students will have the privilege of taking on leadership when opportune, based on hidden abilities.

During the 3rd step of the activity, every group will get the opportunity of presenting the results of its exploration for the enlightenment of the others. What the teacher has to do here is to encourage students to group presentations. It would be effective if students are directed so as to ensure that every member is given responsibility in the planning of the presentation. An important quality of

this step, related to the explanation of student findings, is the creation of the opportunity for the voice of students to be heard in the classroom where, commonly the voice of the teacher had dominated.

After the explanation of the findings in the third step of the activities, students should be directed to elaboration. Each group is given the opportunity to provide constructive suggestions on its findings first, and subsequently, members of other groups are given this opportunity. Anyway the final review is the responsibility of the teacher. The teacher is expected to touch on all the important points relevant to the students' exploration.

The main responsibility of the teacher in this learning teaching process is to monitor continuously, whether the classroom learning-teaching process is implemented successfully, as expected. While assessment and evaluation should be made use of for this purpose, the teacher is provided the opportunity, through planned activities, in the learning teaching process itself. The teacher is given the opportunity for assessment while the students are involved in exploration during the second stage of the activity and for evaluation when the students are involved in explanation and expansion during the third stage. A detailed inquiry into assessment and evaluation will be provided later on in this document.

The teacher is provided direction on the transformation role by the learning-teaching methodology described so far. While priority is given to group exploration here, the teacher is also afforded the opportunity for transaction, discussion and short lectures. While there is room for transaction and discussion, the teacher may also give a short lecture, under review, in the final stage. In the development of the learning-teaching methodology related to this curriculum, the first to be introduced under the curriculum reforms for the new millennium, the attention paid to the important features relevant to the transmission as well as the transaction roles of the teacher, apart from the transformation role, is a special feature of this methodology.

Quality Inputs

(Grade 6) First Term

Permanent Equipment, chemicals and other equipment

- Hand lenses
- Bunsen burners
- Tripod stand
- Scissors
- Forceps
- Test tube holders
- Burette holders
- Thermometer holders
- Thermometers
 - Ordinary
 - Clinical
- Pan balance
- Kitchen balance
- Triple beam balance
- Spring balance
- Sets of weights
- Baking powder
- Ropes
- Stop watches
- Compasses
- Meter rulers
- Measuring tape
- Hacksaw blades
- Clocks (including digital)
- NaHCO_3 (Baking Soda)
- Binoculars
- Forks, spades and rakes
- Pins
- Thread
- Twine
- Bucket wire
- Washing powder
- NaCl (Table salt)
- Beakers and Glass rods
- Demy sheets and marker pens

Competency 1.0 : Observes the environment as a scientist.

Competency level 1.1 : Observes the content of the environment.

Activity 1.1 : Let's identify the environment through observation.

Time : 120 minutes

- Quality inputs :**
- Instructions to prepare the black cloth bag given in annexe 1.1.1
 - Two copies of instructions for exploration given in annexe 1.1.2
 - Hand lenses, forceps, binoculars, spades, meter rulers, thermometers.
 - Demy sheets and marker pens.

Teaching-learning process :

- Step 1.1.1 :**
- Ask few students to observe the black bag.
 - Instruct them to identify the contents in the bag and report.
 - Lead a discussion to highlight the following points.

That,

- different senses are being used to identify various things in the environment.
- things in the black bag have been identified by senses of hearing , smell and touch.
- various things can be identified in day to day life by looking and tasting as well.
- investigating the environment using different senses with special attention is called observation.
- instruments like thermometers, binoculars, meter rulers, hand lenses etc, are used for precise and detailed observations.

(15 minutes)

- Step 1.1.2 :**
- Divide the class into two groups.
 - Provide the groups with instruments and copies of instructions for exploration.
 - Direct the groups to suitable places /nature trail in the school premises.
 - Prepare them to present their findings to the whole class.

(60 minutes)

Step 1.1.3

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

That,

- things in the environment can be named as materials or objects.
- things which occur in the environment can be named as phenomena.
- collection of information is essential in learning or problem solving.
- careful observation is essential for collecting information.
- we make observations by vision, hearing, smell, taste and touch.
- eye, ear, nose, tongue and skin are the organs which help to make observations.
- organs which help to make observations are called sense organs.
- there are limitations in observations perceived by sense organs.
- instruments have been devised to observe things which are beyond the scope of our sense organs.
- observation is the most important step in the scientific process.
- observation has led to many scientific discoveries.

(45 minutes)

Criteria for assessment and evaluation

- Explains what is meant by an observation.
- Appreciates the importance of observation in scientific studies.
- Uses instruments to make precise observations.
- Collects information using correct methodologies.
- Acts on environment in a sensitive way.

Annexe 1.1.1

Instructions to prepare the black cloth bag

A flexible piece of rubber tubing, metal bottle caps, piece of velvet cloth, piece of sand paper, piece of cloth dipped in garlic extract and other appropriate materials are put inside a black cloth bag and sealed so as not to be seen from outside.

Annexe 1.1.2

Instructions for group exploration

- Focus your attention to the topic assigned to your group given below.
 - Things found in the environment
 - Events occurring in the environment
- Use the instruments appropriately in order to make observations on the topic assigned to you.
- Proceed to the places assigned in the school premises.
- Observe the environment meticulously and record the information.
- Be prepared for a creative presentation on your findings to the class.

Competency 1.0 : Observes the environment as a scientist.

Competency level 1.2 : Observes to identify things in the environment.

Activity 1.2 : Let's identify and classify things in the environment through observation.

Time : 120 minutes

Quality inputs :

- A picture of 'Our Environment' given in annexe 1.2.1
- Three copies of instructions for exploration given in annexe 1.2.2
- Hand lenses, pieces of wooden sticks and binoculars.
- Demy sheets and marker pens.

Teaching-learning process :

Step 1.2.1 :

- Display the picture to the class.
- Inquire what students can observe assuming that they are in the environment illustrated by the picture.
- Lead a discussion to highlight the following points.

That,

- the environment illustrated by the picture is familiar to us.
- natural resources as well as man-made things are in the picture.
- things in the environment can be identified as living/non-living objects.
- there are warmth, light, sound etc, as well, in the environment, which we can sense.

(15 minutes)

Step 1.2.2 :

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration, instruments demy sheets and marker pens.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 1.2.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.

- Elaborate highlighting the following points.

That,

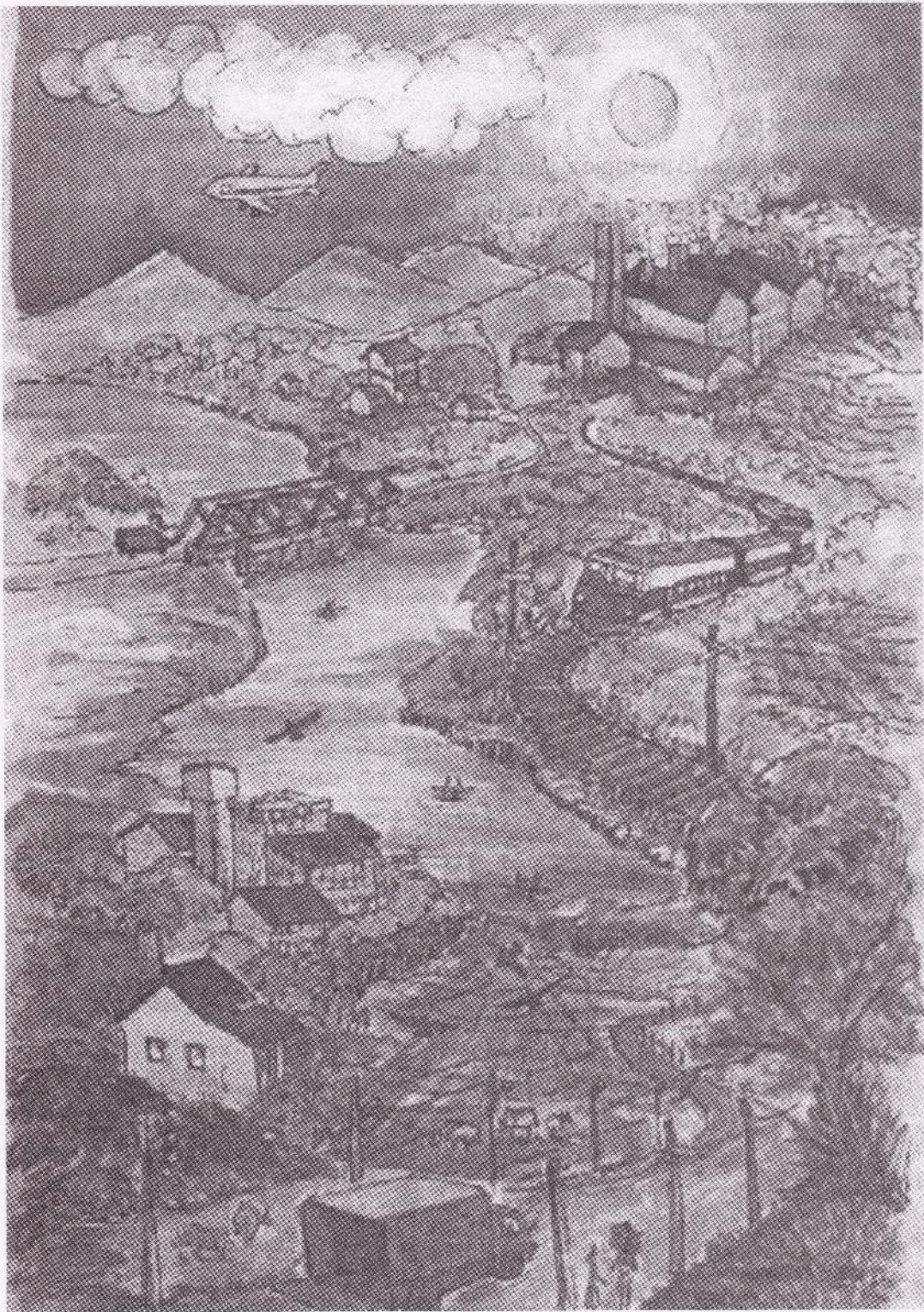
- things which are not created by man are called natural.
- things which are created by man are called artificial.
- things which have common characteristics such as growth, reproduction, death etc, are named as living.
- things which do not have common characteristics such as growth, reproduction, death etc, are named as non-living.
- things which occupy some space in the environment are named as materials (substances).
- most of the substances can be identified by the sense of touch.
- sound, light, heat etc, do not occupy space in the environment.
- things which do not occupy space in the environment are named as energy.
- forms of energy in the environment is essential in day to day activities.

(45 minutes)

Criteria for assessment and evaluation

- Names and describes things that are found in the environment.
- Accepts the importance of perceiving things which belongs to different classes in the environment.
- Classifies things in the environment according to the criteria provided..
- Presents information attractively.
- Explores the environment in an environment friendly manner.

Instructions for group exploration
Some of the characteristics that characterize things in the environment are as follows:



Instructions for group exploration

- Some of the characteristics that could be used to classify things in the environment are as follows;
 - natural/artificial
 - living/non-living
 - material/energy
- Focus your attention to the topic assigned to your group.
- Lead a discussion to identify the criteria for classification that has to be considered.
- Proceed to the respective locations in the school premises directed by the teacher.
- Classify things that you find in the school premises according to the characteristics.
- Be prepared for a creative presentation on your findings to the class.

Competency

1.0 : Observes the environment as a scientist.

Competency level 1.3 : Observes to identify phenomena in the environment.

Activity 1.3 : Let's observe things which occur in the environment.

Time : 120 minutes

- Quality inputs :**
- A copy of the poem given in annexe 1.3.1
 - Three copies of instructions for exploration given in annexe 1.3.2
 - Hand lenses, binoculars and thermometers.
 - Demy sheets and marker pens.

Teaching-learning process :

- Step 1.3.1 :**
- Let the students to listen to the poem attentively.
 - Inquire phenomena contained in the poem.
 - Lead a discussion to highlight the following points.

That,

- there are various phenomena in the environment.
- some of the phenomena are included in the poem.
- phenomena in the environment can be classified using various criteria.
- phenomena in the environment can be observed by listening, seeing and feeling.

(15 minutes)

- Step 1.3.2 :**
- Divide the class into three groups.
 - Provide the groups with copies of instructions for exploration, instruments demy sheets and marker pens.
 - Assign the tasks and engage the groups in exploration.
 - Prepare them to present their findings to the class.

(60 minutes)

- Step 1.3.3 :**
- Get each group to present their findings to the class.
 - Give the first opportunity to the respective group to elaborate on the presentation.
 - Get other groups to propose constructive suggestions.
 - Elaborate highlighting the following points.

That,

- phenomena which are repeated are named as recurrent phenomena.
- some of the recurrent phenomena are ringing of the school bell, sunrise and suneset, blooming 'erabadu' flowers in the new year season, formation of ocean waves etc,

- phenomena which are not repeated are named as non-recurrent phenomena.
- some non-recurrent phenomena are withering of a flower, death of an animal, exploding a cracker etc.
- phenomena which occur spontaneously are named as autogenic.
- some autogenic phenomena are blooming of flowers, falling of rain, flowing of a river etc.
- phenomena which do not occur spontaneously are named as non-autogenic.
- some non-autogenic phenomena are throwing a stone, rotating a fan, cutting down a tree etc,
- some of the phenomena are associated with the biotic environment.
- some phenomena associated with the biotic environment are giving birth to a young, producing fruits, death etc.
- some of the phenomena are associated with the abiotic environment.
- some phenomena associated with the abiotic environment are cracking of earth during dry weather, lightning, operating a robot machine etc.
- a particular phenomenon can be classified using various criteria.
- phenomena can be adopted to day to day life pursuits by examining them using various criteria.

(45 minutes)

Criteria for assessment and evaluation

- Names and describes various phenomena in the environment.
- Accepts that one should be curious about the phenomena in the environment.
- Observes phenomena in the environment correctly.
- Reports information accurately.
- Acts with a sense of unity.

The Poem

The warmth of the sun
Tickles the bees and the butterflies
"Hurry up on your rounds
The pretty flowers await you
With nectar and pollen
With the rising sun
The glistening dew drops vanish
A morning is bright-It's a new day."

Instructions for group exploration

- The ways of grouping phenomena are as follows;
 - phenomena which are repeated (recurrent)
 - phenomena which occur spontaneously (autogenic)
 - phenomena associated with the biotic environment.
 - phenomena which are not repeated (non-recurrent)
 - phenomena which do not occur spontaneously (non-autogenic)
 - phenomena associated with the abiotic environment.
- Focus your attention to the type of grouping assigned to you from the above.
- Proceed to the respective locations in the school premises directed by the teacher.
- Report the phenomena together with the location in which you observed.
- Be prepared for a creative presentation on your findings to the class.

That

- objects have a definite length.
- arbitrary and standard units are used for measuring length.
- cubit is an arbitrary unit.
- meter is the standard unit of measuring length.
- problems may arise due to the use of arbitrary units.
- standard units and instruments should be used to obtain more accurate measurements.

(12 minutes)

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration.

Competency 2.0 : Examines components in the environment quantitatively.

Competency level 2.1 : Uses measurements of length to describe objects in the environment.

Activity 2.1 : Let's measure lengths of objects using suitable instruments.

Time : 120 minutes

- Quality inputs :**
- Two straight, thin wooden sticks and two meter rulers.
 - Three copies of instructions for exploration given in annex 2.1.1.
 - Instructions to set up common table as given in annex 2.1.2.

Teaching-learning process :

- Step 2.1.1 :**
- Inquire about the cubit from students.
 - Call two students of different heights.
 - Provide a stick to each student and ask them to make a stick similar in length to their cubit.
 - Ask them to measure the length of the blackboard with the prepared stick separately.
 - Provide a meter ruler to each student and ask them to measure the length of the blackboard.
 - Ask them to note down the length of the blackboard they obtained in separate instances, with units.
 - Get the ideas of the students on the measurements noted.
 - Lead a discussion to highlight the following points.

- That,
- objects have a definite length.
 - arbitrary and standard units are used for measuring length.
 - cubit is an arbitrary unit.
 - meter is the standard unit of measuring length.
 - problems may arise due to the use of arbitrary units.
 - standard units and instruments should be used to obtain more accurate measurements, .

(15 minutes)

- Step 2.1.2 :**
- Divide the class into three groups.
 - Provide the groups with copies of instructions for exploration.

- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 2.1.3

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

That,

- it is essential to take measurements of length in order to decide on the size of an object.
- there may be various measurements of length associated with the same object.
- various instruments are used to measure lengths of objects.
- various strategies can be employed to obtain measurements of length.
- a thread or a measuring tape can be used to measure the length of circular objects.
- the standard unit of measuring length is meter.
- kilometer is the multiple whereas centimeter and millimeter are sub-multiples of the standard unit.
- a length of an object is described in terms of standard unit or its multiple or the sub-multiples.

(45 minutes)

Criteria for assessment and evaluation

- Names standard and sub-units of measuring length.
- Accepts that measurements of length are useful in describing an object.
- Measures various lengths following suitable methods.
- Acts harmoniously with others.
- Seeks alternative solutions in problematic situations.

Annex 2.1.1

Instructions for group exploration

- You are assigned to obtain measurements of length related to a set of material/objects given below.
 - measurements of some stationery
 - measurements of some instruments
 - measurements of some round objects
- Select materials/objects and instruments to make relevant measurements and other materials from the common table.
- Lead a discussion on the measurements such as length, breadth, thickness and height which are necessary to describe the material/objects and how those measurements are obtained.
- Take measurements of relevant materials/objects assigned to you.
- Be prepared to present your findings to the class.

Annex 1.3.2

Instructions to set up the common table

- Place the following material on the table in order to obtain measurements.
 - Three no's meter rulers
 - Three no's foot rulers
 - Three no's measuring tape
 - Three pieces of thin thread of about one meter in length
- Place three sets of material given below on the table seperately.
 - Set I
 - A few newspapers
 - Hundred no's of thin paper strip with sharp edges
 - A rail of stapler pins
 - An envelope
 - Set II
 - Ten no's hacksaw blades
 - Ten no's pins
 - A pair of scissors
 - An envelope
 - Set III
 - A few mustard seeds
 - A coconut
 - One egg
 - An empty jam bottle
- Demy sheets and marker pens

Competency 2.0 : Examines components in the environment quantitatively.

Competency level 2.2 : Uses measurements of mass to describe materials in the environment where appropriate.

Activity 2.2 : Let's assume first and measure mass

Time : 120 minutes

Quality inputs :

- The set of materials and the balance given in annex 2.2.1
- Three copies of instructions for exploration given in annex 2.2.2.

- A triple beam balance, a platform balance and a compression balance placed on a common table.
- Demy sheets and marker pens

Teaching-learning process :

Step 2.2.1 :

- Display the prepared balance to the class.
- Call forward three students.
- Advice them to fill up the uncut polythene tube with air and leave the cut polythene tube without filling air and to tie them at the bottom using thread.
- Set the balance at equilibrium by adding light, but clearly visible seeds like coriander to the cut polythene tube.
- Add dry sand or water to the polythene tube which was filled by air, and set the balance at equilibrium by adding arbitrary weights to the other tube.
- Lead a discussion to highlight the following points.

That,

- solids, liquids and gases have a mass.
- balances can be set up in order to measure the mass.
- mass of materials can be stated using arbitrary units.
- mass of a particular object can be measured as multiples of the mass of 'Madatiya' or paddy seeds can be considered as an example of arbitrary unit usage.
- accuracy is low when the masses are described in arbitrary units.
- there are standard units to describe the mass.
- Kilogramme(kg) is the standard unit to measure mass.
- there are standard instruments to measure mass.

(15 minutes)

Step 2.2.2 :

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration.

- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 2.2.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

- That,
- there is a spring which pulls down vertically in the spring balance.
 - the spring pulls downwards when a mass is attached.
 - a reading is recorded according to the extent to which the spring is pulled down
 - there is a spring which compresses vertically downwards in the compression balance.
 - the spring compresses when a mass is placed on the balance.
 - a reading is recorded according the extent to which the spring is compressed.
 - there are three horizontal beams in triple beam balance.
 - multiples of 1g, 10g and 100 g are marked in the beams in front, middle and back respectively.
 - the balance is set at equilibrium and the readings are obtained by adjusting the weights placed on the beams.
 - among the measuring instruments mentioned above, a measurement of an accuracy up to 1 gram can be obtained by the triple beam balance.
 - there are objects with small masses that cannot directly be measured by using spring balance, compression balance, triple beam balance and pan balance.
 - the mass of a very small object can be determined by

measuring the mass of a large number of objects with very small masses.

- fine instruments such as chemical balance, electronic balance etc, have been developed to measure light masses.
- a mass of an object is stated as standard unit or sub-units.
- the standard units or sub-units should be selected according to the magnitude of the mass stated.
- when a mass is stated, the value is written as a number, then a space is kept and the standard symbol should be written at the end.

Eg:- five kilograms → 5 kg
hundred grams → 100 g
twelve milligrams → 12 mg

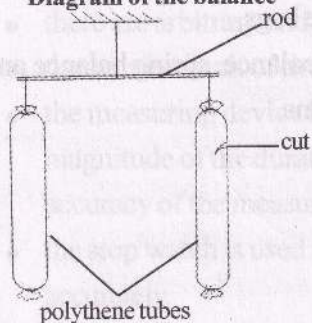
(45 minutes)

Criteria for assessment and evaluation

- Describes how standard and sub-units of expressing mass can be used.
- Accepts that it is necessary to use the standard unit or sub-units in order to express mass of an object meaningfully.
- Uses the instruments of measuring mass accurately.
- Selects appropriate instruments for the purpose.
- Offers alternative solutions to a particular problem.

Annex 2.2.1

Diagram of the balance



- Threads
- Water, sand and coriander seeds

Instructions for group exploration

- Focus your attention to the set of materials provided to your group.
 - Green gram, lime and coconut
 - A button, a two rupee coin and a ceramic plate
 - A half sheet, a bristol board and ceramic tile
- You are assigned to determine the mass of one unit of each material seperately.
- Select the relevant set and other materials from the common table.
- Identify the measuring instruments placed on the common table.
- Record the minimum and maximum masses that can be measured by each balance.
- Record and note down the estimated mass of each object.
- Discuss suitable methods for measuring mass of the lightest object.
- Measure and note down the mass of each object provided by using appropriate methods.
- Compare the estimated and determined masses of each object.
- Be prepared to present your findings to the class.

Instructions to set up the common table

- Prepare a common table which include the following.
 - A bag containing 100 g of green gram, a lime and a coconut
 - A bag containing 25 No's shirt buttons, a two rupee coin and a ceramic plate.
 - A bag containing 40 No's half sheets, a bristol board and a ceramic tile.
 - A few light weight polythene bags.
 - A triple beam balance, pan balance, spring balance and a compression balance.
 - Demy sheets and marker pens.

Competency 2.0 : Examines components in the environment quantitatively.

Competency level 2.3 : Uses measurements of time to describe phenomena in the environment where appropriate.

Activity 2.3 : Let's connect incidents with time.

Time : 120 minutes

Quality inputs :

- The article 'On a River Bank' given in annex 2.3.1
- Four copies of instructions for exploration given in annex 2.3.2.
- Common table prepared using the materials given in annex 2.3.3.

Teaching-learning process :

Step 2.2.1 :

- Present the article 'On a River Bank' to the class by a student.
- Inquire from the students about the quantities to be measured, the units and the instruments used to measure those quantities related to the phenomena described in the article.
- Lead a discussion to highlight the following points.

That,

- the phenomena observed by Udeshika can be described using measurements of length and time.
- there are arbitrary and standard units to measure time.
- the standard unit of time is second.
- the measuring device has to be determined by the magnitude of the duration of time and the expected accuracy of the measurement.
- the stop watch is used to measure small time durations accurately.
- even an ordinary clock can be used for the accurate measurement of various time durations.

(15 minutes)

Step 2.2.2 :

- Divide the class into four groups.
- Provide the groups with copies of instructions for exploration.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

- Step 2.2.3 :**
- Get each group to present their findings to the class.
 - Give the first opportunity to the respective group to elaborate on the presentation.
 - Get other groups to propose constructive suggestions.
 - Elaborate highlighting the following points.

That,

- there is a difference in time taken by different people to run the same distance.
- the average speed of the runner is represented by the distance travelled in a unit time.
- the speed of a runner can vary at different intervals during the run.
- the time taken for each and every oscillation of an object suspended from a light thin string is equal.
- the time taken for an ascillation varies according to the length of the string.
- the time taken to slide an object through a particular distance along an inclined plane vary according to the degree of inclination.
- the time taken for an object to travel the same distance through water and air are different.
- the time taken for a phenomenon to occur can be changed by manipulating the factors pertaining to it.

(45 minutes)

Criteria for assessment and evaluation

- Names the standard units and its multiples as well as the instruments to measure time.
- Accepts that it is necessary to use the measures of time to describe certain phenomena.
- Uses the instruments of measuring time accurately.
- Examines the effect by manipulating the variables.
- Arrives at conclusions through experiments an observations.

Annex 2.3.1

On a River Bank

Udeshika was seated on an expanse of a rock besides the river bank reminding of the group exploration which was done under the guidance of the teacher on the phenomena in the environment. While she was sight seeing, her attention was focussed towards the following events.

- Two young men swimming on a race towards the other side of the river bank.

- The sight of a woman washing clothes in the opposite river bank by dashing against a rock and hearing the sound.
- Variation of length of the shadow produced by the pole in which the canoe was tied.
- A child swinging to and fro on a vine dropping down from a tree besides the river bank.
- Some flower petals floating down the river.
- Falling of a fruit from an *Avicennia* (kerala) tree to the water.

Udeshika came across a problem as how to describe the phenomena observed above to another person clearly.

Annex 2.3.2

Instructions for group exploration

- Focus your attention to the phenomenon assigned to your group below.
 - A few students running a race.
 - Oscillation of a small object suspended by a light thread.
 - Rolling of a spherical object down an inclined plane/sliding of a smooth ring down a wire tied at an inclination.
 - Falling of an object through a liquid filled in long polythene tube.
- Discuss about the measurements to be taken in order to describe the phenomena assigned to you.
- Proceed to your work station and design the activity.
- Take the measurements necessary to describe the phenomena assigned to your group.
- Make various changes in the phenomenon assigned to your group and measure the time taken.
- Be prepared to present your findings to the class.

Annex 2.3.3

Instructions to set up the workstations

- Prepare four workstations with the following materials and instruments .
- **Workstation I**
 - A stop watch or a clock which can measure hours, minutes and seconds.
 - A measuring tape which can measure a distance of 50 m or more/ a graduated rope
 - Demy sheets and marker pens.
- **Workstation II**
 - A stop watch or a clock which can measure hours, minutes and seconds.
 - Twine thread
 - A small object which can be tied to a thread
 - Demy sheets and marker pens.
- **Workstation III**
 - A stop watch or a clock which can measure hours, minutes and seconds.
 - Thin wire about 10 m in length/a railing and a glass marble
 - Demy sheets and marker pens.
- **Workstation IV**
 - A stop watch or a clock which can measure hours, minutes and seconds.
 - A polythene tube of about 2 m in length to which water can be filled , /a railing and a glass marble
 - Various small objects which sink in water
 - Demy sheets and marker pens.

Competency 2.0 : Examines components in the environment quantitatively.

Competency level 2.4 : Uses measurements of temperature to describe phenomena in the environment where appropriate.

Activity 2.4 : Let's measure temperature and seek information.

Time : 120 minutes

- Quality inputs :**
- The set up prepared according to the diagram given in annex 2.4.1
 - Three copies of instructions for exploration given in annex 2.4.2.
 - Common table prepared according to the instructions given in annex 2.4.3.

Teaching-learning process :

- Step 2.4.1 :**
- Present the set up to the class.
 - Provide opportunity for a few students to take the reading in the thermometer.
 - Lead a discussion to highlight the following points.

That,

- the thermometer has been set up to measure the temperature of the water in the beaker.
- it is essential to immerse the bulb of the thermometer in the water.
- the thermometer should not touch the bottom or sides of the beaker when dipping.
- the readings should be taken by keeping the eye and the meniscus of the liquid in the thermometer at a horizontal line.
- the thermometer should not be taken away when reading the temperature.
- there are thermometers to measure a certain range of temperatures.
- the thermometers are graduated in degrees of Centigrade(Celsius) or Farenheit.
- the readings of a thermometer should be expressed as follows;
 - 100^o C
 - 212^o F

(15 minutes)

- Step 2.4.2** :
- Divide the class into four groups.
 - Provide the groups with copies of instructions for exploration.
 - Assign the tasks and engage the groups in exploration.
 - Prepare them to present their findings to the class.
- (60 minutes)

- Step 2.4.3** :
- Get each group to present their findings to the class.
 - Give the first opportunity to the respective group to elaborate on the presentation.
 - Get other groups to propose constructive suggestions.
 - Elaborate highlighting the following points.

That,

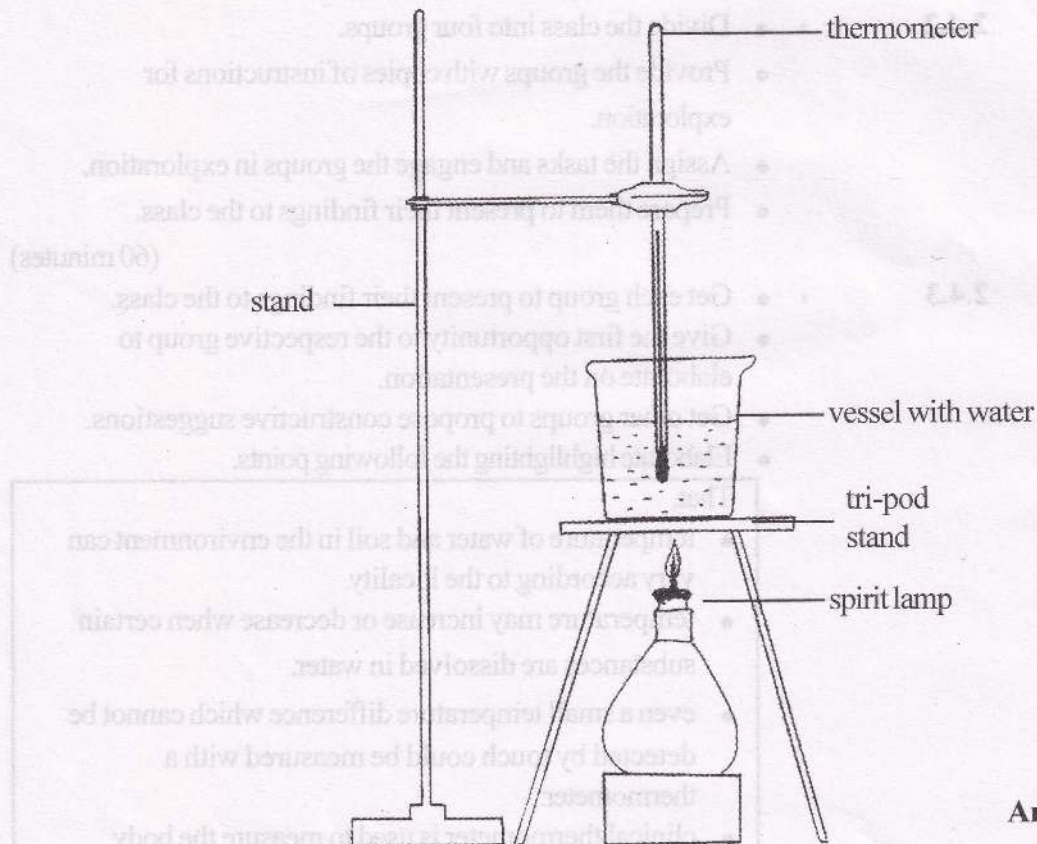
- temperature of water and soil in the environment can vary according to the locality.
- temperature may increase or decrease when certain substances are dissolved in water.
- even a small temperature difference which cannot be detected by touch could be measured with a thermometer.
- clinical thermometer is used to measure the body temperature.
- clinical thermometer is designed accordingly to measure the temperature after it is removed from the body.
- the standard unit of measuring the temperature is

Kelvin (K)

(45 minutes)

Criteria for assessment and evaluation

- Labels the parts of a thermometer and explains the differences between thermometers.
- Accepts the need of measuring temperature to describe certain phenomena of the environment.
- Measures various temperatures by proper manipulation of thermometers.
- Uses instruments with care.
- Exhibits good working habits.



Annex 2.4.2

Instructions for group exploration

- You are assigned to take measurements of temperature of one category from those given below.
 - Body temperatures of different people
 - Temperature of samples of water and soil in different localities.
 - Temperature of water when various substances are dissolved.
- Select a suitable thermometer and other necessary materials/substances from the common table to obtain relevant temperature measurements.
- Draw a labelled diagram of the thermometer you selected.
- Identify the range of measurements and unit relevant to the thermometer.
- Obtain and report the relevant temperature measurements
- Be prepared to present your findings to the class.

Instructions to set up the common table

- Prepare a common table including following materials and instruments .
 - Two ordinary thermometers
 - One clinical thermometer
 - Some water soluble substances like table salt, bicarbonate of soda and washing powder, 50 g each.
 - Beakers and glass rods
 - Water
 - Demy sheets and marker pens

That

- there are various types of organisms in the environment.
- these organisms can be divided into two basic groups as plants and animals.
- there are characteristics common to all organisms whereas characteristics specific for plants and animals.
- accordingly a diversity has been developed in the living world.

(12 minutes)

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(30 minutes)

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points

That

- growth, presence of a distinct life span, feeding, breathing and respiration, excretion, reproduction, sensitivity to the environment, producing energy etc, are characteristics common to both plants and animals.

Competency 3.0 : Investigates animal diversity.

Competency level 3.1 : Investigates similarities and dissimilarities among organisms.

Activity 3.1 : Let's find the similarities and dissimilarities among organisms.

Time : 120 minutes

Quality inputs :

- The picture 'Facts About Organisms' given in annex 3.1.1
- Three copies of instructions for exploration given in annex 3.1.2
- The article 'Listen, Look and Find' given in annex 3.1.3
- Demy sheets and marker pens

Teaching-learning process :

Step 3.1.1 :

- Present the picture to the class.
- Inquire about the diversity among organisms in the picture.
- Lead a discussion to highlight the following points.

That,

- there are various types of organisms in the environment.
- these organisms can be divided to two basic groups as plants and animals.
- there are characteristics common to all organisms whereas characteristics specific for plants and animals.
- accordingly a diversity has been developed in the living world.

(15 minutes)

Step 3.1.2 :

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 3.1.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

That,

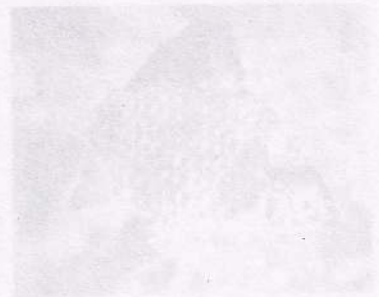
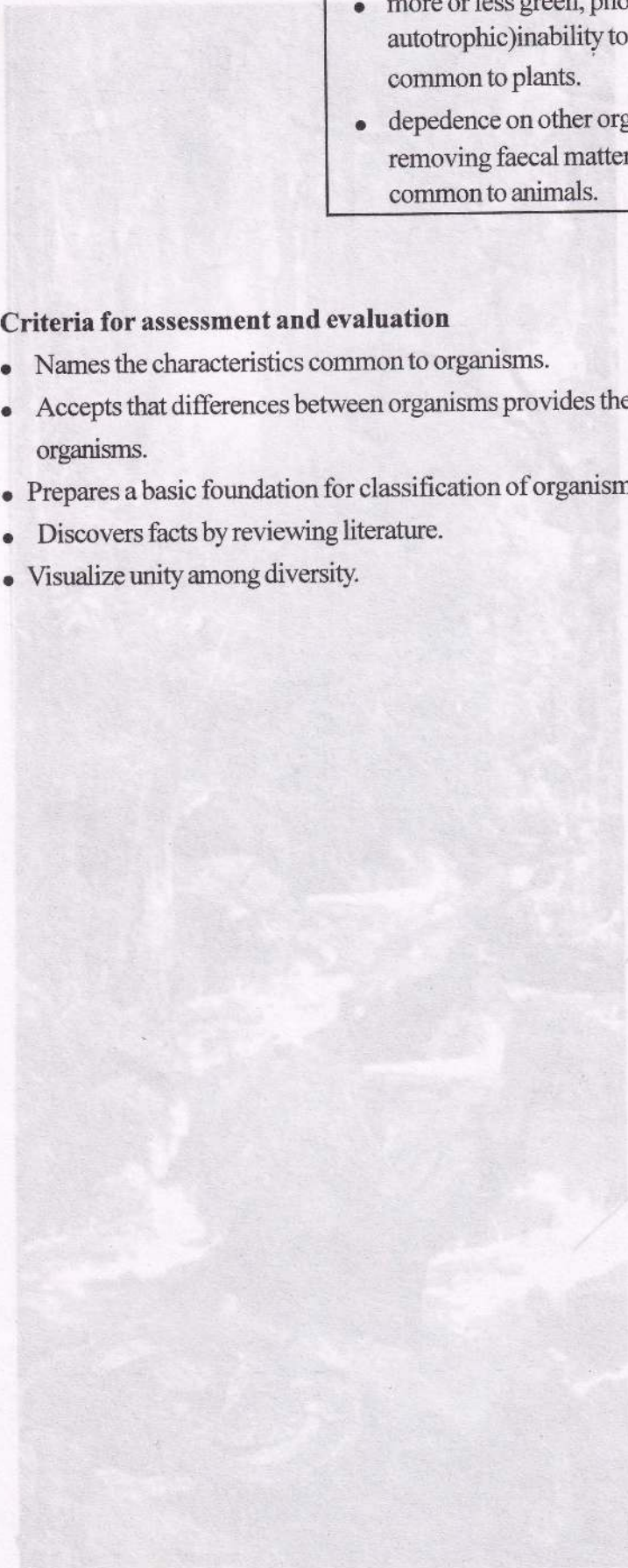
- growth, presence of a distinct life span, feeding, breathing and respiration, excretion, reproduction, sensitivity to the environment, producing energy etc, are characteristics common to both plants and animals.

- more or less green, photosynthetic(release Oxygen, autotrophic)inability to move are the characteristics common to plants.
- depedence on other organisms for feeding, movement, removing faecal matter and urine are the characteristics common to animals.

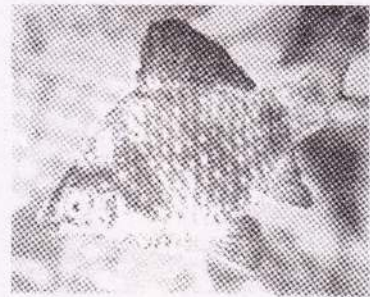
(45 minutes)

Criteria for assessment and evaluation

- Names the characteristics common to organisms.
- Accepts that differences between organisms provides the basis for classification of organisms.
- Prepares a basic foundation for classification of organisms.
- Discovers facts by reviewing literature.
- Visualize unity among diversity.



...move are the characteristics
...organisms for feeding movement
...and urine are the characteristics
(45 minutes)





Instructions for group exploration

- Three themes related to organisms are given below.
 - Characteristics common to organisms.
 - Characteristics common to plants.
 - Characteristics common to animals.
- Focus your attention to the theme assigned to your group.
- Collect facts related to your theme by reading the article 'Listen, Look and Find' .
- Record other facts, if any, known to you related to your theme .
- Be prepared to present your findings attractively to the class.

Listen, Look and Find

Now you are quite capable of differentiating living from non-living in the environment. Did you inquire about the special characters which organisms have whereas non-living don't have? All organisms grow. They grow up from infancy to maturity and after completeing the life span they die. Just imagine, not only plants but animals too have to go through this fate. That is why plants and animals are identified as living.

there are a lot of other characteristics in living things. "Feeding" is one such character. Plants and animals take food. Plants produce food on their own and utilize. The presence of a green pigment in plants assist in this regard. The process of food production is termed as 'Phtosynthesis'. But animals depend on plants or other animals for food rather than preparing food on their own. Therefore, plants are called producers whereas animals are called consumers.

All organisms breath. They take oxygen into their bodies and release carbondioxide. This process occurs in plants as well as animals. It is easy for us to observe animals breathing but gas exchange in plants cannot be observed that much easily.

The release of various materials from the body is also a common to both plants as well as animals. Animals pass away faeces and urine. Carbondioxide and water vapour are released when they respire. Sweat is passed through the skin. In as much carbondioxide and water vapour are released when plants respire. Oxygen is released out of the plant during photosynthesis, ie. when plants produce food.

Competency 3.0 : Investigates animal diversity.

Competency level 3.2 : Investigates animal diversity in relation to the environment they live in.

Activity 3.2 : Let's find the similarities and dissimilarities among organisms.

Time : 120 minutes

- Quality inputs :**
- The script of the role play given in annexe 3.2.1
 - Four masks to cast the roles of a monkey, a cat, a snake head fish(lula) and an earthworm.
 - Four copies of instructions for exploration given in annexe 3.2.2.
 - Instructions to set up common table given in annexe 3.2.3.

Teaching-learning process :

- Step 3.2.1 :**
- Get four students to perform the role play to the class.
 - Lead a discussion to highlight the following points.

That,

- a variety of organisms live in a range of environments.
- the cat, the snakehead fish(lula), the monkey and the earthworm live in terrestrial, aquatic, arboreal and soil environments respectively.
- some animals cannot live in environments other than the particular environment they live in.

(15 minutes)

- Step 3.2.2 :**
- Divide the class into four groups.
 - Provide the groups with copies of instructions for exploration.
 - Assign the tasks and engage the groups in exploration.
 - Prepare them to present their findings to the class.

(60 minutes)

- Step 3.2.3 :**
- Get each group to present their findings to the class.
 - Give the first opportunity to the respective group to elaborate on the presentation.
 - Get other groups to propose constructive suggestions.
 - Elaborate highlighting the following points.

That,

- animals can be grouped according to the environment they live in as follows;
 - aquatic
 - terrestrial
 - tree dwelling
 - soil dwelling

- if the animals live in water, they are aquatic animals.
- if the animals live in terrestrial environment, they are terrestrial animals.
- if the animals live in trees, they are tree dwelling animals.
- if the animals live in soil, they are soil dwelling animals.
- there are a quite a number of animals that inhabit more than one environment which cannot be grouped as above.
- there is a diversity in animals according to the environment they live in.

(45 minutes)

Criteria for assessment and evaluation

- Names the basic characters of animals living in various environments.
- Accepts that the diversity of animals is due to the adaptations to the environment.
- Determines the environment animals live in by examining the characters.
- Arrives at conclusions by reasoning.
- Uses diagrams as a media of communication.

Annexe 3.2.1

Discussion near a tree

A scene by a pond. The monkey is on a branch of a tree. The cat is on the bank of the pond, whereas earthworm is lying on the soil and the snakehead fish(lula) is swimming in the water.

Cat:- "The monkey and the snakehead fish(lula) have never visited our home. Although, earthworm at least come to our garden. Shall four of us get together to our home one day and play ? It is quite comfortable near the hearth in our kitchen."

Lula:- (laughs loudly) "How can I come out of the water? If I do so I will die. Call monkey and earthworm if you want, or else three of you come to the pond."

Monkey:- (leaps on to another branch) "Lula, don't utter foolish words. If myself and cat fall into the pond, we will drown. Earthworm will creep from water to soil again. Can we breath without air ? Oh! I cannot go any where other than tree tops. If you want, then climb on to the tree.

Earthworm:- (Yawns) "How comfortable it is to be onside the soil ? There is plenty of moisture in the soil. I will die if i'm going to dwell either tree tops or near the fireplaces in the kitchens ."

Cat:- "This will not work anyway. Some live in tree tops, some other in water, another in the soil and I'm on the ground. So, you see, we will never be able to get together and play.

Monkey:- "You just think wisely. All of us cannot live in one particular environment. Each of us have adapted to live in corresponding environments. If you want to play with others how many animals are there in your particular environment? Just as we have kept company for so long, we will meet as usual, have a chat and be happy."

Cat, lula and earthworm :- (smiles in joy, approves) That's true, very good. Monkey is brilliant.

Annex 3.2.2

Instructions for group exploration

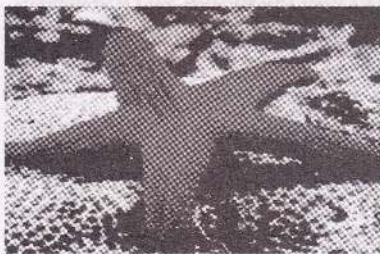
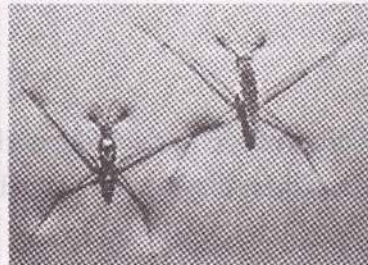
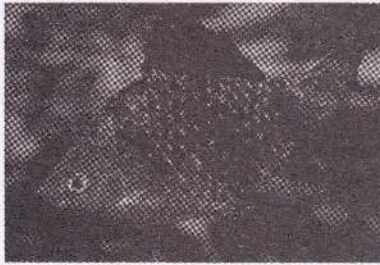
- Focus your attention to the category of animals assigned to your group given below.
 - Aquatic animals
 - Terrestrial animals
 - Tree dwelling animals
 - Soil dwelling animals
- Select instruments needed to observe appropriate animals from the common table.
- Observe as much as possible and draw diagrams of animals found in the field that you are being directed.
- Record special characters of animals which suit them to live in that particular environment.
- Discover through discussion the possibilities of that animals to live in other environments as well.
- Collect the set of pictures and other materials again from the common table.
- Identify the other animals from the set of pictures that could live in the environment you observed.
- Be prepared to present your findings together with the pictures and observations attractively to the class.

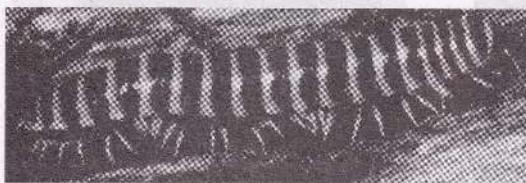
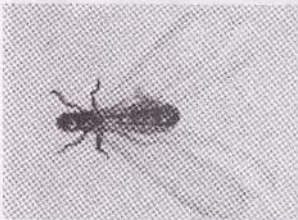
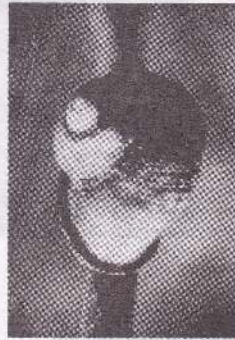
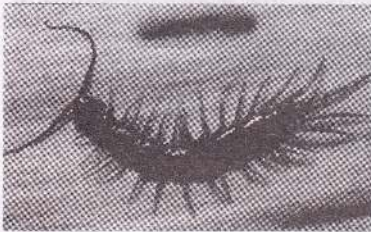
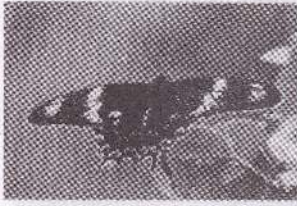
Annexe 3.2.3

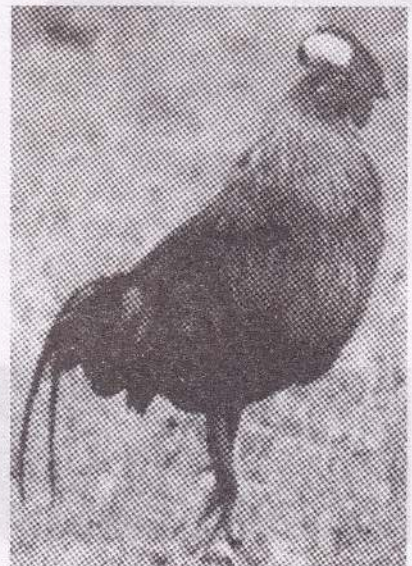
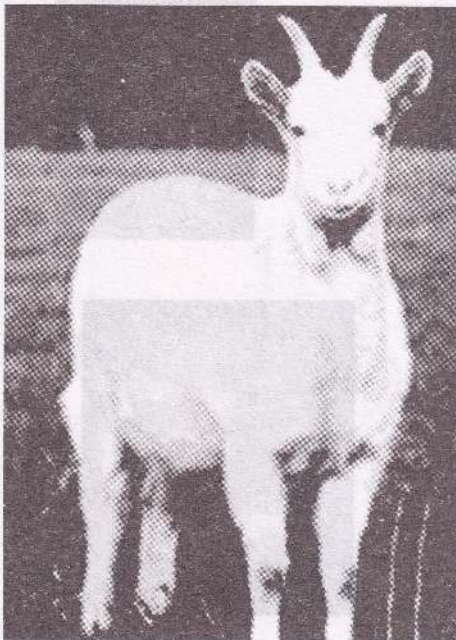
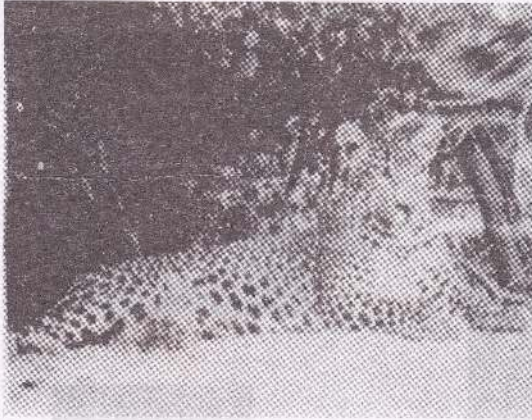
Instructions to set up common table

- Prepare a common table with sufficient amount of materials and instruments to observe animals.
 - Pieces of sticks
 - Hand lenses
 - Binoculars
 - Forks, spades and rakes
 - Demy sheets and marker pens
 - Four sets of pictures indicated in the table given below.

Aquatic	Terrestrial	Tree dwelling	Soil dwelling
Fish	Man	Squirrel	Millipede
Tortoise	Goat	Monkey	Earthworm
Dolphin	Tiger	Parrot	Black ant
Crab	Lizard	Butterfly	Snail
Frog	Jungle fowl	Red ant	Centipede
Star fish	Ostrich	Bat	
Water scater			







Competency 3.0 : Investigates animal diversity.

Competency level 3.3 : Investigates animal diversity in relation to their external characteristics.

Activity 3.3 : Let's examine the features and see the differences.

Time : 120 minutes

Quality inputs :

- Drawings of enlarged geometrical figures given in annexe 3.3.1
- Four copies of instructions for exploration given in annexe 3.3.2
- Four sets of pictures given in annexe 3.3.3
- Demy sheets and marker pens.

Teaching-learning process :

Step 3.3.1 :

- Present the enlarged drawings of geometric figures to the class.
- Lead a discussion to highlight the following points.

That,

- there is a diversity in the shape, color, symmetry and appendages of geometrical figures.
- animal diversity can be investigated through external features such as color, shape, symmetry and appendages.

(15 minutes)

Step 3.3.2 :

- Divide the class into four groups.
- Provide the groups with copies of instructions for exploration, sets of pictures, demy sheets and marker pens.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 3.3.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

That,

- there are animals of different color.
- skin, hair, feathers and external skeleton can be of different colours.
- bodies of some animals have patterns of different colours.
- the colours of animals can be helpful in protection against predators as well as to catch prey.
- there are animals of different shapes.

- the shape of the body helps in movement and protection against enemies.
- streamlined shape of the body is helpful in swimming in water and flying in the air.
- there are symmetrical as well as asymmetrical animals.
- symmetry is helpful in maintaining the balance in movement.
- there are animals with radial or bilateral symmetry in the environment.
- the parts involved in performing behaviour are named as appendages.
- appendages in the body are important in fulfilling the needs such as movement, maintaining the sensitivity to the external environment, feeding

(45 minutes)

Criteria for assessment and evaluation

- Names the animals and describes the external features.
- Accepts that the diversity of external features can be used to differentiate animals.
- Classifies animals on the basis of external features.
- Experiences the beauty of the nature.
- Presents information attractively.

Diagrams

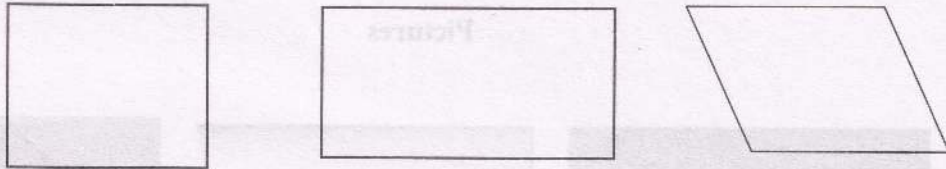
Your group is assigned to investigate on one of the external characters given below, which is responsible for the diversity in animals.

- Colour
- Shape
- Size
- Number
- Arrangement

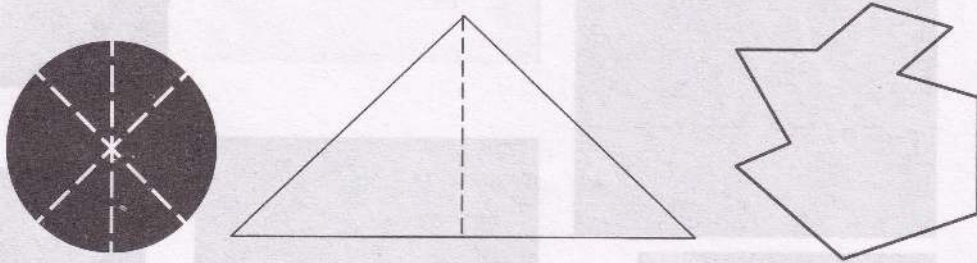
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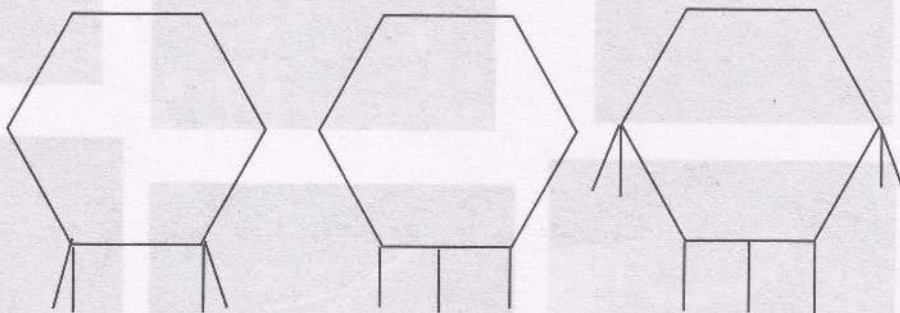
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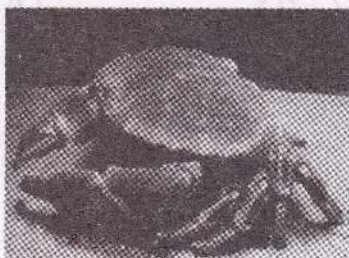
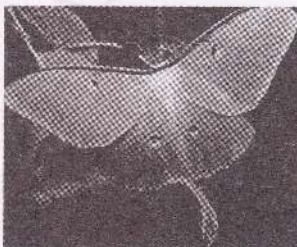
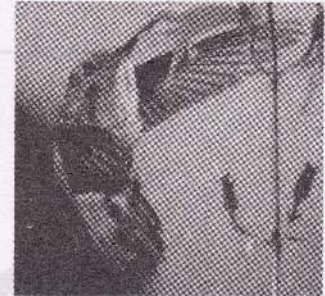
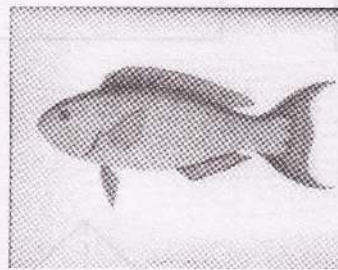


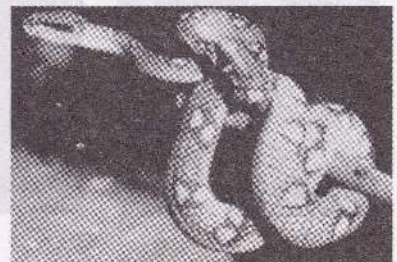
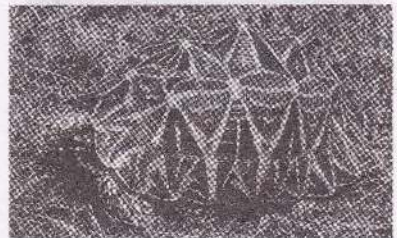
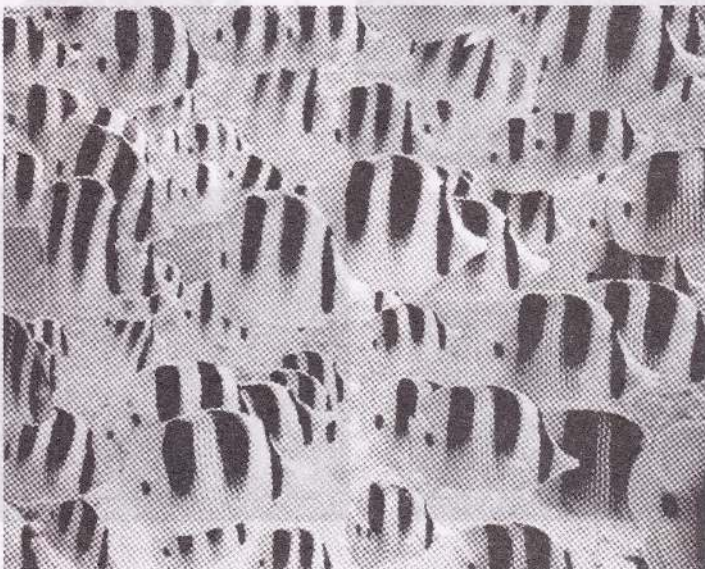
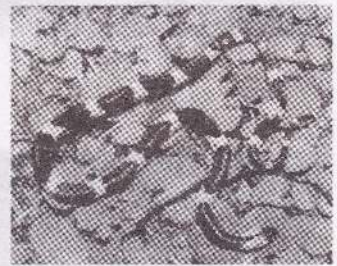
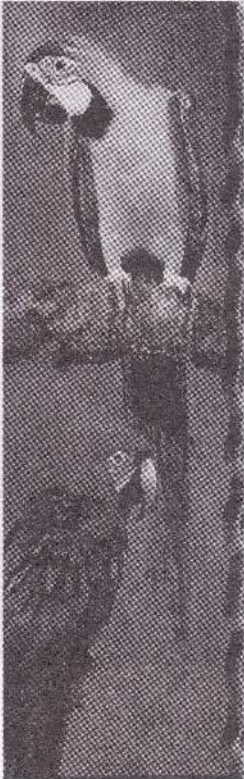
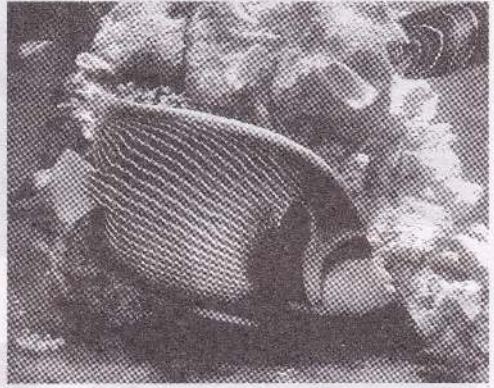
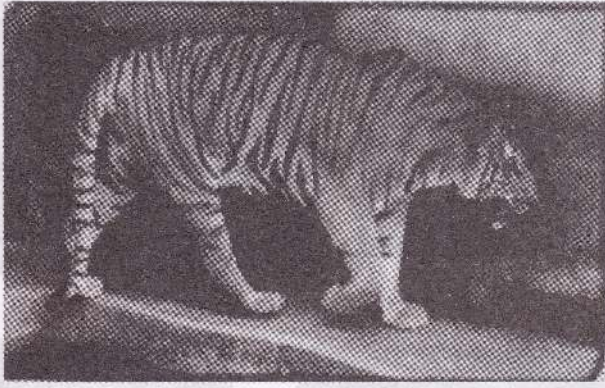
Instructions for group exploration

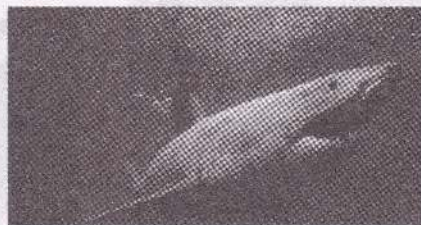
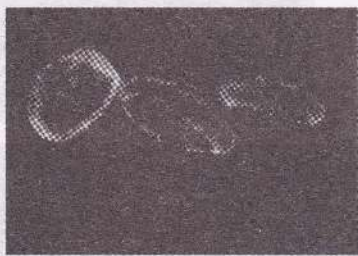
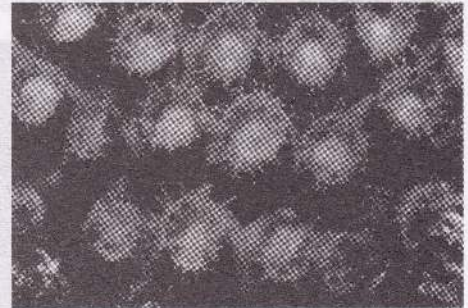
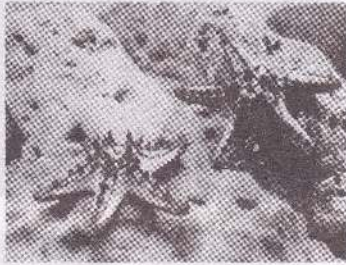
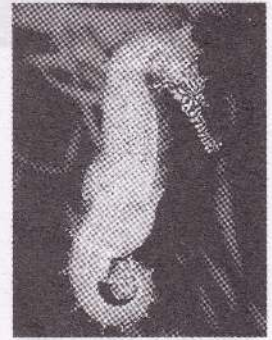
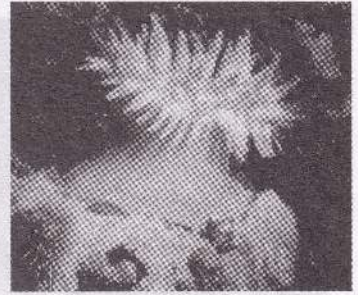
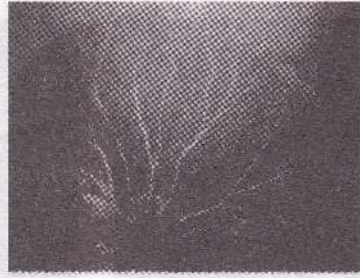
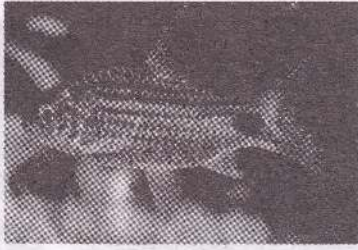
- Your group is assigned to investigate on one of the external characters given below, which is responsible for the diversity in animals .
 - Colour
 - Shape
 - Symmetry
 - Appendages
- Focus your attention to the character assigned to your group.
- Look for the character assigned to your group in the animals in the set of pictures provided.
- Discuss the advantages they have from that character.
- Be prepared to present your findings to the class.

Annex 3.3.3

Pictures







Competency 3.0 : Investigates animal diversity.

Competency level 3.4 : Investigates animal diversity in relation to their type of food.

Activity 3.4 : Let's inquire about food of animals and see the differences.

Time : 120 minutes

Quality inputs :

- Three pictures of herbivorous, carnivorous and omnivorous animals given in annex 3.4.1
- Three copies of instructions for exploration given in annex 3.4.2
- Three sets of pictures given in annex 3.4.3
- Demy sheets and marker pens.

Teaching-learning process :

Step 3.4.1 :

- Present three pictures to the class.
- Inquire about the food eaten by those animals.
- Lead a discussion to highlight the following points.

That,

- some animals feed on plants only.
- some animals feed on animals only.
- some animals feed on both plants and animals only.
- adaptations can be seen in animals according to the nature of food

(15 minutes)

Step 3.4.2 :

- Divide the class into three groups.
- Provide the groups with copies of instructions for exploration, demy sheets and marker pens.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 3.4.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.
- Elaborate highlighting the following points.

That,

- animals like cow, butterfly, humming bird that feed on plants only are termed **herbivores**.
- animals like leopard, spider, cobra, shark that feed on animals only are termed **carnivores**.
- animals like man, crow, cockroach, bear that feed on plants as well as animals are termed **omnivores**.

- some appendages of the animal body are adapted to suit the nature of food they eat.
- appendages of herbivores are adapted to suit the nature of the parts of plant they eat.
- animals feed on plant sap possess a thin tubular appendage named proboscis.
- animals feed on grass and plant leaves have a rough tongue, rough edged flat teeth and long jaws.
- birds feed on cereals have a sharp, short beak.
- the predators who kill animals for food have sharp pointed canine teeth, feet with sharp nails to catch prey easily, high degree of sensitivity for smell and vision to find prey.
- omnivores have a dentition which facilitate in grinding food of plant and animal origin into small pieces.
- in birds which feed on small animals have sharp long or curved beaks as well as feet with sharp nails to catch, to hold prey.
- some omnivores have prominent body characters of carnivores.

(45 minutes)

Criteria for assessment and evaluation

- Names herbivores, carnivores and omnivores with examples.
- Accepts that the appendages have been adapted to suit their food.
- Uses the nature of food as the basis for classifying animals.
- Presents a list of criteria for classification.
- Proceeds from concrete concepts to abstract concepts.



Goat - herbivore



Macaque-omnivore

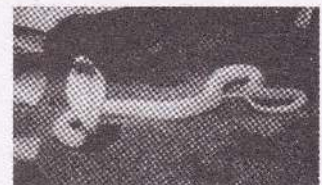
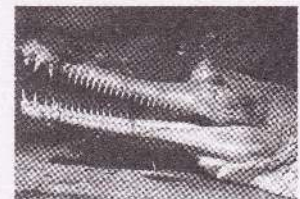
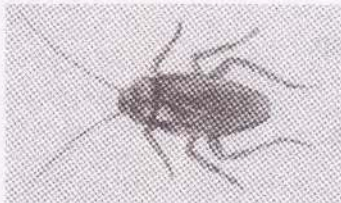
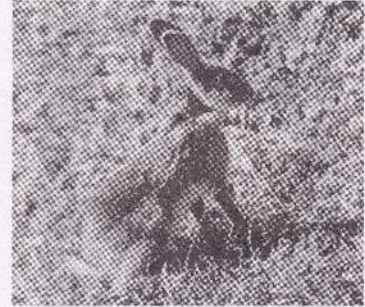
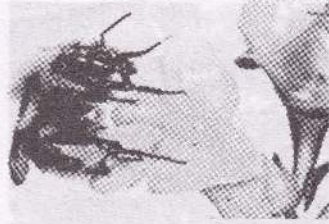
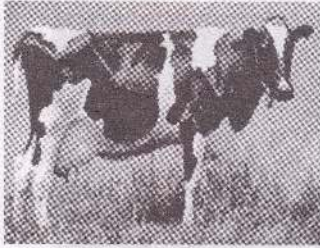


Lion-carnivore

Instructions for group exploration

- Three groups of animals identified according to the type of food they eat are given below,
 - Herbivores
 - Carnivores
 - Omnivores
- Focus your attention to the class of animals assigned to your group.
- Observe the pictures relevant to that group.
- Discuss the adaptations of organs according to the food they eat.
- Be prepared to present your findings to the class.

Animals and the appendages that they use for feeding



Competency 3.0 : Investigates animal diversity.

Competency level 3.5 : Investigates animal diversity in relation to locomotion.

Activity 3.5 : Let's inquire about the way animals move about.

Time : 120 minutes

- Quality inputs :**
- Four copies of instructions for exploration given in annex 3.5.1
 - Four copies of leaflet 'This is how animals move about' containing pictures given in annex 3.5.2
 - Demy sheets and marker pens.

Teaching-learning process :

- Step 3.5.1 :**
- Get some students to immitate various modes of locomotion in animals.
 - Direct other students to identify the animals.
 - Lead a discussion to highlight the following points.

That,

- there are various modes of locomotion in animals.
- walking, flying, crawling and swimming are the chief modes of locomotion in animals.
- there are sedentary animals like sea anemone and oysters which are attached permanently to a substrate.

(15 minutes)

- Step 3.3.2 :**
- Divide the class into four groups.
 - Provide the groups with copies of instructions for exploration, demy sheets and marker pens.
 - Assign the tasks and engage the groups in exploration.
 - Prepare them to present their findings to the class.

(60 minutes)

- Step 3.3.3 :**
- Get each group to present their findings to the class.
 - Give the first opportunity to the respective group to elaborate on the presentation.
 - Get other groups to propose constructive suggestions.
 - Elaborate highlighting the following points.

That,

- animals like man, dog, elephant, move about by walking and running.
- animals like tortoise, crocodile, gecko crawl by placing their feet on the floor.
- serpents move with the aid of their scales and zig-zag movement of their body.

- fishes, water birds, ducks and frogs use swimming as a mode of locomotion.
- birds, some insects, bats like animals move about by flying.
- animals use appedages such as fins, flippers, scales, wings and feet for locomotion.
- streamline shape, scales pointed in the same direction, light flexible bodies to make zig-zag movements, can be stated as examples of special characters that facilitate movement.
- the same animal exhibits various modes of locomotion according to the environment they live.
- animals can be grouped according to their mode of locomotion

(45 minutes)

Criteria for assessment and evaluation

- Names different methods of locomotion.
- Accepts that adaptations for locomotion contributes to the diversity of the animal world.
- Analyzes how the characters of body contributes to facilitate methods of locomotion.
- Uses logic to ensure relationships.
- Visualizes individual differences.

Annex 3.5.1

Instructions for group exploration

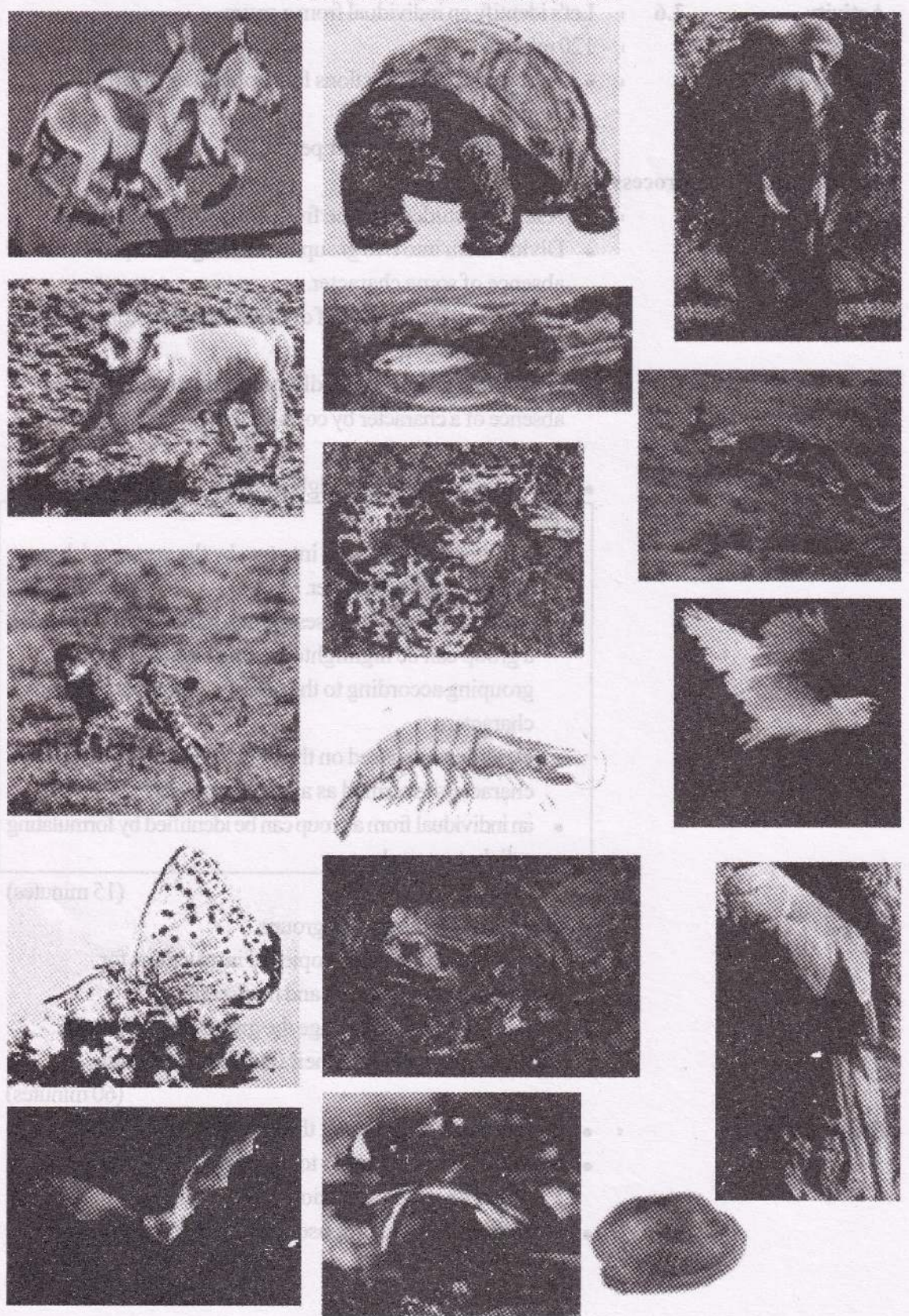
- Focus your attention to the mode of locomotion assigned to your group.
 - Walking and running
 - Flying
 - Swimming
 - Crawling
- Identify the animals that exhibit the relevant mode of locomotion from the leaflet of pictures.
- Discuss the special features of locomotory organs and how they are manipulated during locomotion.

- Examine how the shape and the design of the body helps in locomotion.
- Be prepared for a creative presentation on your findings to the class.

Competency

Annex 3.5.2

This is how animals move about



Competency 3.0 : Investigates animal diversity.

Competency level 3.6 : Classifies animals using suitable criteria and methods.

Activity 3.6 : Let's identify an individual from a group.

Time : 120 minutes

Quality inputs :

- Four copies of instructions for exploration given in annex 3.6.1
- Demy sheets and marker pens.

Teaching-learning process :

Step 3.6.1 :

- Ask a few students to the front of the class.
- Divide them into two groups according to the presence/absence of some character.
- Write down the method of division as a dichotomous key in the blackboard.
- Divide one group repeatedly, according to the presence/absence of a character by considering a different character, each time.
- Lead a discussion to highlight the following points.

That,

- a group can be divided into two by the presence/absence of a particular character.
- specific characters possessed by a particular individual in a group can be highlighted on the basis of repeated grouping according to the presence/absence of various characters.
- classification based on the presence/absence of various characters is termed as a dichotomous key.
- an individual from a group can be identified by formulating a dichotomous key.

(15 minutes)

Step 3.6.2 :

- Divide the class into four groups.
- Provide the groups with copies of instructions for exploration, demy sheets and marker pens.
- Assign the tasks and engage the groups in exploration.
- Prepare them to present their findings to the class.

(60 minutes)

Step 3.6.3 :

- Get each group to present their findings to the class.
- Give the first opportunity to the respective group to elaborate on the presentation.
- Get other groups to propose constructive suggestions.

- Elaborate highlighting the following points.

That,

- aquatic, terrestrial, arboreal, soil habitats and their special characters could be considered when classifying according to the habitat.
- animals can be classified into two major groups as sedentary and capable of moving when classifying according to the mode of locomotion.
- animals capable of moving can be classified as walking, flying, swimming and crawling.
- can also be classified according to their external features such as colour, shape, symmetry and appendages.
- developing a dichotomous key is advantageous in identifying an individual animal from a group.
- a particular dichotomous key is valid only for the group under consideration.

(45 minutes)

Criteria for assessment and evaluation

- Describes the procedures to be followed in preparing a dichotomous index.
- Accepts that a dichotomous key can be used to distinguish an element from a group.
- Develops a dichotomous key to identify an element from a given group.
- Analyzes accurately.
- Follows instructions properly.

Annex 3.6.1

Instructions for group exploration

- Four criteria in classifying animals are given below.
 - External features
 - Habitat
 - Mode of locomotion
 - Nature of food consumed
- Focus your attention on the criterion assigned to your group.
- Develop a dichotomous key considering the given criterion by using twenty animals known to you.
- Be prepared for a creative presentation on your findings to the class.

<ul style="list-style-type: none"> • a particular dichotomous key is valid only for the group • identifying an individual animal from a group • developing a dichotomous key is advantageous in such as colour, shape, symmetry and appendages • can also be classified according to other features • long swimming and diving activities for mammals • animals capable of moving can be classified according to the mode of locomotion • sedentary and capable of moving when classifying • animals can be classified into two major groups according to the habitat • aquatic, terrestrial, arboreal, soil dwellers and their special characters could be considered when classifying 	<p>That</p>
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(45 minutes)

Assessment & Evaluation

- Follows instructions properly
- Analyzes accurately
- Develops a dichotomous key to identify an element from a given group
- Accepts that a dichotomous key can be used to distinguish an element from a group
- Describes the procedure for developing a dichotomous key

Annex 3.6.1

Instructions for group exploration

- Be prepared for a creative presentation on your findings to the class
- Focus your attention on the criterion assigned to your group
- Develop a dichotomous key considering the given criterion by using twenty animals known to you
- Prepare or food consumed
- Mode of locomotion
- Habitat
- External features
- Four criteria in classifying animals are given below

Introduction

Assessment and Evaluation can be identified as two interconnected programs that can be conveniently implemented in the classroom in order to identify the levels of competence achieved by students so as to establish that the students have actualized the expected learning outcomes through the learning-teaching process. If the assessment is implemented properly, it is not difficult for all the students studying in the class to acquire a competency at least proximate to the relevant skill. On the other hand, what evaluation expects is to identify what the levels of competency the students have achieved are.

Teachers involved in assessment can provide their students with guidance of two types. This guidance is commonly called “feedback” and “feed forward”. When the weaknesses and inabilities of students are discovered, it is the task of the teacher to provide feedback in order to overcome their learning difficulties and to provide feed forward to improve their skills when their abilities and strengths are discovered.

It is necessary that students find out as to which competencies in the course they have been able to actualize and the relevant levels for the success of the learning-teaching process. Accordingly, determination of the levels of competency students have achieved through the program of evaluation and the communication of student progress to parents as well as other relevant sections, is expected of the teacher.

This curriculum comprises a student centered, competency-based, activity oriented approach. The transformation role of the teacher and learning through action becomes the core for the purpose of making life meaningful.

An attempt has been made to integrate assessment and evaluation with the learning and teaching of the curriculum implemented through a series of activities developed in the past. When students are involved in exploration under the second step of each activity, the teacher will be able to subject them to assessment and to evaluation when students present their findings and subject same to elaboration.

The teacher is expected to move among the students engaged in exploration, observe the tasks they are involved in, help them to solve in the classroom itself any problems they happen to encounter and provide them facilities and guidance.

Five common criteria are suggested to facilitate the task of assessment and evaluation. Out of these criteria, the first three criteria are based on knowledge, skills and attitudes that combine to develop each competency. The two final criteria support students in the inculcation of two attitudes important in their life. The teacher should make an effort to identify these criteria and the five behavioral changes within the classroom itself while the students are active and strengthen them under assessment and quantify these behaviors under evaluation.

The learning-teaching process can be broadened through the improvement of the evaluation program. For this purpose the teacher has the opportunity of creating several evaluation situations through an activity continuum. The program of assessment can be made meaningful by dividing the activity continuum to several activity clusters to facilitate identification of evaluation points. It is necessary that the evaluation instrument being used with respect to each activity is introduced to the students at the beginning of every activity cluster. It is also necessary in the selection of learning varieties, those activities where student motivation to learn are helped to blossom forth, is selected. Below is a list of the relevant activities.

- Concept maps
- Wall newspapers
- Quizzes
- Question and answer books
- Portfolios
- Exhibitions
- Debates
- Panel discussions
- Seminars
- Impromptu speeches
- Role-play
- Presentation of literature reviews
- Field books/ nature diaries
- Practical tests

The third part of the course guide has been planned in order to introduce the suggested evaluation points and instruments of evaluation selected for this purpose. In this manner, students will be able to involve themselves in learning with interest and motivation while the learning teaching process is further broadened as a result of the evaluation process being implemented between as well as in the course of activities.

Tools for extended learning-teaching process

1.0 Evaluation Stage : Term 1, Instrument 1

2.0 Competency levels covered : 1.1, 1.2 and 1.3

3.0 Subject content covered :

- Components of the environment
- Things found in the environment
- Natural/artificial
- Living/nonliving
- Material/non-material (energy)
- Phenomena in the environment
- Recurrent/non-recurrent
- Autogenic/non-autogenic
- Related to biotic environment/related to abiotic environment

4.0 Nature of Instrument : **Nature diary**

5.0 Objectives	: <ul style="list-style-type: none"> • To develop skills on observation • To enhance the skills of reporting observations as a scientist • To involve in analyzing the reported information using various criteria
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6.0 Instructions for implementation:	
For teachers	: <ul style="list-style-type: none"> • In this tool each student is involved in an individual process. • Advice each student to select a small ecosystem nearby, where regular observations can be made by his/herself with ease. • Direct the students to collect, categorize and analyze their daily observations according to the relevant subject content at the end of each activity. • Inform the students in advance the date at which they have to submit the completed nature diary. • Provide constructive suggestions once or twice by examining their nature diaries before submission.
For students	: <ul style="list-style-type: none"> • Use a 40 pages exercise book for your nature dairy. • Include a sketch map of the selected environment on the first page.

- Observe the selected environment at your convenience daily.
- Special attention could be paid for a selected portion each day.
- Categorize and report your observations attractively according to the criteria used in the relevant activities done in the classroom.
- Submit the your nature diary to the Science teacher on the prescribed date.
- Limit the daily observation report to one page in the diary.

7.0 Evaluation model:

Criteria	Names of the students									
• Reports observations accurately										
• Uses prescribed criteria in the analysis										
• Completeness of the daily observation reports										
• Follows instructions										
• Presents the nature diary attractively										

State the proficiency level as A, B, C and D

- A Very good
- B Good
- C Fair
- D To be developed

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Ambarnani
Tollipalal

Tools for extended learning-teaching process

1.0 Evaluation Stage : Term 1, Instrument 02

2.0 Competency levels covered : 2.1, 2.2, 2.3 and 2.4

3.0 Subject content covered :

- Length, measuring length, units of measuring length, instruments and techniques
- Mass, measuring mass, units of measuring mass, instruments and techniques
- Time, measuring time, units of measuring time, instruments and techniques
- Temperature, measuring temperature, units of measuring temperature, instruments and techniques

4.0 Nature of Instrument : **Impromptu speeches**

5.0 Objectives :

- To upgrade the knowledge and understanding on the measuring instruments and their uses
- To develop presentation skills

6.0 Instructions for implementation:

For teachers :

- Instruct the students to get prepared for an impromptu speech of one minute duration on one of the randomly selected physical quantities such as length, mass, time and temperature.
- Briefly introduce the contents to be included in the speech as the historical background of measuring and presenting the relevant physical quantity, measuring instruments, standard unit in usage, sub-units and multiples used at present.
- Give the opportunity for the students to select the relevant topic five minutes prior to the speech.
- Present one or two simple questions at the end of the speech to test the students' understanding related to the presented facts.

For students :

- Deliver a speech on one of the randomly selected topics related to physical quantities of length, mass, time, and temperature.
- Present additional information apart from the facts which you learnt in the classroom in your speech.

7.0 Evaluation model:

Criteria	Names of the students									
• Including the scientific information adequately										
• Presenting information in an organized manner										
• Utilizing the allotted time completely										
• Exhibiting verbal communication skills such as controlling the tone, correct pronunciation, miming etc.										
• Ability to present appropriate amount of information										

State the proficiency level as A, B, C and D

- A Very good
- B Good
- C Fair
- D To be developed

Tools for extended learning-teaching process

1.0 Evaluation Stage : Term 1, Instrument 03

2.0 Competency levels covered : 3.2, 3.3, 3.4 and 3.5

3.0 Subject content covered :

- Animal diversity based on the environment they live in.
- Animal diversity based on the external features.
- Animal diversity based on the nature of food.
- Animal diversity based on the methods of movement

4.0 Nature of Instrument : **Exhibition of students' creations**

5.0 Objectives :

- To arouse the students' curiosity on animal diversity.
- To motivate the students to develop enthusiasm on the splendour of nature.
- To develop the creative skills
- To direct the students on effective communication through creations.

6.0 Instructions for implementation:

For teachers :

- Assign each group of students to investigate on a particular area of animal diversity.
- Direct the students to study the necessary resources in the creation of individual exhibits.
- Make students aware of the criteria used to evaluate their creations.

For students :

- Discuss among your group and plan to prepare a diverse collection of creations.
- Utilize the special skills of the members of your group to develop attractive creations.

7.0 Evaluation model:

Criteria	Names of the students									
• Quality of the information contained in the creation										
• Raw materials used in developing the creation are cheap/environmental friendly										
• Attractive finish										
• Contribution obtained from the current technology in developing the creation										
• Motivation towards developing attitudes										

State the proficiency level as A, B, C and D

- A Very good
- B Good
- C Fair
- D To be developed

