INNOVATING AN ALTERNATE CURRICULUM THROUGH DESIGN

by Yashna Jhamb

ACKNOWLEDGEMENT

My heartfelt gratitude to

The team of SELCO foundation for their unwavering support and belief in me and my project.

Ms. Santhi Davedu, my industry mentor, for her sound guidance and, for sharing her knowledge and experience in the field of education.

Facilitators of Education Lab for their suggestions and feedback on the education programs running in SELCO Foundation.

Prof. Sanjay Jain, my faculty mentor, for being the strength of this project and especially for enlightening me in how to manage industrial constraints. I also want to thank him for always pushing me to go that extra mile while at the same time keeping in mind my abilities as a design student.

Meghshala and it's team (Ms. Smitha Kumar, Ms. Sucheethra Srinivasan and Ms. Ritika Shah) for working collaboratively on 2 modules of the curriculum.

Abraham Jacobs for helping out with the illustrations and character designing.

My friends and family for their encouragement and motivation.

PREFACE

There are many organizations whose objective is to impart skills and techniques aimed at improving the quality of education of children in society. The main aim is to create a system that focuses on applied knowledge and where teachers play the role of facilitators. This methodology can be visualized and practically implemented by involving design-thinking in education.

Design thinking in its basic form can provide holistic and sustainable solutions in almost all walks of life. In education, it can help produce a system which can act as a balance between facilitators(teachers) and children (students) and hence, build a space where real learning happens. With this ideology I carried out my project at SELCO Foundation.

SELCO foundation, formed in 2010, is a non-profit research and development wing of SELCO India (Solar Electric Light Company, India). It works to uplift the underserved communities in varied sectors.

During my internship at SELCO foundation, I got an opportunity to work in the Education department of the organization, to design a curriculum called Invention and Sustainability Education Curriculum(ISEC) for Grades 6,7 and 8 in the rural areas of Karnataka.

This document is a compilation of the process followed to devise the curriculum and explains the design of 4 modules in detail.

TABLES OF CONTENTS

THE STRUCTURE

SELCO FAMILY

01

SELCO India (1994)

For Profit, Social Enterprise

SELCO India was founded by Dr. Harish Hande with the aim to enhancing the quality of life of under-served households, institutes and livelihoods by providing customized sustainable energy solutions that become assets for the poor through a network of customer energy service centres.

02

SELCO Foundation (2010)

Non Profit. Research and Development wing
This organisation was formed to develop innovative sustainable - social, technical and financial - models that impact energy access, climate change and poverty alleviation. SELCO Foundation uses a holistic ecosystem approach to impact areas of well-being and livelihood.

03

SELCO Incubation (2012)

Entrepreneur Development
This was formed to achieve wider access and faster outreach of energy services, for the energy deprived, across India through entrepreneurship development and incubating potential energy enterprises.

SELCO FOUNDATION

SELCO Foundation is a think-tank that currently encompasses six research and development Labs working on sustainable solutions for under-served communities. Context driven solutions that include social, cultural, financial and environmental aspects are developed with focus on local empowerment, replication and ethical scaling.

SELCO Foundation seeks to holistically facilitate opportunities that result in improved well being and livelihoods for under-served communities through sustainable energy and energy efficient applications.

vv FOUNDATION AIMS TO:

» Systematically identify diverse needs and understand the role of sustainability and energy in under-served communities
» Create and support product-service-systems and sustainable ecosystems that positively impact well-being and livelihoods by focusing on energy-driven solutions
» Foster innovation in the social sector by bridging gaps in process, technology, finance and policy

APPROACH

SELCO Foundation's process begins with a mapping & profiling exercise to understand the needs of the community holistically. It starts with an entry point intervention which would address the most pressing need of the community, collaborating with partners where necessary. In an urban scenario this could be energy, where as in tribal it could be health.

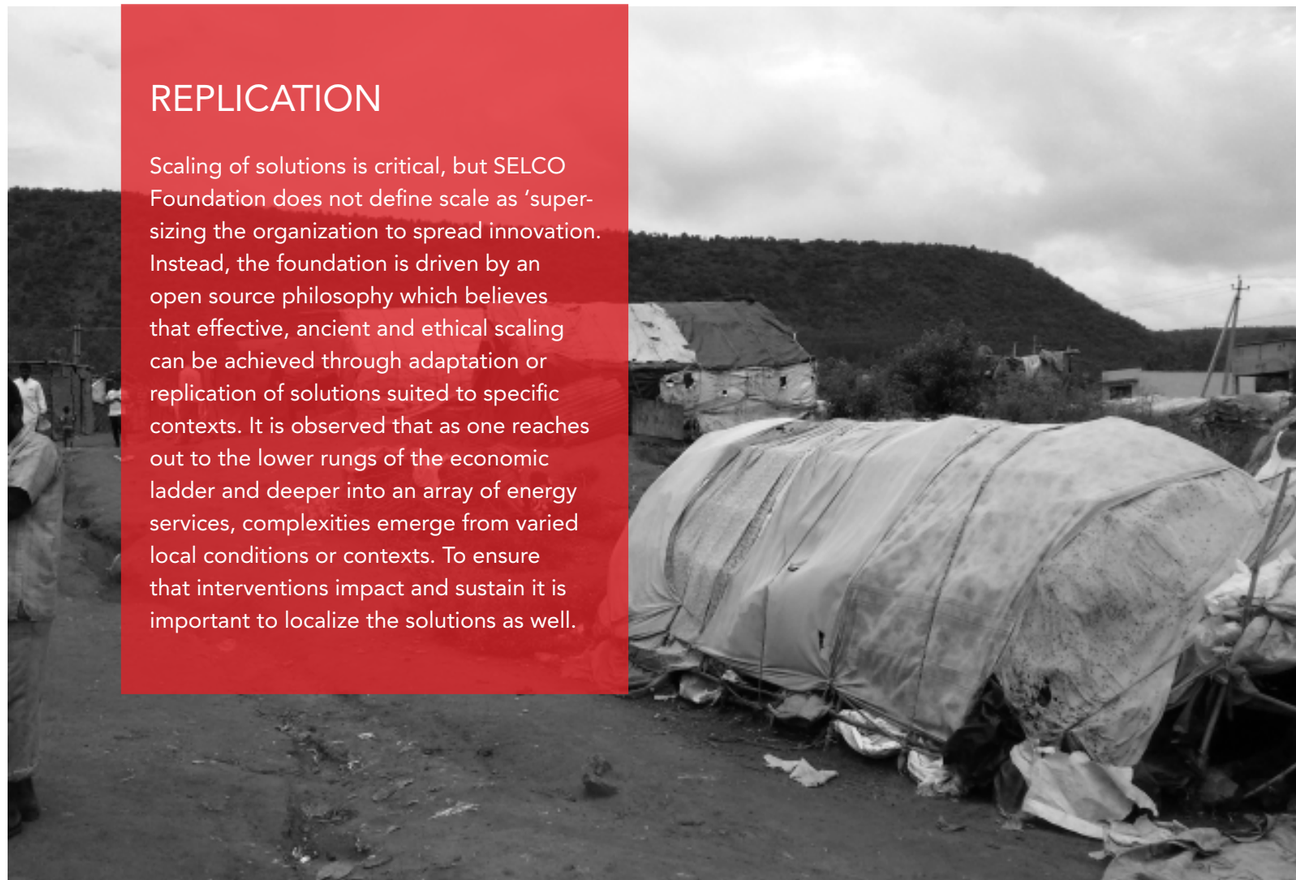
Climate change and poverty is a challenge for many of the developing countries in the world. The issues of the poor cut across boundaries, especially between the countries in the Global South. Many a time the problems might be the same but the solution is always re-invented. This is leading to inefficient ways of capital utilization and slower rate of poverty reduction and hence leading to inefficient ways of capital utilization and slower rate of poverty reduction. SELCO FOUNDATION in aims to solve this problem in a small way.

HOLISTIC

The targeted solutions have to be favourable to local conditions and in line with the needs of the local poor. Therefore based on various factors Influencing the need of an end user-affordability, geography (slum or rural or hilly region), occupation (daily labourers or street vendors or home-based workers), built environment (design of houses), functionality (cooking or reading or livelihoods), usage (portable, stationary, brightness, no. of hours)- solutions have to be designed to suit that context.
The solution is not just focused on one aspect, say technical, but also includes other aspects like market linkages, access to credit, local culture etc. which include financial and social aspects. If all the three are considered and combined while designing a solution it makes it more feasible and long term.

REPLICATION

Scaling of solutions is critical, but SELCO Foundation does not define scale as 'super-sizing the organization to spread innovation. Instead, the foundation is driven by an open source philosophy which believes that effective, ancient and ethical scaling can be achieved through adaptation or replication of solutions suited to specific contexts. It is observed that as one reaches out to the lower rungs of the economic ladder and deeper into an array of energy services, complexities emerge from varied local conditions or contexts. To ensure that interventions impact and sustain it is important to localize the solutions as well.



SELCO Foundation at its core consists of issue based labs that maintain focus on crucial concerns cutting across geographic regions.

01

URBAN LAB

Urban Lab explores inter-linked areas of energy access, water, and built-environment in urban contexts through an interdisciplinary, collaborative approach.

02

RURAL LAB

Issues specific to energy for agriculture, productive utilizations and clean cooking are addressed through an integrated, bottom-up approach in rural settlements.

03

VULNERABILITY LAB

Marginalized communities ridden with extreme insecurity and social and financial exclusion, require alternative approaches to bring about long term, inclusive impact.

04

TRIBAL LAB

The unique needs of remote tribal communities revolve around the lack of basic energy access for health, education and livelihoods.

05

EDUCATION LAB

By combining energy interventions with appropriate content and delivery in rural schools, colleges and vocational institutes, SELCO Foundation seek to improve learning around sustainability, energy and innovation.

06

LIVELIHOOD LAB

Building appropriate ecosystem design to improve under-served livelihoods with efforts on value addition, market linkages, energy efficiency and entrepreneurship.

ECOSYSTEM SUPPORT

POLICY

By representing the practitioner's perspective, SECLO Foundation facilitates better policies and interventions for decentralized energy and social entrepreneurship.

TECHNOLOGY

Implementation of innovative solutions involves modification and customization to improve technology, design and efficiency.`

INCUBATION

Incubation of micro, small and medium sized social entrepreneurs through transfer of innovative mechanisms in technology, finance, skills and ecosystem development.

EDUCATION LAB

SELCO is working on educational programs that hope to inspire a new generation of youth that focuses on solving the problems of the 3 billion+ underserved populations of the world by being:

- Sensitive, inclusive, sustainable
- Innovators with a bottom-up perspective, who can work seamlessly across varying cultural and geographical contexts
- Socially entrepreneurial in spirit The target audience for these programs are students from middle and high schools, vocational training schools and undergraduates.

There are 4 different programmes that are currently taking place in the education lab:
Digital Education programme
Light for Education

01 Invention Education
02 Sustainability Science Lab

Chapter 1

ABOUT SELCO

01 INVENTION EDUCATION

the Lemelson foundation
improving lives through invention

Photograph credits: SELCO Foundation

A pilot program conducted in government schools to sow the seeds of invention in the young minds of children who will eventually be effective contributors to inventions for sustainable villages in India.

OBSERVE • • • • ANALYSE • • • • INVENT

OBJECTIVE

» To give a hands-on experience of ‘science’ by facilitating experiments that strengthen the fundamental principles of science in the minds of the children

» To leverage the children’s innate sense of curiosity to make science interesting and fun

» To target the children when they are young (during schooling) and inspire them to invent.

APPROACH

The whole program is centred around activity based learning.

Hands –on experiments are followed by thought provoking questions on observation, analysis and sustainability.

Facilitators support the children through their individual difficulties in carrying out a particular activity.

Challenge the children to find problems to solve in their own communities by observing their surroundings and exploring the local livelihoods.

Encourage children to persevere towards the solution. Make them follow the ‘try-fail-learn-improve’ model.

Evaluate the solutions with the children for impact on sustainability and opportunities in livelihood.

Topics covered

- Air pressure
- Fluids
- Heat
- Electricity
- Electromagnetism
- Climate change
- Locally available materials
- Agriculture
- Water
- Magnetism

‘Invention Education’ programme impacts 1500 + children, across 11 government schools in Yadgir and Belthangady districts of Karnataka

Yadgir district
- GUPS, Warkanalli
- GUPS, Koyilur
- GUPS, Abbetumkur
- GUPS, Killanakera
- GUPS, Ashnal

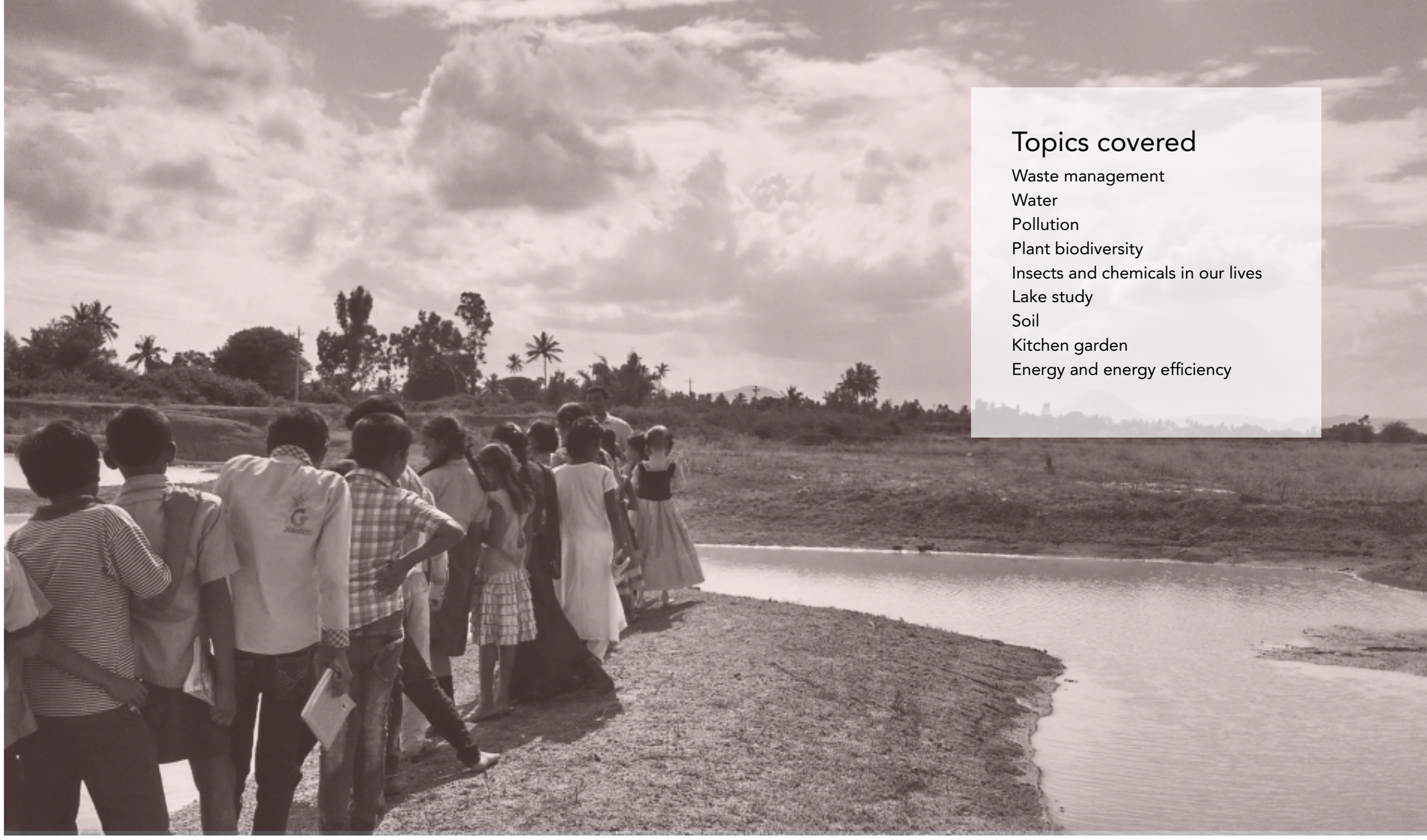
Belthangady district
- GUPS, Thotathadi
- GUPS, Kiloor
- GUPS, Kanyadi-2
- GUPS, Bayalu
- GUPS, Belthangady

It is a program run for grade VI to VIII

02 SUSTAINABILITY SCIENCE LABS

A pilot program introduced in government schools to expose the students to a variety of challenges related to environmental and sustainability issues that are specific to Muthur, a district in Karnataka. The focus is not just on alternative energy solutions, but also on holistic, sustainable living practices.

‘Sustainable Science Labs’ programme in Muthur in Karnataka, impacts 130 students across 2 government schools



Topics covered

Waste management
Water
Pollution
Plant biodiversity
Insects and chemicals in our lives
Lake study
Soil
Kitchen garden
Energy and energy efficiency

OBJECTIVES

» To ensure that students have a clear understanding of the science and technology underlying several issues that have an immediate relevance to their lives

» To get students and teachers to critically think about their immediate environment and how their lifestyles can be made more sustainable

» To increase students' understanding of community issues through carefully chosen projects. Here students will share the knowledge they have gained with the community members to identify and implement locally relevant solutions

APPROACH

The sustainable science lab programme is for students of classes VI to IX of the Government Schools.
Certain themes or topics of relevance to sustainability and the local environment have been chosen.
These themes have been mapped across their school curriculum, so that the activities in the lab complement and enrich what they are required to learn as part of the regular curriculum.
Students gain a rich understanding of the concepts through exploration, hands-on activities, field visits and talking to domain experts.
A facilitator from the community has been appointed to guide students through the process.

BRIEF

AS BOTH, INVENTION EDUCATION CURRICULUM AND SUSTAINABILITY SCIENCE LABS, DO NOT PROVIDE HOLISTIC KNOWLEDGE TO CHILDREN, SELCO CAME UP WITH A SPECIALIZED CURRICULUM CALLED INVENTION AND SUSTAINABILITY EDUCATION CURRICULUM

DESIGNING OF **ISEC**

Chapter 2
BRIEF

INVENTION AND SUSTAINABILITY EDUCATION CURRICULUM

ISEC is learner-centered ,inquiry-based curriculum and emphasizes the use of evidence in constructing explanations. Concepts and skills in Life Sciences, Physics, Chemistry, and Earth Sciences are presented with increasing levels of complexity from one grade level to another (spiral progression), thus paving the way to deeper understanding of the concepts.

VISION

ISEC envisions the creation and development of scientifically and environmentally literate productive members of society who manifest skills as informed decision makers, critical problem solvers, innovators, responsible stewards of nature and effective communicators who work on providing sustainable solutions to the prevailing problems of the society.

APPROACH

ISEC emphasizes nurturing clarity of thought, understanding of concepts associated with various topics and applying to solve real life problems, rather than just memorizing the facts and failing to apply the knowledge in real life. The need for invention in creating sustainable solutions is paramount given the dynamic changes in the society and the new problems arising at every front.

GOALS

The goal is to enable students to develop capabilities in six key areas:
i) Conceptual understanding
ii) Clarity of thought
iii) Identifying the root causes of problems
iv) Thinking about solutions
v) Empathy
vi) Communication and collaboration
vii) Leadership and advocacy for the improvement of the human conditions

SCOPE
OF THE CURRICULUM

Historically, the theory and practice of curriculum has been approached in four possible ways [Smith 2000], corresponding to different purposes that a curriculum can achieve:

i) Curriculum as a body of knowledge to be transmitted
The central themes in the content are identified and justified for inclusion in this curriculum. ISEC goes beyond a syllabus. It not only defines the details of the themes, sub-themes and topics to be taught at each grade, but also indicates the relative importance of different topics, the connections between the topics and the order at which they are to be studied.

ii) Curriculum as an attempt to achieve certain ends in students
This approach is useful for facilitators and students since this approach specifies clear performance outcomes at various stages. This is addressed in ISEC by specifying learning objectives for themes and sub-themes at every grade.

iii) Curriculum as a process
In this model, the curriculum is required to provide the basis for planning a course, and the justification of various choices. These points are addressed in ISEC by providing a framework for the selection of the content and guidelines for sequencing it, and principles for developing teaching-learning strategies. The underlying principles and philosophy on which ISEC is based are also described.

iv) Curriculum as a praxis
Praxis may be described as a form of critical thinking and comprises the combination of reflection and action. Praxis can be viewed as a progression of the following cognitive and physical actions:
• Taking the action
• Considering the impacts of the action
• Analysing the results of the action by reflecting upon it
• Altering and revising conceptions and planning following reflection
• Implement these plans in further actions.
This creates a cycle which can be viewed in terms of educational settings, learners and educational facilitators.

The National Curriculum Framework 2005 has prepared five guiding principles for curriculum development:
» Connecting knowledge to life outside the school
» Ensuring that learning shifts away from rote methods
» Enriching the curriculum so that it goes beyond textbooks
» Making examinations more flexible and integrating them with classroom life
» Nurturing an overriding identity informed by caring concerns within the democratic polity of the country

ISEC WAS TO BE DESIGNED IN-LINE WITH THESE GUIDELINES

ISEC in its current stage, does not address the following points:
It does not yet differentiate implementation in varying contexts, such as for schools in rural and tribal areas in India.
It does not address alternate components such as digital literacy or vocational education.
It attempts to address the praxis approach, such as exploration of practice between peer-teachers or reflection by implementers as to what worked.

THEMES AND TOPICS IN ISEC

- PHYSICAL WORLD
- MATERIAL WORLD
- LIFE SCIENCE
- EARTH SCIENCE
- IMBALANCE

Topics in Physical world:

Magnetism
Electricity
Mechanics
Simple Machines
Energy

Topics in Life Science:

Evolution
Body organization
Habitat
Life processes
Functions
Interaction and interdependencies

Topics in Material world:

Matter
Structure and properties
Reactions
Chemistry in Daily life

Topics in Earth Science:

Soil
Water
Air
Minerals
Astronomical systems

Topics in Imbalance:

Climate Change
Waste management
Depletion Resources
Biodiversity
Calamities

ISEC is meant for 3 levels; depending on the level of understanding the levels can be considered to be for grade 6, 7 and 8

THE 3 FACETS OF ISEC

INVENTION
SUSTAINABILITY
PROBLEM SOLVING

01

INVENTION

Invention refers to the act of creating something. It need not be the creation of a device or an object. It could range from a material invention to a system invention. It could also be the creation of a process or a means to reach out to people.
The main aim is to train students to think like inventors, to work like improvers and become creators. For this, they either need to understand some concepts and principles, or just need a push to apply what they already know.

THE KEY TO REAL INVENTION IS TO LET CHILDREN EXPLORE ALL POSSIBILITIES AND NOT JUST THE ONES WE ARE AWARE OF. ALL THAT THE CHILDREN NEED IS THE RIGHT GUIDANCE.

02

SUSTAINABILITY

Sustainability is the ability to continue a defined behaviour indefinitely. Be it in the field of environment or be it in the socio-economic sense, sustainability is the demand of the day.

ISEC focusses on both the aspects of sustainability and blends it through the curriculum. It makes children understand what a sustainable model of invention could be. It believes in the philosophy that there is no need of inventing something which is not sustainable as it will not last for long.

We are spoiling the environment at a rampant rate and along with us, we need to impart this information to the coming generation as well. They may not be the ones spoiling the environment the most, but they are surely going to learn from the same practices.

These children are the future and if today they are informed about sustainable means and are inspired to intervene in that direction, we can still hope to see a brighter future for the world.

The children we are targeting are exposed to sustainable practices more than the average children. They are aware of the problems in the current scenario as they are the biggest victim of these problems. We need to give them a chance to solve these issues by giving them the extra right exposure.

Photograph credits: SELCO Foundation

ISEC originally had 6 themes. Sustainability was the sixth one. But as sustainability is the baseline of invention, now the modules are designed in such a way that the aspects of sustainability have to be part of all modules.

03

PROBLEM SOLVING

Children are natural problem solvers, and early childhood settings - where children interact with one another and participate in decision making - offer countless opportunities for children to grow in their problem-solving abilities. These important experiences help children learn to value both logical and creative thinking, and to take an active role in their world.

PROBLEM SOLVING APPROACH IN ISEC

Observe and understand the surroundings through the lens of social, economical and environmental perspectives

Identify and assess the issues/ problems in the system in social, economic & environmental perspectives

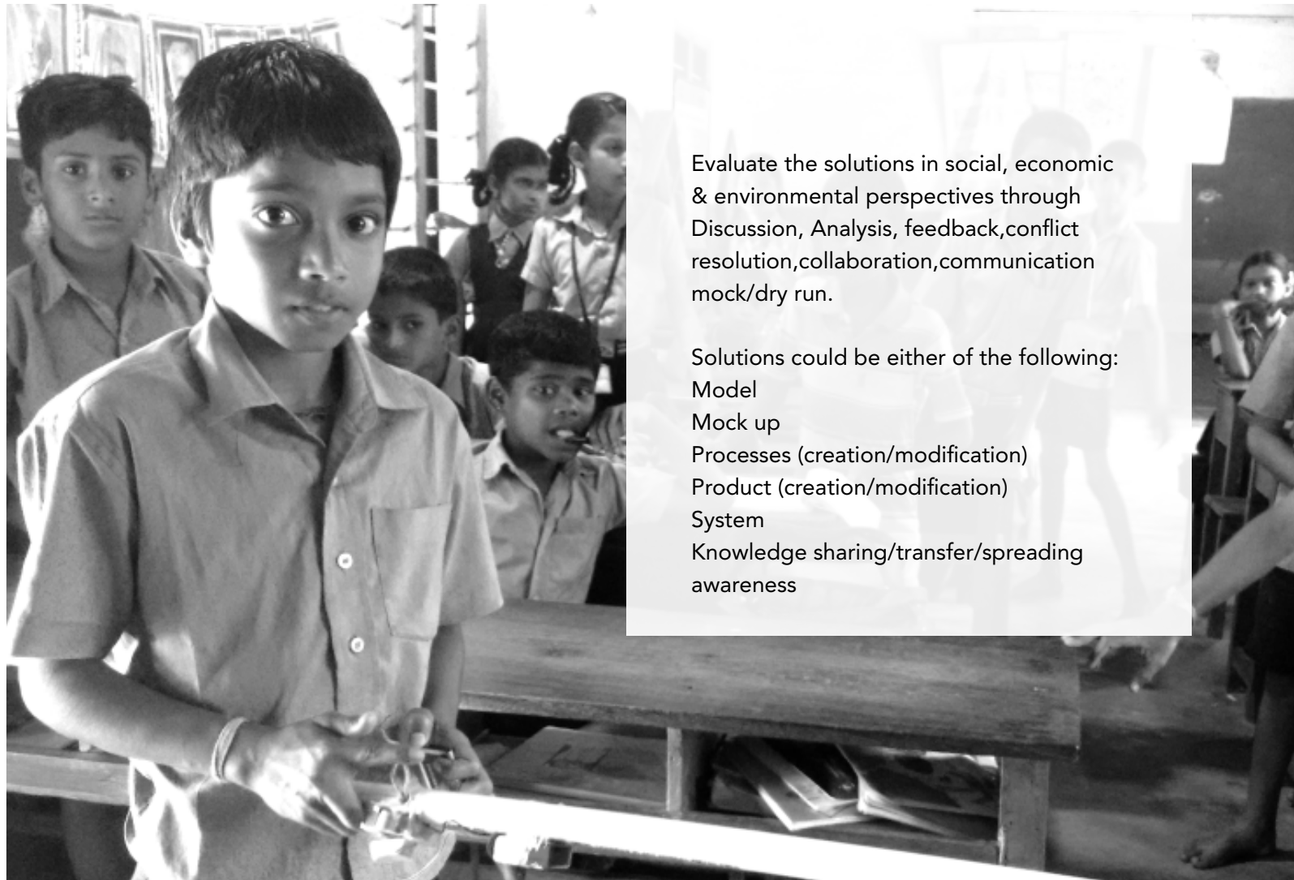
Critically think about what can be done by using various thinking processes such as Meta-cognition (ability to reflect on one's assumptions and thinking for the purposes of deeper understanding and self-evaluation) and Analytical thinking(separating problems or issues into their component parts) to result in:

» Prioritizing the problems
» Deciding a feasible solution
» Ability to develop solutions
» Conceptual understanding
» Reasoning-logical thinking & decision making

Awareness about existing solution / exposure to what a solution can be like
» Generating and selecting from alternatives based on desired outcomes

» Creativity that involves Ideation: Using a wide range of idea creation techniques
» Imagination: Using intellectual inventiveness to generate, discover, and restructure ideas or imagine alternatives
» Innovation implementation: Acting on creative ideas to make a new contribution

Ability to plan & execute solutions keeping in mind the
» Resources
» Stakeholders
» Stages of execution
» Impact analysis
» Adapt & explore sustainable lifestyles



Evaluate the solutions in social, economic & environmental perspectives through Discussion, Analysis, feedback,conflict resolution,collaboration,communication mock/dry run.

Solutions could be either of the following:
Model
Mock up
Processes (creation/modification)
Product (creation/modification)
System
Knowledge sharing/transfer/spreading awareness

PROCESS

This process was defined in the beginning and was followed throughout the time-line

RESEARCH

PRIMARY RESEARCH

SECONDARY RESEARCH

SYSTEM OPPORTUNITIES

IDEATION AND CONCEPTUALIZATION OF EACH SOLUTION BY INVENTING, RE-DESIGNING, REPLICATING

- » Brainstorming to make the system more sustainable
- » Figuring out on how can different stakeholders add to the scalability
- » Collaboration with different organizations which can add to the scalability
- » Coming up with solutions which can make the learning interesting and effective,be it digital or non-digital
- » Making assessments (formative+summative) simpler and effective in such a way that they gives exposure than pressure and provide learning opportunities
- » Integration of all the solutions

SYSTEM DEVELOPMENT OF INDIVIDUAL SOLUTIONS

System of individual solutions should be figured out to make sure they work properly in the bigger system and check its functioning and feasibility

DETAILING

PROTOTYPING AND VALIDATION

RESEARCH

PRIMARY

Education structure

SELCO system

STAKEHOLDERS

Direct users:
Learners (students)
Facilitators

Indirect users:
Teachers
Supporters and funders
Parents

INFRASTRUCTURE

SECONDARY

Learner's Centered Design
Pedagogies
Methodologies
Lesson hooks
Class breakers
Assessments
Children's emotions and behaviour
Parallel organisations
Teaching in India

STATE SYSTEM IN KARNATAKA

DISTRICT

TALUKA

VILLAGE

EDUCATION STRUCTURE

DDPI: Deputy Director of Public Instruction, For every district

BEO: Block education officer for every 3-4 BRPs.

BRP: Block resource person for every 3-4 CRPs.

CRP: Cluster resource person for every subject. He/She handles 8-9 schools in his/her area- same subject

Subject-wise teachers

SYSTEM OF SELCO PROGRAMS IN SCHOOLS

A facilitator is appointed for each school

Classes take place before and after school hours

Permission has been taken by the BEO

PROFILE OF SCHOOLS VISITED

page 49

School category: Upper Primary and Lower secondary

No. of children: 50 and above

Schools by number of teachers: two to five

Schools by infrastructure:

With pucca building
With boundary wall
No proper facility of drinking water
With common toilet

STAKEHOLDERS

Students
Facilitators
Parents and Community members
Teachers
Supporters and funders
SELCO Foundation
Government

STUDENTS

STUDENTS INTERVIEWED: 200 +

GRADE: 6,7,8

REGION: BELTHANGADY AND MUTHUR

STATE: KARNATAKA

Village facts

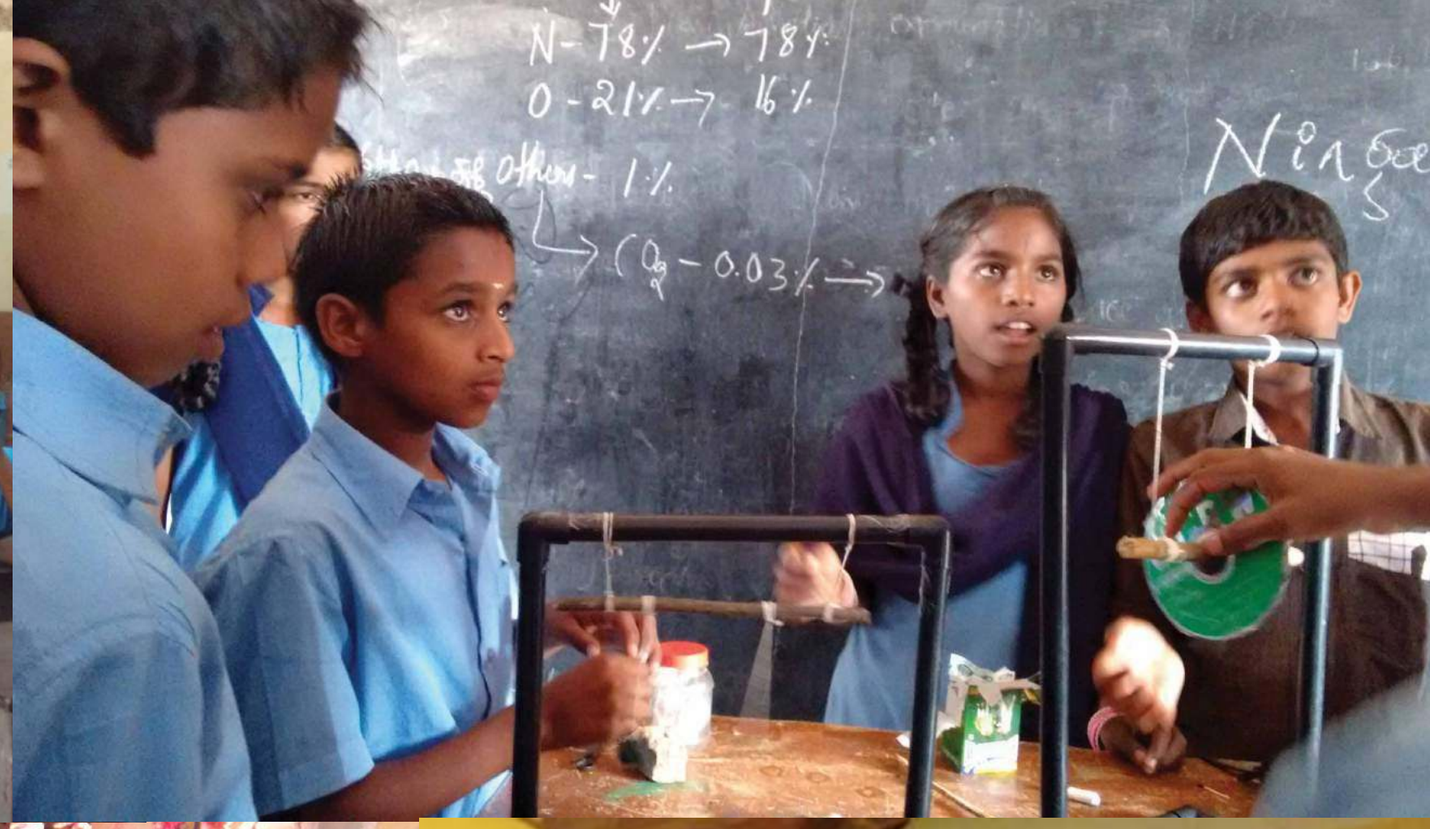
» Agricultural activities happen throughout the year
» Belthangady does not have many livelihood activities
» Muthur has silk worm farming and wine yards
» BEO of these places are not very cooperating

GROUP INTERVIEW AND CLASSES

Demographics
Economic aspects
Cultural aspects
Behaviour
Motivations

INDIVIDUAL INTERVIEW

Behaviour
Motivations


N-78% → 78%
O-21% → 16%
Others - 1%
(Ar - 0.03% →


V-CRAFT

Chapter 3
PRIMARY RESEARCH

Each class had a maximum of 25-30 students and on an average, 20 percent of the students in a class were academically weaker than the rest.

A prominent gender division was observed in classes throughout all the schools. Boys and girls did not interact much with children from the respective opposite gender. Another observation was that the girls of grade 6 were are more confident than those of grades 7 and 8.
Otherwise too, there was an immense difference observed in grade 6 and grade 8 students. For instance, the state board curriculum of grade 8 was much higher than what Invention Education curriculum offered which was a one of the reasons of making them disinterested.

In general, children were extremely intelligent and had an urge to do something but because of the poor manner in which classes were conducted, their mind was not open to grasping new concepts.

ECONOMIC AND CULTURAL ASPECTS

» 85% of the children interviewed have **television at home**. they watch television once in 2 days. They enjoy music, dance, movies, cartoons
» they have **very little computer exposure**
» **No exposure to internet**
» Student **help their parents** in washing clothes washing, sweeping, watering, cooking
» They are fond of outdoor games: **Kabadi and Volleyball**

ACADEMIC STANDING

» Everything is **prompted in classes**. there are very little inputs from the children
» 20% of the class is **not very fluent in reading and writing**
» They **like** experimenting and doing **hands on activities** or making models but when it comes to **conceptual understanding, they are very weak.**

BEHAVIOUR

» Their **mind is not so open** in grasping new concepts
» Students get **bored within class** and start creating a raucous
» They like activities which involve graphics or is interactive
» They **have a lot of physical energy** which is vented in outdoor activities

MOTIVATION

» Children **benefit with outside interaction**
» Hands on activities are the most effective
» **Theory is extremely boring and disconnected**
» The ones not interested in classroom learnings are interested in activities like kitchen garden etc.

INDIVIDUAL INTERVIEWS

Individual interviews were beneficial in understanding the psychology of children belonging to different grades.
In the beginning, they were quiet and shy but slowly as a rapport was built, they started opening up and sharing their experiences.
Grade 8 students had a different attitude towards studying. They cared less about creating and inventing as compared to students from grades 6 and 7.
Some of the concepts of grade 8 students were weak as they could not answer basics of invention education.
The complexity of topics in their regular classes was much higher than what the facilitators' taught.
In grades 6 and 7, the major concern was that some students had brilliant ideas that they wanted to experiment with but needed resources. Both, the students and the facilitators, did not know how to take the ideas forward.

CLASSES

» A common booklet of content is given to both facilitator and children
» Presentation of theory is poor
» Concepts need to be interlinked and which was missing
» Storytelling worked and children were interested
» Value education was missing in the sessions
» Children involvement in the sessions was poor
» Gap between facilitators and children was there because of less frequency of sessions
» Children can't relate to the last session because of the schedule of classes
» Hands on activities are the most effective.
» Theory are extremely boring and children are disconnected
» 60% listen to theory, 40% are not interested
» Assessments are done superficially and children need to be prompted
» Children and mentors, both enjoy field visits

FACILITATORS

Facilitator from the community have been appointed to guide students through the programs. They support the children through their individual difficulties in carrying out activities and teaching concepts.

Age group: 20-25 years
Native place: Karnataka
Languages: English and Kannada

Behaviour

» They try experimenting but need guidance
» Follow conventional form of teaching
» Do no wait for students to reply
» Not so motivated
» Less enthusiasm was observed in delivering the concepts

Beliefs

» Teaching like a regular teacher can only bring the change
» Emotional blackmail can work to control children

Perception

» Only tests can be used as assessments
» Only behaved students can be taught
» Learning by teaching methodology revising concepts

Inputs from the facilitators

» Mind maps help in reducing time
» Session after field visit is not effective and is boring
» Learning by teaching is tried and worked. Helped in fighting stage fear and building confidence

REASONS FOR FACILITATORS TO LEAVE THE TEACHING LINE

'I want a secured job and for that I am willing to take up any other job. I love teaching and spending time with children but I am preparing for law exams to be to apply for a government job. Here you are uncertain because you don't know if your tenure will be extended or not.'
-A facilitator

Behaviour and beliefs
Perception
Actions

All parents want their child to excel and be at the top of their class. But unfortunately, they fail to understand the meaning of real growth of their children and society.

Parents who were interviewed perceived this initiative as a waste of time and did not support it.

PARENTS

TEACHERS

BEHAVIOUR, BELIEFS, ECONOMICS

They are not so interested in the program but don't interfere in the classes.

Only a few school teachers get involved in the activities.

Head Master (of mostly all the schools) is not very supportive and does what the BEO suggests.

They believe that the old-school methodologies are the only way to teach.

They do not share any extra knowledge with the facilitator.

Get very minimum wages. Their main reason of staying is a secured job.

SUPPORTER

ROTARY CLUB

» Outside interaction is beneficial

» Children benefit from the current programmes

» Parents don't understand the programme

» Time is less for each class

Deliverables feedback:

» Theory presentations needs to change

» Activity orientated programs

» A module where everything is told properly

Facilitators feedback:

» Facilitators need to be directed, they can't handle the class themselves

SCHOOL INFRASTRUCTURE

» Mostly all schools had a common corridor for all classrooms with a huge school ground facing the classrooms.

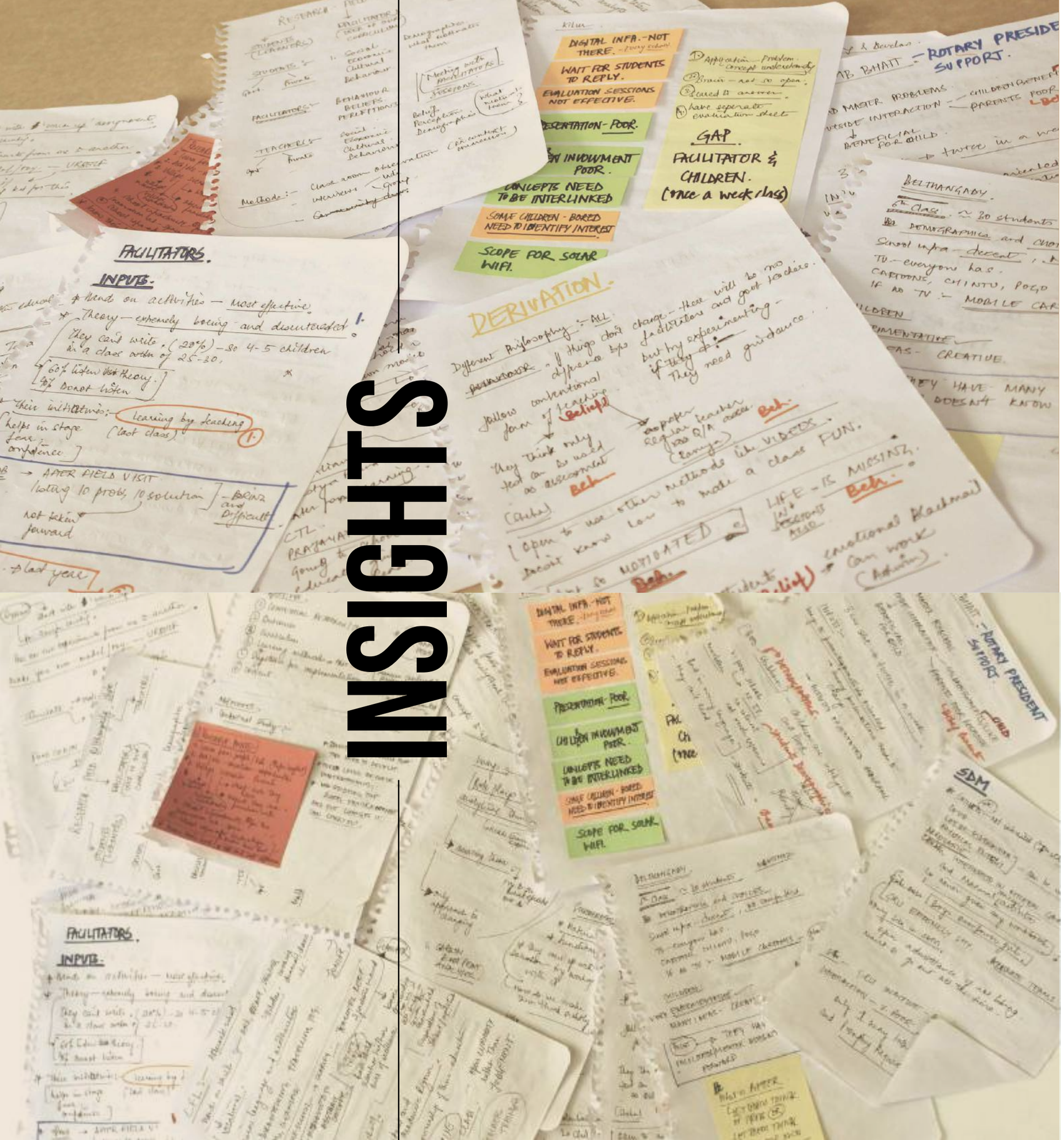
» There is no electricity in any school

» Some schools had SELCO's LFE program running in them

» Digital infrastructure missing in most of the schools and even if it was there, it was spoilt

» Morning prayer, and confidence building activities take place in the grounds.

» Classrooms were equipped with heavy furniture and boards



INSIGHTS

» Outdoor games can also be used as input and they relate to cartoon characters

» Grade 8 students need more attention and complexity in the their sessions

» Sessions need to be made small and effective

» If things don't change there will be no difference between a facilitator and government teacher

» Facilitators need to be less involved in the delivery of content

» Assessment needs to be made formative instead of summative

» Each child should get a fair chance in doing an activity

» It should not be just another class

» Activity and practical oriented program needs to be planned

» Facilitators need to be directed in terms of how to take the ideas forward

» Parents can be motivated if they see their child's name on the top

SECONDARY RESEARCH

LEARNER CENTERED DESIGN

Learner-centered design requires redefining the modelling task, focusing on providing support to learners while they engage in activities that are normally beyond their abilities.

Learner-centered designs focus on developing a learner's understanding, rather than on improving usability issues. Developed through this process should support the learner's needs by giving a variety of tools to use and helping the students through adaptable tasks.

Learner-centered design enables constructive methods to be successfully executed in new and powerful ways. Analysis of these new applications according to three dimensions, engagement, effectiveness, and viability, highlight the implications for future design and learning.

LEARNER CENTERED PRINCIPLES

- Encourage multiple perspective
- Collect and gather ideas from them
- Take their advice
- Learners construct their own plan
- Promote learner's to think
- Let the students decide how they want to go ahead
- Coach learners to expect performance

PEDAGOGIES

Experiential learning
Activity based
Socrates methods - Inquiry learning
Blended Learning
Flipped Classroom
Learning by teaching
Storytelling
Project based
Cooperative learning
Scenario based learning
Contextual learning
Game and game design

EXPERIENTIAL LEARNING

"Learning through reflection on doing"

Experiential learning is a process through which students develop knowledge, skills, and values from direct experiences outside a traditional academic setting.

The learner must be willing to be actively involved in the experience;
The learner must be able to reflect on the experience.
The learner must possess and use analytical skills to conceptualize the experience.
The learner must possess decision making and problem solving skills in order to use the new ideas gained from the experience.

ACT

Concrete experience

APPLY

Reflexive observations

CONCEPTUALIZE

Abstract conceptualization

REFLECT

Practical application

ACTIVITY BASED LEARNING

Activity based learning is a subset of Experiential learning where children of different ages are grouped together in one class and learn at their own pace through teacher-facilitated exercises.
Activity-based learning or ABL describes a range of pedagogical approaches to teaching. Its core premises include the requirement that learning should be based on doing some hands-on experiments and activities. The idea of activity-based learning is rooted in the common notion that children are active learners rather than passive recipients of information. If children are provided the opportunity to explore by their own and provided an optimum learning environment then the learning becomes joyful and long-lasting.
Types of activity base learning

1. Exploratory – gathering knowledge, concept and skill.
2. Constructive - Gathering experience through creative works.
3. Expressional – presentation.

Experiencing:
Watching, observing, comparing, describing, questioning, discussing, investigating, reporting, collecting, selecting, testing, trying, listening, reading, drawing, calculating, imitating, modelling, playing, acting, taking on roles, talking, writing about what one can see, hear, feel, taste, experimenting and imagining.

Memorizing:
Sequencing ordering, finding regularities and patterns, connect with given knowledge, use different modes of perception

Understanding:
Structuring, ordering, classifying, constructing, solving, planning, predicting, transferring, applying knowledge, formulating ones individual understanding, interpreting, summarizing, evaluating, judging, explaining and teaching

OUTCOMES

It enhances creative aspect of experience.
It gives reality for learning.
Uses all available resources.
Provides varied experiences to the students to facilitate the acquisition of knowledge, experience, skills and values.
Builds the student's self-confidence and develops understanding through work in his/her group.
Gets experiences, develop interest, enriches vocabulary and provides stimulus for reading.
Develops happy relationship between students and students, teachers and students.
An activity is said to be the language of the child. A child who lacks in verbal expression can make up through use of ideas in the activity.
Subjects of all kind can be taught through activity.
Social relation provides opportunity to mix with others.

OBJECTIVES

Child centered approach

Provides students to facilitates the acquisition of knowledge, experience, skills and values

Self-confidence

Develops understanding through work

Interest generation

Opportunity to mix with others

Improving social skills

Work cooperatively and collaboratively

PROJECT BASED LEARNING

Project Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an engaging and complex question, problem, or challenge.
5 keys to rigorous problem solving:
Real world connection- authentic problem
Effective learning- through the project
Structured collaboration

Student driven- Teachers become facilitators and students take control – as a facilitator she needs to ask good questions. a facilitator needs to ask good questions and also redirect if necessary

Multifaceted assessment – in between assessment, formative assessments, throughout. Students should be able to assess themselves.

OBJECTIVES

Critical thinking
Problem solving skills

LEARNING OUTCOMES

» Become more engaged, self-directed learners
» Learn more deeply and transfer their learning to new situations
» Improve problem solving and collaborative skills
» Perform as well or better on high skates tests
» Students blossom – they have a voice and a choice
» Can reach ALL students and get them engaged
» It improves learning – learn deeply
» It provides opportunities for students to use technology
» It makes teaching more enjoyable and rewarding

STORYTELLING

Storytelling is an activity that can transfer emotions and feelings and also can boost thinking capacity.

Storytelling is the conveying of events in words, sound and/or images, often by improvisation or embellishment. Stories or narratives have been shared in every culture as a means of entertainment, education, cultural preservation, and instilling moral values.

Story telling is an art that has mental, social and educational benefits on children.
Storytelling is a great activity of learning
Storytelling is the basic training for academic learning

OUTCOMES

Promote a feeling of well-being and relaxation
Increase children's willingness to communicate thoughts and feelings
Encourage active participation
Increase verbal proficiency
Encourage use of imagination and creativity
Encourage cooperation between students
Enhance listening skills
Increase the memory capacity of children
Storytelling introduces lot of new vocabulary to children.
It can enhance the listening skills of children

LEARNING BY TEACHING

This allows pupils and students to prepare and to teach lessons, or parts of lessons

People/students learn better and recall more when they think they will soon need to teach the material to someone else.

Phases:
Preparation at home
Interactions during the lesson
Introduction
First deepening: Gathering information in class
Introduction to the new content
The second deepening: Playing scenes
The third deepening: written homework (text task, interpretation of a place

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OUTCOME

Student work is more motivated, efficient, active and intensive way due to lowered inhibitions and an increased sense of purpose
By eliminating the class division of authoritative teacher and passive audience, an emotive solidarity is obtained.
Students may perform many routine tasks which are otherwise unnecessarily carried out by the instructor
Next to subject-related knowledge students gain important key qualifications like:
Teamwork
Planning abilities
Reliability
Presentation and moderation skills
Self-confidence

COOPERATIVE LEARNING

To perform a structured task or goal in a group!

Cooperative learning is an educational approach which aims to organize classroom activities into academic and social learning experiences.
There is much more to Cooperative Learning than merely arranging students into groups, and it has been described as "structuring positive interdependence.
Unlike individual learning, which can be competitive in nature, students learning cooperatively can capitalize on one another's resources and skills

Advantages

Socialize
Solve problems
Handle conflicts
Team building
Collaborating skills

Structured tasks and goals such that every one learns and participate

COLLABORATE COMMUNICATE LEARN

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Important tools

Face to face interaction(direct interaction)
Individual accountability
Positive interdependence
Group processing

Appropriate use of collaborative skills

Trust building
Leadership
Decision making
Communication
Conflict management

SCENARIO BASED LEARNING

It uses interactive scenarios to support active learning strategies such as problem-based or case-based learning. It normally involves students working their way through a storyline, usually based around an ill-structured or complex problem, which they are required to solve

OBJECTIVE

Students apply their subject knowledge, and critical thinking and problem solving skills in a safe, real-world context.

SBL is often non-linear, and can provide numerous feedback opportunities to students, based on the decisions they make at each stage in the process.

GAME AND GAME DESIGN

Game design is the art of applying design and aesthetics to create a game to facilitate interaction between players for playful, healthful, educational, or simulation purposes. Game design can be applied both to games and, to other interactions, particularly virtual ones

Elements of game design

Abstraction(concept/reality)
Goals
Rules
Conflicts/competition/cooperation
Time
Reward structure
Storytelling
Curve of interest
Action of game
Method – steps, runs etc

CONTEXTUAL LEARNING

Learning takes place when teachers are able to present information in a way that students are able to construct meaning based on their own experiences.

OBJECTIVE

» Emphasizing problem solving
» Recognizing that teaching and learning need to occur in multiple contexts
» Assisting students in learning how to monitor their learning and thereby become self-regulated learners
» Encouraging students to learn from each other
» Employing authentic assessment

OUTCOME

Compatible and effective in the achievement of learning goals

INDUCTIVE METHOD

Inductive instruction makes use of student "noticing". Instead of explaining a given concept and following this explanation with examples, the teacher presents students with many examples showing how the concept is used. The intent is for students to "notice", by way of the examples, how the concept works.

DEDUCTIVE METHOD

A deductive approach to instruction is a more teacher-centered approach. This means that the teacher gives the students a new concept, explains it, and then has the students practice using the concept. For example, when teaching a new grammar concept, the teacher will introduce the concept, explain the rules related to its use, and finally the students will practice using the concept in a variety of different ways.

METHODOLOGIES

Peer instructions
Outdoor games
Puppet shows
Toy making
Nature walks
Physical movement based
Involvement
Memory games
Board games
Interviews
Question boards
Analogies
Reading sessions
Radio clubs
Newsletters
Journal writing
Talking pages
Pictorial Learning
Graphical learning
Audio Visual
Flash cards
Role plays
Audio tapes
Dialogue classes
Converting lessons in songs
Resource book
Scrap box

LESSON HOOK

There should be a lesson hook in the starting of the class which makes the students interested in the subject.

Lesson hooks should also be used in the middle of the class depending on how difficult and new a concept is for the students.

The lesson hook needs to be defined according to the
Course taken
Content of the course
Age group
Prior knowledge about the content

OPTIONS OF LESSON HOOKS AND ACTIVITIES

Show & Tell: Use a prop to explain the concepts

Story: Tell a quick and engaging story.

Analogy: Offer an interesting analogy that touches students' lives.

Media: A picture, or a piece of music, or a brief video

Inventions: Talk about the inventions done in this field and motivate these

Challenge: Offer students a very challenging task and let them try to solve it.

Place objects in a brown bag: Have students reach in and make observations about the contents of the bag

Gallery Walk: Using images or objects, students move from station to station making observations. The goal is for students to come to a conclusion about the objects/images that is related to a particular concept.

Survey: By asking questions and having them step to a side or corner of the room that represents their response.

Prediction: Present a scenario and have students make a prediction (great for probability, statistics and data analysis).

Outdoor visits

Song: Play a song as the students enter the room. Leave it on during the warm-up. Ask students how the song might be related to a given concept. Let them share their ideas before you explain your purpose for doing it

Experiment: Conduct an experiment that illustrates a concept.

Vocabulary connections: Give students a group of words related to the lesson. Make them guess the topic or find the word that doesn't fit in the group.

News: Bring in a newspaper article or online news clip that addresses an area of interest or importance to your students.

Skit/Dress-Up: Give students roles and have them act out a skit.

Layout or arrangement of sitting: Classes can also made interesting by making different classroom arrangements. For example if you are testing/investigating some things then the lesson hook could be a set-up where students feel like scientist and investigators.

Riddles, Brain Teasers, scavenger hunt

Ask a Question: In order to get your students engaged in an upcoming lesson, ask them a question that will interest them and activate prior knowledge. Example: Ask students to recall their favourite movie or favourite story from earlier in the year. Ask students to recall who the story is mostly about and use this as an opening to introduce main character.

Use a book: Using a picture book at the start of the lesson can be an effective strategy to motivate students and provoke interest. Picture books help make learning new concepts more accessible to students by highlighting the concepts in cultural context.

Play a game: Playing a quick game in order to recall prior knowledge can be an effective strategy for getting students engaged in the lesson and prepared to build off prior knowledge.

Tell a story: In order to highlight a concept, a teacher can choose to tell a story that is closely related to the concept.

Use manipulative or models: Teachers can use physical models to prepare students to learn a specific concept or better highlight the critical attributes of new concepts.

ACTIVITIES AND LESSON HOOK SELECTION CRITERIA

» Simplicity of understanding
» Ease of executing
» Material availability
» Interest generation
» The ability to understand the concept with the activity
» Activity should create an urge to know more
» The skill students develop from that

CLASS BREAKERS

Picture prompts
Think breaks
Choral responses
Instructor storytelling
Pass the pointer
Empty outlines
Classroom opinion polls
Total physical response
Hand held response cards
Student polling
Self-assessment of ways of learning
Everyday ethical dilemma
Make them guess – about new sessions
Make it personal
Punctuated lectures- listen, stop, reflect/ write give feedback.
Interest/knowledge skill checklist
Energizers- chants
Shout out exercises

ASSESSMENT

Educational assessment is the process of documenting, usually in measurable terms, knowledge, skill, attitudes, and beliefs. Assessment can focus on the individual learner, the learning community (class, workshop, or other organized group of learners), the institution, or the educational system as a whole (also known as granularity)

The term assessment is generally used to refer to all activities teachers use to help students learn and to gauge student progress.

FEELING OF BEING JUDGED

This is the fear or phobia of being judged unfavourably on the basis of how you perform in an interview, examination, test, or public talk or presentation.

Such situations are unfair – yet they are a necessary part of our society and have been for thousands of years.

They are unfair for a variety of reasons – including the propensity of the interviewer or examiner to respond subjectively rather than objectively.

They are unfair because of the tendency for examination papers to sometimes be worded ambiguously.

They are unfair because they are frequently one-off moments on which a person's future can depend – yet on that particular day we may feel unwell or be below par mentally.

FORMATIVE ASSESSMENT

Formative assessment serves several purposes:
» To provide feedback for teachers to modify subsequent learning activities and experiences;
» To identify group or individual deficiencies;
» To move focus away from achieving grades and onto learning processes, in order to increase self-efficacy and reduce the negative impact of extrinsic motivation;
» To improve students' meta-cognitive awareness of how they learn.

Chapter 3
SECONDARY RESEARCH

CHILDREN'S EMOTIONS

The study of the brain and intensive work in cognitive psychology have resulted in a significant shift in orientation away from the behaviourist principles that once dominated educational thought and practice.
For the behavioural psychologist, the student is considered to be a relatively passive subject, to be manipulated through reinforcement techniques and drill. The cognitive psychologist, by contrast, sees students as active participants in the learning situation, controlling and shaping their own learning processes. In the behaviourist classroom, the students respond to stimuli and reinforcement, whereas in the classroom based on cognitive psychology, the students' own internal motivation drives the learning process. One of the most important principles of cognitive psychology is that information is best learned and retained if it is made meaningful to students.

We use our emotions to tell us what is important to learn and what to remember.
» The brain stores information based on functionality and meaningfulness.
» Emotions drive attention.
» Attention drives learning and memory.
» Repetition is necessary but it requires novelty with regard to instructional design (Which should incorporate all five language processes—observation, listening, speaking, reading, and writing—and utilize a variety of methods and approaches).

PATTERNING

One of the most important points about the brain and learning is the fact that the brain's search for meaning occurs through patterning. The brain looks for patterns as it organizes information according to schematic maps and categories. As young learners in language classes search for meaning in the experiences we provide for them, we must be sure to create complex, meaningful experiences from which they construct their own patterns of understanding.
What we now know about the brain suggests that it resists having meaninglessness imposed on it; facts and skills that are presented in isolation need more practice and rehearsal to be stored.

SOCIAL DIMENSION

Construction of meaning also has a social dimension. The social dimension of games and classroom rituals provides another way in which the brain can attach meaning. Once the students have learned a concept, they can practice it in partners and small groups. The social relationships of partner and small group activities add to the richness of meaning-based experiences for the brain.

Students can practice classroom dialogues with partners, or "read" to each other a memorized story that they have written either individually or as a class activity. Students can do a partner weather report. After a class member has looked out the window and reported on the weather, the other students can tell their partners about the weather outside.

EMOTIONS

Many researchers have described the importance of emotion in the learning process and in the construction of meaning. Emotions and thoughts cannot be separated, and thus emotions have a great effect on all learning. "Emotions drive attention, create meaning, and have their own memory pathways."
Activities have positive emotions associated with them, such as games, songs, rhymes, and lessons involving Movement and physical activity.
Creating a warm emotional climate in which children feel self-confident, free, and highly motivated is equally as important as providing activities that have emotional connections
Story is another vehicle for integrating emotion in instruction.

CHARACTERISTICS OF GRADE 6 STUDENTS

The stage of concrete operations . During these years, the child develops the ability to apply logical thought to concrete problems. Hands-on, concrete experiences help children understand new concepts and ideas. Using language to exchange information becomes much more important than in earlier stages, as children become more social and less egocentric.

Physical

May be careless with clothes, room and body cleanliness
Enjoy physical activities that master specific skills
Enjoy competitive games
Possess high activity level
Enjoy games that allow for comparison of skills
Enjoy games that allow for self-improvement

Social-Emotional

Enjoy small, peer-dominated group discussion
Are anxious to grow up
Starting to make separate girl and boy groups
Extremely loyal to their peer groups
Form a close one to one friendship
Have a growing desire to assert individuality and independence
Can be daring
Are self-conscious about their abilities and want to try out more and explore more

Cognitive

Ask many questions and want thoughtful answers
Developing strong interest, hobbies and collections
Enjoy problem solving game and puzzles etc.
Enjoy rule based games
Are beginning to develop view point about social/global issues

Chapter 3
SECONDARY RESEARCH

CHARACTERISTICS OF GRADE 8 STUDENTS

During this stage, the child's cognitive structures reach their highest level of development. The child is able to apply logical reasoning to all classes of problems, including abstract problems- either coming from the child's direct experience or having no concrete referents.

Physical

Appearance starts changing as a result of rapid physical growth
Experiencing the beginning of puberty
Differ greatly in rate of maturity
Tend to tire easily but still have a great activity level
Enjoy cooperative games and competitive sports

Social-Emotional

Sensitive to their appearance
Establishing a personal moral code
Unsure of their place in the society
Depend on their peer group to develop identity
May adopt extreme fads in clothing, speech, handwriting and mannerisms
Enjoy small, peer-dominated group discussion
Have a strong desire to assert individuality and independence

Cognitive

Capable of high level of abstract thought
Beginning to think about their future life roles
Need time and freedom to engage in self reflection
Can plan and organize tasks with little or no guidance from adults
Beginning/start to develop views about social issues

LEARNING IS FUN

WHEN

You love what you do
You can choose how to learn
You feel safe
The environment is inspiring
It becomes a healthy addiction
You appreciate who you are

HOW

Interest	Content should be interesting
Fail	Made in such a way that it holds their attention
Addiction	Content delivery is also fun and
Choice	Can motivate any age to start learning

Learning styles

VISUAL
AUDITORY
KINESTHETICS
COGNITIVE

LEARNING STYLES

Some learners thrive in a highly social and interactive environment; others feel more comfortable and may do better when they can think and learn alone. Some learners are motivated and empowered by carefully structured, linear tasks and unvarying routines; they may find it annoying and distracting when bullet in boards or visuals are not carefully aligned and the classroom isn't neat and orderly. Other students feel suffocated by so much structure and long for the freedom to solve problems and be creative. These same students enjoy classes in which the teacher keeps them guessing and sometimes makes random leaps from one topic to another. These students don't usually mind a little clutter—it makes them feel at home!

MULTIPLE INTELLIGENCES

1. Linguistic : Reading, writing, telling stories, playing word games, etc. - Almost everything we do in class!
2. Logical-mathematical: Experimenting, questioning, figuring out logical puzzles, calculating, etc. Surveys, making charts and graphs
3. Spatial: Designing, drawing, visualizing, doodling, etc. Illustrating a series; creating a picture of an object by writing the word for the object over and over
4. Bodily -Kinaesthetic: Dancing, running, jumping, activities adding motions to songs and chants - Total Physical Response (TPR),building, touching, gesturing, etc.
5. Musical: Singing, whistling, humming, creating, melodies for favourite rhymes Using songs and rhythmic chants, tapping feet and hands, listening, etc.
6. Interpersonal: Leading, organizing, relating, manipulating, mediating, partying, etc. -Small group and partner work
7. Intra-personal: Setting goals, meditating, dreaming, planning, being quiet Journalling, portfolio building
8. Naturalist: Understanding, categorizing, explaining things in the world of nature Photography, field trips, classifying

Each student in the classroom is an individual of remarkable complexity. No single category or set of categories is adequate to describe or explain that individual student, although at times the categories can be useful in finding a way to reach an individual student.

PARALLEL ORGANISATIONS

Agastya
SECMOL
Rishi Valley
CFL
Arvind Gupta Toys
Going to school
Prajayatna
Kathalya
DFC
Muktagan

AGASTYA

Agastya Runs the Largest Hands-On Learning Program in the World!
Agastya International Foundation is a Bangalore based non-profit educational trust that seeks to transform and stimulate the thinking of economically disadvantaged children. Agastya does this by bringing innovative science education to the doorstep of Government schools in various states in India. The mains sector is:
Mobile labs
Science centres
Model making
Toy science
Teacher training
Art
Ecology
Young instructors

Who benefits

Disadvantaged Children in the age group 6-18. Most of these children come from rural India. Their parents are small marginal farmers, carpenters, stone cutters, construction and menial white collar workers. A majority of them study in government schools and have no access to labs or other hands–on learning opportunities. Some of them are school drop-outs.
Visitors from urban schools and institutions who come to experience Agastya's unique campus and learn about rural India.
Government officials and NGOs interested in replicating the Agastya model.
Government school teachers
Village parents and communities reached by Agastya Mobile Lab night community visits.

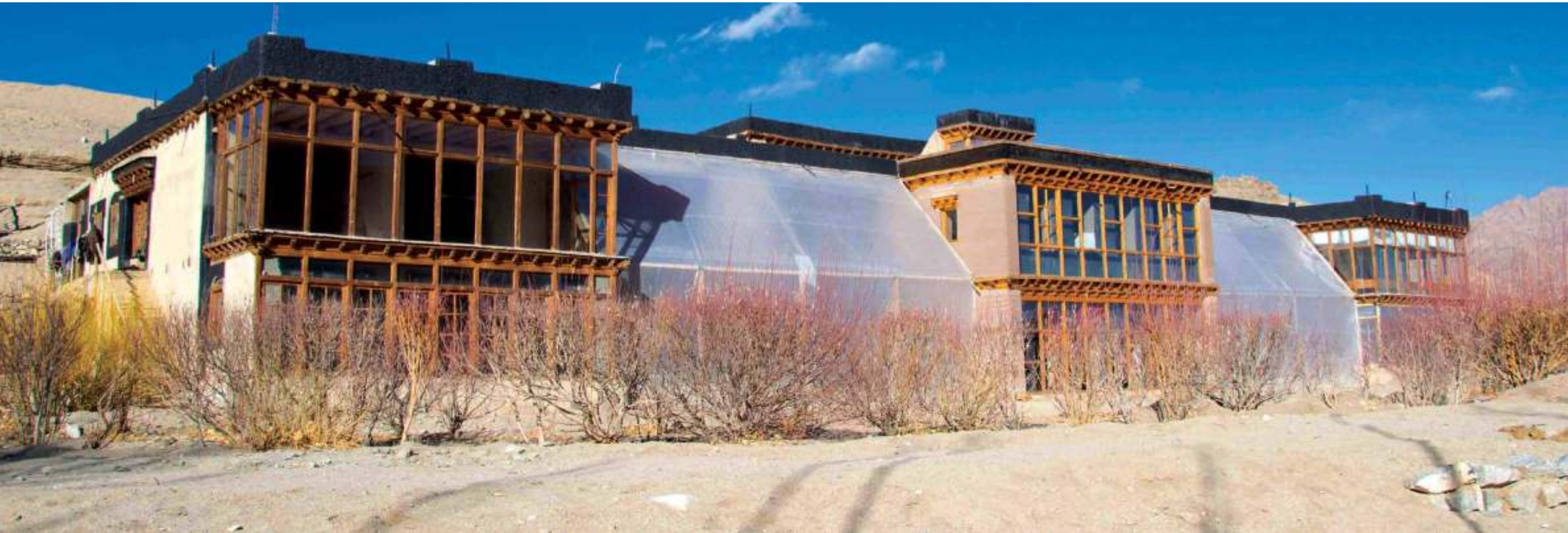
SECMOL

SECMOL is everything but a normal school. Besides the usual curriculum including English conversation sessions and literature classes, the students are also learning about different subjects such as agriculture and sustainable development. They are even introduced to a number of eco-friendly technologies such as eco-toilets and solar powered rice-cookers. The school is now well established and offer many ways for the students to grow and learn even outside the classroom.

During their free time, they can wander in the library in search for an interesting book, watch a documentary in the hall or grab a chess board and challenge one of their peer.
SECMOL can count on many volunteers in its rank to assist the children during every step of their learning process. Coming from a wide range of different countries, they also give the opportunity to the students to learn a little bit more about the other cultures of the world.
There is a kitchen to run, many crops to maintain and the buildings to clean. The good news is that all these chords are done evenly and there's a constant rotation between the members of the little community.

Life on campus

Students, volunteers and staff live together on the campus, creating a rich and lively atmosphere perfect for inter-cultural exchange.
The students take care of everything on campus, and have responsibilities for everything from maintaining the solar electricity to milking the cows to buying the food for the kitchen to cleaning. Their day starts early with physical exercises, and the first classes are before breakfast.



RISHI VALLEY

Rishi Valley Institute for Educational Resources (RIVER) is the teacher training and resource development wing of Rishi Valley Rural Education Centre. It is located on 14 acres of land on campus. Its facilities include:
Seven class rooms and a large seminar space that can accommodate up to 50 persons during teaching sessions
A well-equipped Library consisting of 5000 books of all kinds with a emphasis on education, curriculum development and teaching methodologies. The library is available to teachers, children and the village community
A set of computers, reference books, journals, multi-media equipment and related accessories that can be used for training programmes and workshops.

Aims of the Programme are:

» To promote village-based education
» To train teachers and teacher trainers in a multi-grade multi-level methodology (MGML) developed by RIVER
» To publish instructional materials in the MGML methodology
» To draw working children into the school system
» To create green spaces around the school campus for the conservation of biodiversity in general and medicinal plants in particular
» To raise awareness of health, nutrition and sanitation
» To actively involve the community in the day-to-day management of their children's school

A school is a place where one learns about the totality, the wholeness of life. Academic excellence is absolutely necessary, but a school includes much more than that. It is a place where both the teacher and the student explore, not only the outer world, the world of knowledge, but also their own thinking, their own behaviour.
The more apparent features of this spirit are shared by all schools—large campuses of great natural beauty; a friendly, caring relationship between teachers and students; simple, wholesome vegetarian diet; austere but comfortable living quarters; spacious and inviting classrooms; well-equipped libraries and laboratories; and a small teacher-student ratio with highly qualified and motivated teachers.

CENTER FOR LEARNING – CFL

CFL is a community of students and adults interested in learning about ourselves and our relationship with the world. This learning involves not only academics and other life skills, but also a deeper exploration about our emotions and thought processes and the way we respond to the challenges of life.

CFL has a dialogue class: its an open curiosity rather than a judgement. It's an inquiry and looking inward strategy. Hands on skill development method and vocational training arealso their main aims.

JUNIOR SCHOOL

Hands on skills: Art, craft,sewing
Vocational and other activities like cooking, drama, dance etc.
Learn language and arithmetic
Birdwatching,travelling together, cleaning

MIDDLE SCHOOL

Introduced to abstract concepts
Basic level in all subjects is given to each child regardless of their talent or aptitude
Each child reaches his/her level of excellence

HIGH/SENIOR CLASS

Intellectual and academic rigour
Take initiative and ownership of their education

ARVIND GUPTA TOYS

Arvind Gupta is an Indian toy inventor and popularizer of science. Gandhian in outlook, Arvind Gupta participated in the Hoshangabad Science Teaching Programme (HSTP) in Madhya Pradesh in 1978. While he was there he developed his idea of creating simple toys and educational experiments using locally available materials as well as items usually thrown as trash. These simple toys, he found, fascinated children and Gupta went on to make these as the hallmark of his movement of popularizing science.

Referring to Arvind Gupta Toys, a bank of experiments/toys has been created on topics that come under ISEC which can assist the children to inculcate creative thinking like that of inventors.

GOING TO SCHOOL

Design driven stories
Problem solving techniques
Impact enterprise
Employability
Entrepreneurship skills
Teacher training: Inspire them to use their stories to teach children
Character based learning
Make shift news show-run by children - SCRAPPY NEWS
Build entrepreneur skills by interviewing entrepreneurs and business leaders
Introduce children to different sustainable enterprises
Children engage with local entrepreneurs, conduct interviews
7 movies- entrepreneurs take up local communication challenges and solve them.

PRAJAYATNA

Active Involvement of community
Interdisciplinary and integrated learning

System Based Approach

» Integrated Curriculum
» Concept Mapping
» Ongoing assessment
» Ongoing assessment
» Mixed age group
» Empowerment of teaching

THEY MAKE/DEVELOP SUBJECTIVE SESSION PLANS FOR EACH SCHOOL-IN COLLABORATION WITH THE TEACHERS OF THE SCHOOL. This makes the plan more contextual.

KATHALYA

Storytelling, story plans, concept maps, mind maps, props reading cards and worksheets

DESIGN FOR CHANGE

Design for change aims to promote: I CAN
Steps:
Feel
Imagine
Do
Share

MUKTANGAN

Innovate classroom layout
Promote Collaborating
Discussion
Demonstration
Field trips
Low-student teacher ratio
Inventing music and art
Parent involvement

ORGANISATIONS & INFLUENCE

UNDERS.
THOUGHT

CFL:- DIALOGUE CLASS. — open curiosity rather than judging.
↳ inquiry and looking inwards

CHILDREN MEET LOCAL ENTRE./EXPERTS

HANDS-ON — SKILL DEVELOPMENT - VOCATIONAL TRAINING.

SYSTEM → SMALL THING → MORNING ASS.M.
↳ PARENT CONTRIBUTION
↳ NO REWARD
NO PUNISHMENTS.

VALUES

Be/Movies
7 MOVIES
LOCAL COMM.
CHALLENGES

LABORATING.

NT.

MAKING COURSE — IN COLLABORATION WITH TEACHERS. — CONTEXTUAL

INSPIRE TEACHERS TO USE STORY-TELLING

CHARACTER (STORY) BASED LEARNING

MAKE SHIFT NEWS SHOWING BY CHILDREN

TEACHER TR

TEACHING IN INDIA, TEACHERS AND THEIR BEHAVIOUR

REASONS FOR GETTING INTO TEACHING

"I wanted to become a Physical Training Instructor (PTI). Since jobs are difficult to get, I applied for the post of grade III teacher also. I got both the jobs but the call letter for PTI came late. So I decided to become a teacher (family pressure was also there)." (A teacher)

"I was selected for the job of a patwari (village level revenue official who maintains records and collects revenue). During training, I was told by the trainer that society always sees a patwari as a corrupt person even though he may be honest. I did not want the label of a corrupt person so I left the training half way. Those days a teacher was viewed with great respect in the community so I changed my profession." (A teacher)

"I did not want to work but after I got married, my husband was posted in a remote place where I did not have much to do. So, I applied for the job. I did a B. Ed and my marks were good. I had good contacts as my father was well connected. I got this job by luck. I am enjoying it as the salary is good. I can buy things for myself and for the house and have lot of spare time in my hands. It is also non-transferable (outside the district). It is the best profession for women – I can strike a balance between family and job. I do not have much tension from the HM and enjoy a good understanding with my colleagues." (A teacher)

Reference:
Teacher Motivation in India
By Vimala Ramachandran and Madhumita Pal, Educational Resource Unit and Dr. Sharada Jain, Sunil Shekar, Jitendra Sharma of Sandhan, Jaipur

PROBLEMS

Emotional level
Teachers complained about feeling demeaned when they were sent out to collect data or for door-to-door polio campaigns.

Financial level
Non-receipt of salaries on time and, in particular, the inability of the administration to release timely travel reimbursements and other payments were cited as reasons for poor motivation

Physical level:
Improvement in the physical facilities – the infrastructure – of schools was perceived as a factor that influenced motivation levels, but physical infrastructure though necessary is not a sufficient condition.

Academic level:
Nearly all teachers talked at length about the number of training workshops they had to attend and the poor quality of training doled out to them

Reference:
Teacher Motivation in India
By Vimala Ramachandran and Madhumita Pal, Educational Resource Unit and Dr. Sharada Jain, Sunil Shekar, Jitendra Sharma of Sandhan, Jaipur

The education system has expanded rapidly and enrolment rates have shot up. But growth rate in the number of teachers has not kept pace with the rise in enrolment.

The social distance between the teachers and the children is wide in government schools.
Teachers lack the skills to manage so much diversity in the classroom. Training programs for teachers are designed keeping in view the situation in large urban schools where one teacher manages one class. The problems faced by teachers in multi-grade situations, where teacher-pupil ratios are high, are rarely covered in training programs.

Systemic issues dealing with corruption (payment for transfers/ preventing transfers, deputations, appointments, promotions and special assignments) have vitiated the larger teaching environment in the country.

Teachers' unions and block and district-level administrators claim they are asked to do a range of non-teaching tasks which them away from the classroom. For example, the Rajasthan Government had asked teachers to motivate couples for terminal family planning methods.

Teacher training has picked up since 1994 with almost all teachers expected to attend a range of training programs every year. Many of these workshops are held during the academic session. Teachers are eligible for compensatory leave if they attend these workshops during vacations.

Reference:
Teacher Motivation in India
By Vimala Ramachandran and Madhumita Pal, Educational Resource Unit and Dr. Sharada Jain, Sunil Shekar, Jitendra Sharma of Sandhan, Jaipur

ATTRIBUTES OF A GOOD FACILITATOR

“ A good teacher/facilitator is one who can admit if he/she doesn’t understand a particular concept and seeks to learn with the children.”

A good facilitator is one who gives freedom to students and only takes responsibility of giving basic guidance.

A good facilitator needs to ask good questions

He/she must just give hints and not spoon-feed answers

Teachers/facilitators should be able to motivate children to assess themselves.

They have to be good storytellers

He/she motivates students in 2 ways - make a problem look very small or make it look very big

A good facilitator is one who believes that children are going to be the agents of change in the future.

SUSTAINABLE SYSTEM

ISSUES TO BE DEALT

» Minimizing the regular teacher dependency in imparting knowledge but making use of a teacher's skill to give out relevant information

» Training the teachers(of all subjects) such that they become component to guide the students (promoting constructive learning)

» Help the teachers adopt the TLS (teacher learning strategies) in their own subjects

» Make the content more engaging

WAYS TO DO THAT

» Developing self explanatory kits for both; students and teachers
» Guidance notes for the teachers
» Developing invention and sustainable labs (low cost science centres/innovation hubs)
» Understanding principles/concepts through models and experiments
» Increase digital exposure of children so that they learn on their own at their own pace
» Building interactive solutions which promotes peer learning and interactive studies
» Mentoring system

CONCEPT

DEVELOPMENT

SYSTEM FLOW

Understanding the
APPROACH TAKEN

Mapping and selection of
CONTENT

Finding a way to
SPIRAL THE CURRICULUM

Planning the
FLOW OF CONTENT

Selecting the right
PEDAGOGY AND METHODOLOGY

This system and approach was figured out and followed to design the modules. The following pages explain each point of the system flow and determines the constraints and guidelines that are to be kept in mind for making a module.

APPROACH TO BE TAKEN

The idea is to make the ISEC a ready-to-use product.

The content and kit for each topic is to be made in such a manner that it develops into a complete package.

Once the content, activities and collaterals are ready for each topic, the products have to be packaged together either theme-wise or topic-wise.

ISEC aims to be a part of the school time table and be absorbed as part of the regular class-schedule.

When ISEC is at a stage to be replicated, school teachers should be trained to take this on their own.

TARGET AUDIENCE

This has to be tested in the current schools under Invention education. After testing (each module) and gathering feedback; it can be taken to different schools

DURATION OF THE MODULES

Schedule for schools

ISEC classes take place before or after school hours;
Classes are taken separately for grade 6, 7 and 8

Time for each class

The time given for each grade in a school is one hour per week.

Time given to each module

Modules are to be created such that it lasts for 2 weeks i.e. for 2 hours.

Consider extending the modules only when the module is content heavy. For example Electricity and Electromagnetism

ISEC aims to be a part of the school time table and be absorbed by the school schedule.

MAPPING AND SELECTION OF CONTENT

Criteria of selecting the content:

» A topic's existence in the state board curriculum
» National science standards
» Aspects of sustainability and invention in it
» It's ability to make the basics strong

Careful judgement and understanding of the curriculum is required. As ISEC aims to reach out to all the states, it should not only be matched to the state board of Karnataka, but also be adaptable to national standards. The content created so far is quite general in nature and does not involve extreme specificity. It can be modified as per the requirements of individual state boards.

Mapping the content as per the global standards has to be done.

For grade 6 students the content may or may not be heavy but one has to make students believe that they are learning concepts to become problem solvers and future scientists

Grade 8 is the level where we can add difficulty by creating situations to apply the skills and knowledge gained in the previous years.

The topic selection criteria should also based on the difficulty level of the previous year's content

There is a need to choose the content to get invention as an output.

SPIRAL CURRICULUM

It is a course of study in which students see the same topics throughout their school career, with each encounter increasing in complexity and reinforcing previous learning.

WHAT SHOULD BE SPIRALLED

SPIRAL A SKILL

For topics like Chemistry in daily life or topics which are more general; the content may not be spiralled directly.
At times its more important to develop a skill through the years

Examples that should be developed and reinforced throughout the years:
Skill of learning that there is chemistry or chemical reaction in all everything around us elements or a skill to become more observant.

SPIRAL THE CONTENT

For topics like Electricity, Matter and Structure etc. that are content heavy, it's important to spiral the content than teach all the concepts in one year.

There are times when you spiral both the skill and the content together.
For example, learning to read evolving into reading to learn.

CONSIDERATIONS

CONTENT

» One needs to map the content with the curriculum of the state board.
» Evaluate and change based on what all can be added or eliminated to it. The content topics in the lower grade become the basis of the topics in the higher grades.
» Make sure there are revision tools adopted in the higher grades

SKILL

» Keeping the skill as the base; one needs to decide the activities and methodologies.
» For higher grades the focus will go on how to APPLY the skill.
» If the topic is not content heavy and rely more on observation- The focus will shift to that.
» One can even choose a 'process' to spiral in the 3 levels

FLOW OF CONTENT

HOW TO DEFINE

Once your topics are mapped one need to define how to take the students through the content.

Make sure the topics link with each other such that one topic leads to the another or have a connection for the child to make in his mind.

CONSIDERATIONS

Content
Level of content
Mapping of content with the classroom curriculum
Once you have mapped the content properly:
See what can intrigue the student to know more about the topic
Which topic can lead to the next topic
What is the most understandable topic and if that can be linked to the other topics
Look for the topics that can link the start of the lesson and create a loop (refer to Chemistry -Soaps)

DECIDING THE FACILITATOR FLOW

Make sure of evaluating and selecting the topics that need a human voice
Make sure of imagining the class in the context
When in doubt about any step- Find a group of adults(if not children) and make them role-play as children. Make them understand the topic as a child would.
Based on their responses, make the Facilitator guide/content delivery.

USE OF COLLATERALS IN THIS CONTEXT

To break the class monotony, there is a need to use creative collaterals for children to enjoy what they are doing.
One can easily use a tabulated A4 sheet of paper but that might create monotony in the class and students might not like the activity of simply observing and noting down. The activity has to be made interactive and attractive.

USE OF MODELS

One needs to use models that can be created and tested easily. Students should be given things that have instant and prominent results to understand a concept or a scenario.
Always consider what they can create fast and test so that they are motivated to do the same.

IMPORTANCE ON THE DETAILS

Importance should be according to the learning objectives which need to be mapped to the 3 main points of ISEC that is, students should be able to invent, produce sustainable results, identify and solve problems in areas around them.

MAPPING OF METHODOLOGIES

Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
Experiments	Material provided with instruction guide Material with Facilitator guide	Where the principle needs a proof When new with the concept of experiments, when the experiment Is too complex. When it has to be related to concept understanding in the later session of the class	Magnetism, mechanics, electricity, chemistry, bottle ecosystem	Children should be provided with instructional cards to make them feel more independent and explorative. Add other elements like workstation marking and class room layouts. In a complex situation, they should be verbal instructions as well	Self-confidence Develops understanding to work with different things Interest generation for all kinds of students Opportunity to mix with others Improving social skills Work cooperatively and collaboratively	Scrap material-bottles, straws, pipes, Cardboard, metal rods, Aluminium foil, Recyclable materials such as wine corks, aluminium soda cans, bubble wrap, packaging peanuts, and twist ties Thermocol sheets Foam board Balsa wood Paper Modelling clay Parts and Materials To Connect Things • String • Wire • Rubber bands • Rubber tubing • Tape (duct, masking, packaging, and electrical) • Glues (epoxy, super-glue, glue sticks, glues for hot glue gun, and rubber cement) • Hinges • Nuts and bolts, washers, assorted screws • Nails, thumb tacks Suggested Tools • Several sets of each: pliers, saw, hammer, screwdriver, hot glue gun, and tin snips Chemistry material Electricity material: Batteries etc.
Games	Digital games Board games - small or life size	Can be made to explain all concepts and add a fun element as well Used for giving a message - civic, life	Topics like climate change and waste management where the context is hard to understand otherwise To give information on other contexts, socio-economic aspects, civil manners	Get the content ready See what all things in that one can characterize What all are to kept as objects What are the obstacles Make rules	Interest generation Involvement with self and others Easier way to get/ practise a concept	For the base: Cardboard, paper, fabric, ground (use of stencils and chalk powder) For others- dices, cups, caps of bottles, scrap material

Methodology	Means to carry out	Context	Domain specific
Games	Memory games	Assessment For repetition of the concept and not letting children get bored Revision exercises	Class starts and ends: Physical world and Material world
Games	Outdoor games	Challenging students For all grades Treasure hunt: when we want them to unfold information step by step	2 scenarios: For topics that are meant to be outdoor like soil, biodiversity and many from life sciences For topics that are indoor and there is a need to break the monotony like Electricity
Toy making	Experiments Die cut parts and other parts that can be assembled	For principles of Physics	Physical world
Puzzles	Regular puzzle making arranging pieces on a guided layout/ information Stick on a board/ paper 3D puzzles	To make them remember with a story and link information to it To make them learn in a orderly manner Assessments	All topics

Action plan	Learning outcomes	Material of construction
Get the content ready See what all things in that one can characterize What all are to kept as objects What are the obstacles Make rules	Confidence Interest generation Concept get cleared, children are highly active and can do fast problem solving	For the base: Cardboard, paper, fabric. For ground- use stencils and chalk powder. For others- dices, cups, caps of bottles, scrap material
Refer to the existing toys available in the market. Gather the material	Self-confidence Develops understanding of how to work with things around them Interest generation for varied students	Concept guide/manual Punched and die cut parts All material of ‘experimentation’
Content finalization Breakdown into smaller elements	Interest generation Conceptual understanding	Paper, cardboards, 2 way glue, thick pieces for 3D puzzles

Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
Activities like Radio club/ Newsletter/ journal writing	Radio announcements- practice session, activity in outdoor games	As an assessment or sharing	All topics		Talking and writing skills, Introspection, Self Assessment, Writing, Articulation	Paper, radio equipment
Role play	Class enact	Introduction to a class In between for conceptual understanding It could also be used as an assessment technique	Imbalance. Living world	Make the student: Observe the character Understand the scenario Enact	Interest generation Improving social skills Confidence Work cooperatively and collaboratively	Props
	Making a student represent an entity- Props Cards/2 page booklet-show the whole picture, then distribute to represent an entity	For higher grades		Give out the information about the entity and make sure it is enough	Build confidence Good understanding of concept Motivation Feeling of responsibility	Paper and prints
Creating on their own eg. Drawing		When there is a need for children to observe In between sessions Field study - drawing what they observe Works as a memory game	Living world: biodiversity Earth science		Observation skills Creative skills Ability to articulate Gives a change to students inclined towards different directions	Paper, Pencil, crayons
Paper crafts	Paper foldings - opening order represents something Paper formations - different fold represents different things	To show an order of things or if something lead to some other thing	For example food chains or time-lines,	It can be given as an instructional guide and asked the children to do the rest Can be demonstrated by the facilitator	Understanding of a series of events easily	Paper

STORYTELLING

Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
Pictorial	Books	For bigger topics, or a longer story	For human impact in imbalance and earth science modules so that the message is conveyed without going in the depth	Define the characters Write the story Make a storyboard Get the resources	Can boost thinking capacity new vocabulary to children. Concept understanding	Paper, cardboard, binding material
Graphical						
Audio Visual						
Words, Written	Booklets	For holding the attention for a small time span and making them habitual to read				
Audio	Talking pages	To make the children intrigued to the topic. Audio impacts more than reading.			Enhance the listening skills of children	Audio support with paper, cardboard, binding material
Interactive	Movies	Audio visual is the most impactful in terms of holding the attention – for topics where a scenario needs to be depicted - the person who is shown is in motion – eg. Impact of climate change			Increase memory capacity for children	Audio visual set up, Talking pages Classroom small interventions Bioscope Projectors Tablets Pico projectors E-vans
	Oral Narration	Where expressions and words are enough to teach	All topics		Enhance the listening skills of children	
	Props by facilitators	For concepts which involve structures, molecules etc.				Stationery items to make props
	Puppet shows					Cloth, felt, threads, sticks, paper, ready made puppets
	On the spot story building by students	As a warm-up assignment				
	Plays and drama	Assessment/ team building, concept understanding				
	Audio tapes	When limited resources			Enhance the listening skills of children	Tape recorder, phones, tablets etc.

PROJECT BASED LEARNING

Methodology	Means to carry out	Context	Domain specific
	Assistance of collaterals Outdoor Visits Experts talk Self analysis	To make students come up with new ideas that can be implemented and tested Could be given to the children itself - eg. Grass cutter etc. Or for higher grades, where a project can be done at the end For all field based topics and sustainability and livelihood topics For design competitions - like DFC - one each student has to do - include in the course.	All topics, higher grades
			All physics and chemistry topics and experiments

CONTEXTUAL LEARNING

Action plan	Learning outcomes	Material of construction
	Become more engaged, self-directed learners Learn more deeply and transfer their learning to new situations Improve problem solving and collaborative skills Students perform better Students blossom – they have a voice and a choice Can reach ALL students and get them engaged PBL improves learning – learn deeply PBL provides opportunities for students to use technology PBL makes teaching more enjoyable and rewarding	On the spot and based on the demand of the children - for this no kit will be provided Material Should be taken from the field, from waste, from field scrap Can be taken from the scrap box - taken care by 2 volunteers
Teacher/facilitators given a bank of examples for each experiment they conduct or each topic they teach	Emphasizing problem solving recognizing that teaching and learning need to occur in multiple contexts Assisting students in learning how to monitor their learning and thereby become self-regulated learners Encouraging students to learn from each h other employing authentic assessment	

Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
COOPERATIVE LEARNING Laboratories and Projects JIGSAW Peer editing Peer-led team Learning	We need structured tasks and goals Assign different roles to team members Use JIGSAW: Each student required to research one section and teach it to other members		All topics, higher grades	Make someone on the team (the process monitor) responsible for ensuring that everyone understands everything in the report or assignment that the team hands in. Keep groups intact for at least a month Provide for periodic self-assessment of team functioning	Students tend to become open to other's inputs and improve their social skills They know how to handle conflicts better Their problem solving skills are improved	For this no kit will be provided Material Should be taken from the field, from waste, from field scrap Can be taken from the scrap box - taken care by 2 volunteers
SCENARIO BASED LEARNING		Especially effectively when used to simulate real-world practice, providing opportunities which may be difficult for students to experience within the confines of a course. Can be used as part of either formative or summative assessment SBL usually works best when applied to tasks requiring decision-making and critical thinking in complex situations.	For all field based topics and sustainability and livelihood topics For design competitions - like DFC - one each student has to do - include in the course.	Identify the learning outcomes Decide the format Choosing a topic Identify the trigger event or situation Review your scenario	Students apply their subject knowledge, and critical thinking and problem solving skills in a safe, real-world context. SBL is often non-linear, and can provide numerous feedback opportunities to students, based on the decisions they make at each stage in the process	

	Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
BLENDED LEARNING	Digital Analogue	Talking pages Classroom small interventions Bioscope Projectors Tablets Pico projectors E-vans		All topics	Finding the Mix – Start with your objectives – Know your learner – Make your course interactive – Deciding when to be live versus when to be online – Learner choice vs. self-regulation – Knowing if the blend works	Students become familiar to the current literature Become familiar with instructional technologies that can be used to enhance the student learning	Technology - screens and displays
FLIPPED CLASSROOM	Pre read Explanation of prior classes Lecture form Activity form Peer Instructions Through drawing	Open for the students to decide how are they want to go about it	For topics like life sciences or topics where they can relate to In between sessions - mid class - so a little intro is given and rest can be understood Flipped: To save time and put the time in the right direction. When there is a need to focus more on the application than the theory	Physical world - revision for higher grades Material world - revision for higher grades	Be prepared in advance Give the data in any form and ask students to spend time reading it before hand. Discuss the applications in class than the content. This is also a good way of assessing the child's understanding	Student work is more motivated, efficient, active and intensive due to lowered inhibitions and an increased sense of purpose By eliminating the class division of authoritative teacher and passive audience, an emotive solidarity is obtained. Students perform many routine tasks themselves Students gain important key qualifications like • teamwork • planning abilities • reliability • presentation and moderation skills • self-confidence	Boards, Sheets etc.

	Methodology	Means to carry out	Context	Domain specific	Action plan	Learning outcomes	Material of construction
INDUCTIVE METHOD		By the facilitator	Students will usually be more involved in the learning experience and tend to participate more actively when an inductive approach is used		When teachers speak at a more advanced level, they are giving the students constant opportunities to notice the differences between the teacher's speech and theirs. This way each student can become aware of the differences at his own pace. Teachers can provide students with opportunities for noticing simply by putting posters up in the classroom in the target language. As before, when the students are ready to notice the difference, they will.	Students tend to understand and remember more when learning occurs inductively.	
DEDUCTIVE METHOD		By the facilitator: Direct learning instructions Black board teaching Introduction of topic and explain what it consists			It is important to structure the learning experience in order to draw on students' prior experiences and learning, and to provide for their active involvement.	The deductive approach is faster and can be an efficient way to teach large numbers of facts and concrete concepts.	

BRAINSTORMING

CONTENT

DEFINING THE LEARNING OBJECTIVE

FLOW OF CLASS

DIVIDING AND SPIRALLING THE CONTENT AS PER GRADES

OPTIONS TO DELIVER THE CONTENT

ASSESSMENT PLANNING

FINALIZING THE TECHNIQUE

OUTPUT

OUTCOME

APPROACH TAKEN

CREATED MODULES

MODULE 1
Theme: Imbalance
Topic: Climate Change

MODULE 2
Theme: Material World
Topic: Chemistry in Daily Life

MODULE 3
Theme: Physical World
Topic: Electricity and Electromagnetism

MODULE 4
Theme: Living World
Topic: Interactions and Interdependencies

MODULE 1

THEME: IMBALANCE

TOPIC: CLIMATE CHANGE

FLOW OF LESSON

GRADE 6, 7

BASIC CONCEPTS
- Weather
- Atmosphere
- Climate
- Photosynthesis
- Temperature
- Rainfall
- Carbon dioxide

ADVANCED CONCEPTS
- Carbon cycle
- Greenhouse
- Global Warming
- Climate change

ASSESSMENT

TESTING OF CLIMATE CHANGE

HUMAN IMPACT

GRADE 8

REVISION

PROJECT BASED LEARNING

PLANNING OF CONTENT

CONTENT
What is climate?
What is weather?
What is atmosphere?

LIFE CYCLE OF CO2 AND greenhouse gases
Why are they called fossil fuels?
How does carbon get into living things?
How much carbon is good for the atmosphere?
How much CO2 can Earth suck out of the air?
What is carbon footprint

What is a greenhouse?
How is Earth a greenhouse?
What if earth gets a little warmer?
Why is earth getting warmer?

How can so little warming cause so much melting?
How does climate change affect other species?

What are oceans
Why is the ocean important?
How does the ocean soak up energy?
How does the ocean affect the climate?
Does the salt in the ocean do anything?
How will melting ice sheets affect ocean currents?

L3
How will climate change affect rain and snow?
Can I help nature to help us?
How can I reduce my trash pile?
Do I need to save water too?
How can I make a real difference?

CONTENT

BASIC CONCEPTS

WEATHER

Weather is the day-to-day conditions of a particular place. It is Weather is the condition of the air around us whether it is hot or cold, wet or dry, calm or stormy, clear or cloudy.
For example: It was raining today at school. Yesterday it was sunny at home.
Weather often controls how and where we live, what we do, what we wear and what we eat. Weather is not the same everywhere. It may be hot and sunny in one part of the world, but freezing and snowy in another. Weather can change from minute-to-minute, hour-to-hour, day-to-day, and season-to-season.
Elements of Weather:
(A). Temperature
(B). Humidity
(C). Rainfall

CLIMATE

The climate is the common, average weather conditions at a particular place over a long period of time (for example, more than 30 years). While the weather can change in just a few hours, climate takes hundreds, thousands, even millions of years to change. Example-Deserts have a hot and dry climate while the Antarctic has a very cold and dry climate.

TEMPERATURE

Temperature is the measure of how cold or hot somewhere is.

RAINFALL

Rain is the water that falls in drops from clouds in the sky/ Rain is liquid water in the form of droplets that have condensed from atmospheric water vapour and then precipitated.
Rainfall is the quantity of rain falling within a given area in a given time.

ATMOSPHERE

The atmosphere is a thin layer of gases that surrounds the Earth. It seals the planet and protects us from the vacuum of space. It protects us from electromagnetic radiation given off by the Sun and small objects flying through space. The atmosphere of Earth is mostly composed of nitrogen. It also contains oxygen used by most organisms for respiration and carbon dioxide used by plants, algae and cyanobacteria for photosynthesis.

PHOTOSYNTHESIS

A process used by plants and other organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities. This chemical energy is stored in carbohydrate molecules, such as sugars, which are synthesized from carbon dioxide and water – hence the name photosynthesis. Photosynthesis maintains atmospheric oxygen levels and supplies all of the organic compounds and most of the energy necessary for life on Earth. Plants use this process to make their own food. They use Carbon Dioxide, Water, and Light to make their own food.

CARBON DIOXIDE

Colourless, odourless, non-toxic gas
In its solid form is known as "dry ice".

Uses:

In fire extinguishers
Soft drinks/to carbonate beverages

Sources:

When any substance containing carbon is burned
Breathing
Fermentation`

ADVANCED CONCEPTS

GREENHOUSE EFFECT

The CO_2 in the atmosphere traps the heat from the sun and won't allow it back to the space so surface of the earth become hot. That is why CO_2 is called a greenhouse gas. It creates a layer of warmth, known as the greenhouse effect that keeps our earth from freezing. The more CO_2 in the atmosphere, the warmer the earth becomes. The amount of CO_2 in the atmosphere over the last 8,000 years has been stable, creating suitable conditions for human beings to thrive.

CLIMATE CHANGE

Climate change is a significant change in climate (including temperature, rain and wind) that a region experiences. While this can be caused by natural factors, the term climate change is now generally used to describe the changes in our climate as a result of human activity.

GLOBAL WARMING

Global warming is the gradual heating of Earth's surface, oceans and atmosphere.
"Global Warming is a term used to describe an increase over time of the average temperature of Earth's atmosphere and oceans. Global warming theories attempt to account for the rise in average global temperatures since the late 19th century (0.6 ± 0.2°C) and assess the extent to which the effects are due to human causes.
The most common global warming theories attribute temperature increases to increases in the greenhouse effect caused primarily by human-generated carbon dioxide."

CARBON CYCLE

All living things are made of carbon. Carbon is also a part of the ocean, air, and even rocks. Because the Earth is a dynamic place, carbon does not stay still. It is on the move! In the atmosphere, carbon is attached to some oxygen in a gas called carbon dioxide. Plants use carbon dioxide and sunlight to make their own food and grow. The carbon becomes part of the plant. Plants that die and are buried may turn into fossil fuels made of carbon like coal and oil over millions of years. When humans burn fossil fuels, most of the carbon quickly enters the atmosphere as carbon dioxide.
Carbon dioxide is a greenhouse gas and traps heat in the atmosphere. Without it and other greenhouse gases, Earth would be a frozen world. But humans have burned so much fuel that there is about 30% more carbon dioxide in the air today than there was about 150 years ago, and Earth is becoming a warmer place. In fact, ice cores show us that there is now more carbon dioxide in the atmosphere than there has been in the last 420,000 years.

Role of oceans in CO_2 cycle and how are they getting affected
Ocean CO_2 cycle:
Carbon Dioxide in the atmosphere is absorbed by the oceans
Dissolves in water, CO_2 creates carbonic acid (H_2CO_3)
Acid breaks into bicarbonate and hydrogen ions
Reaction harms cell growth and reproduction, leading to disintegration
Hydrogen ions react with carbonate in coral and shellfish

IMPACT OF CLIMATE CHANGE

Coral Reefs: Rising water temperatures and ocean acidification threaten coral reefs and the rich ecosystems they support. These and other climate-related impacts on coastal and marine ecosystems will have major implications for tourism and fisheries.
Heavy rain: more rain is already coming in very heavy events, and this trend is projected to increase across the nation. Such events are harmful to transportation infrastructure, agriculture, water quality, and human health.
Agriculture: Increasing heat, Pests, floods, weeds, and water stress will present increasing challenges for crop and livestock production.
Water and energy interactions: As warming increases competition for water, the energy sector will be strongly affected because power plants require large amounts of water for cooling.
Water Supply: Water supplies in the rapidly growing southwest will become increasingly scare, calling for difficult trade-offs among competing uses.
Coastal communities: Sea-level rise and storm surge will increase threats to homes

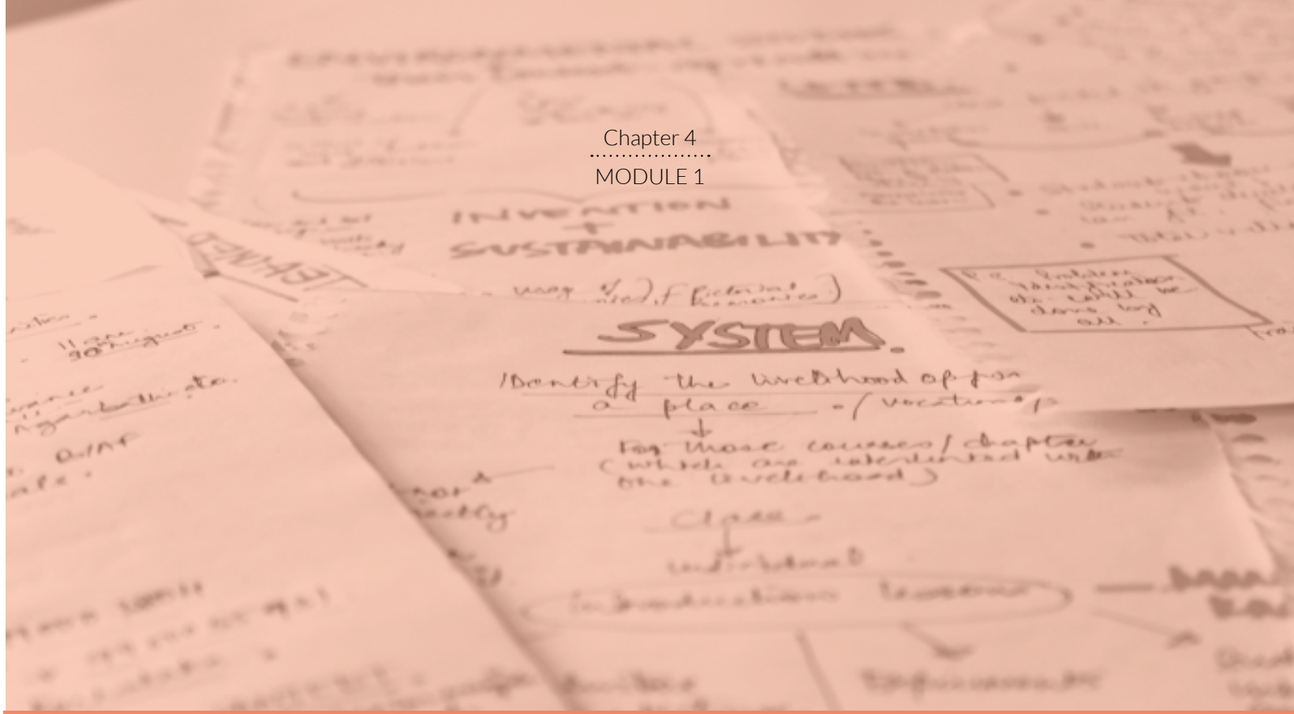
and infrastructure including water, sewer, transportation, and communication systems. Many barrier islands and coastal marshes that protect the coastline and support healthy ecosystems will be lost.
Energy Supply: Warming will decrease demand for cooling energy in summer. The latter will result in significant increases in electrically use and higher peak demand in most region.
Habitat loss: polar bear will have no place to live. Animals will not hibernate and will not have food for the winter months and will die

HUMAN IMPACT

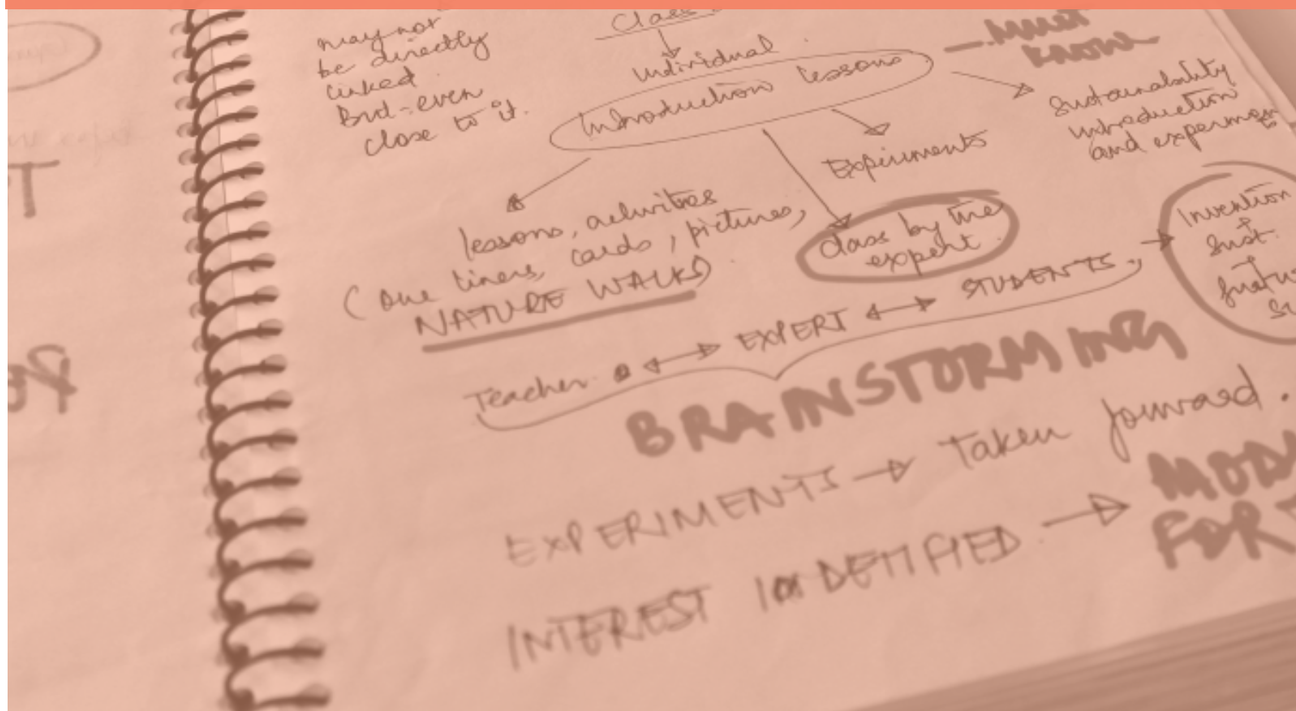
Burning of fossil fuels: burning of coal and wood
Usage of non renewable energy sources.
Deforestation - not enough co2 sinks
Urbanization
Emission from vehicles/lack of emission check
Industrial emissions
Indiscriminate use of energy sources
Incomplete combustion processes
Cattle rearing and meat production
Waste management
Indiscriminate drilling of natural gases and minerals

IMPACT IN INDIA

Unpredicted rainfall.
Melting of snow caps: flood, Tsunami
Submerging of islands and coastal reasons
Draughts
Rising temp, disrupted weather cycle
Unpredictable weather conditions
Shifting in crop pattern
Farmer suicides
Overuse of artificial pesticides etc. to increase of crop production.
Which leads to pollution of natural resources (water bodies)
Unemployment and economic divide - nation's economy affected.
Extinction of wildlife and plant and animal species
Disappearance of lakes and water bodies,
Ocean acidification - habitat affected
Disturbance of ecosystem and natural food chain



The content spiralling is done by making level 1 as the base for level 2. Level 2 is an application of level 1.



LEVEL 1,2 - GRADE 6,7
WEEK 1

BASIC CONCEPTS - REVISION

ACTIVITY:
CARD READING

There are 30 cards on Temperature, rainfall, weather, climate, carbon dioxide, photosynthesis and atmosphere
The cards in the class will be randomly distributed. Students will be asked to read their card to the class in the order specified on the cards.
After each card, students are asked what they understood from it and the facilitator sums it up as per his/her notes.

REASON

Children are aware of the basic topics. All they need is a revision.

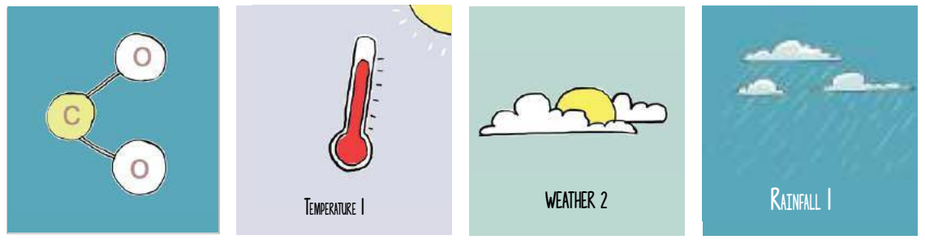
Lesson hook chosen:
Card based revision: To involve each child in the class and to let the information come from children itself.

Criteria of selection of the activity:

There was more than one small topic to be revised.
Each of these topics had 2-3 small points

OUTPUT

Facilitator distributes the revision cards to the children. As their turn comes, they read what is written on their cards



REVISION CARDS DISTRIBUTED

Chapter 4
MODULE 1

PART 2

page 182

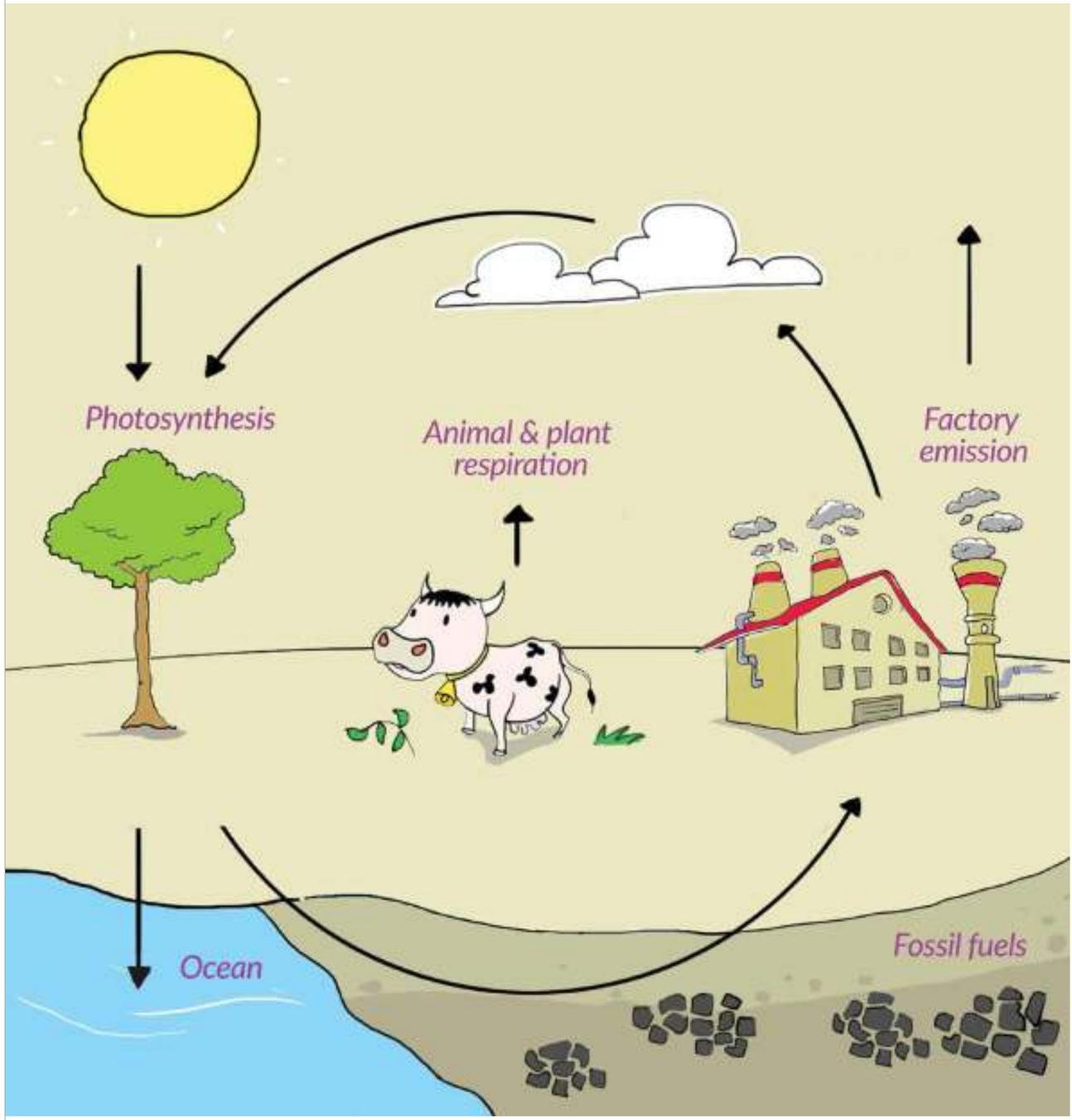
LEARNING OBJECTIVE 2
Understanding the advanced concepts of climate change

Topics:

Carbon cycle
Greenhouse effect
Global warming
Climate change

Activity: **Using a media - picture; led by facilitator explanation**

The advanced topics need to be explained by the facilitator as they are intense and need verbal guidance along with visual techniques. Visual clues are used instead of the blackboard to give the students a break from regular teaching methods.



MEDIA-CARBON CYCLE
Illustration: Abraham Jacobs

Assessment

2-WAY PUZZLE

The setup has one sheet of questions on its base. There are puzzle pieces which are printed on both the sides. On one side there are answers and the other side forms a picture when joined in the correct order.

The children have to place the puzzle pieces on the base question sheet in such a way that the back of the answers are facing them.
When the children are done with this,
They see an image which tells the effect of global warming i.e. icebergs melting, floods occurring etc. As they see the picture, the facilitator asks them a question of how do they think it happened. Answer could be – temperature increase.
The facilitator informs them that even 1 degree change can cause icebergs to melt and thus occurence of floods take place.
The leading question – how do you think this happened? Do you think CO2 is a cause of increase in temperature – leave it at 'Let's find out in the next session'?

FLOW CONSIDERATION

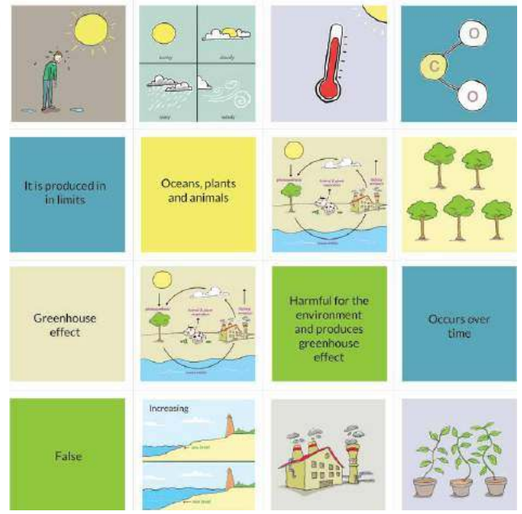
The visual on the flip side of the puzzle was chosen keeping in mind the flow of the topics; it will lead to a discussion on the next topic

The activity was conducted to assess what they learnt.
The assessment is a question answer session but it also develops visual interpretation skills.
This activity changes the format of assessment, wherein the questions lead to another interpretation thus it is a combination of a puzzle and matching tiles.

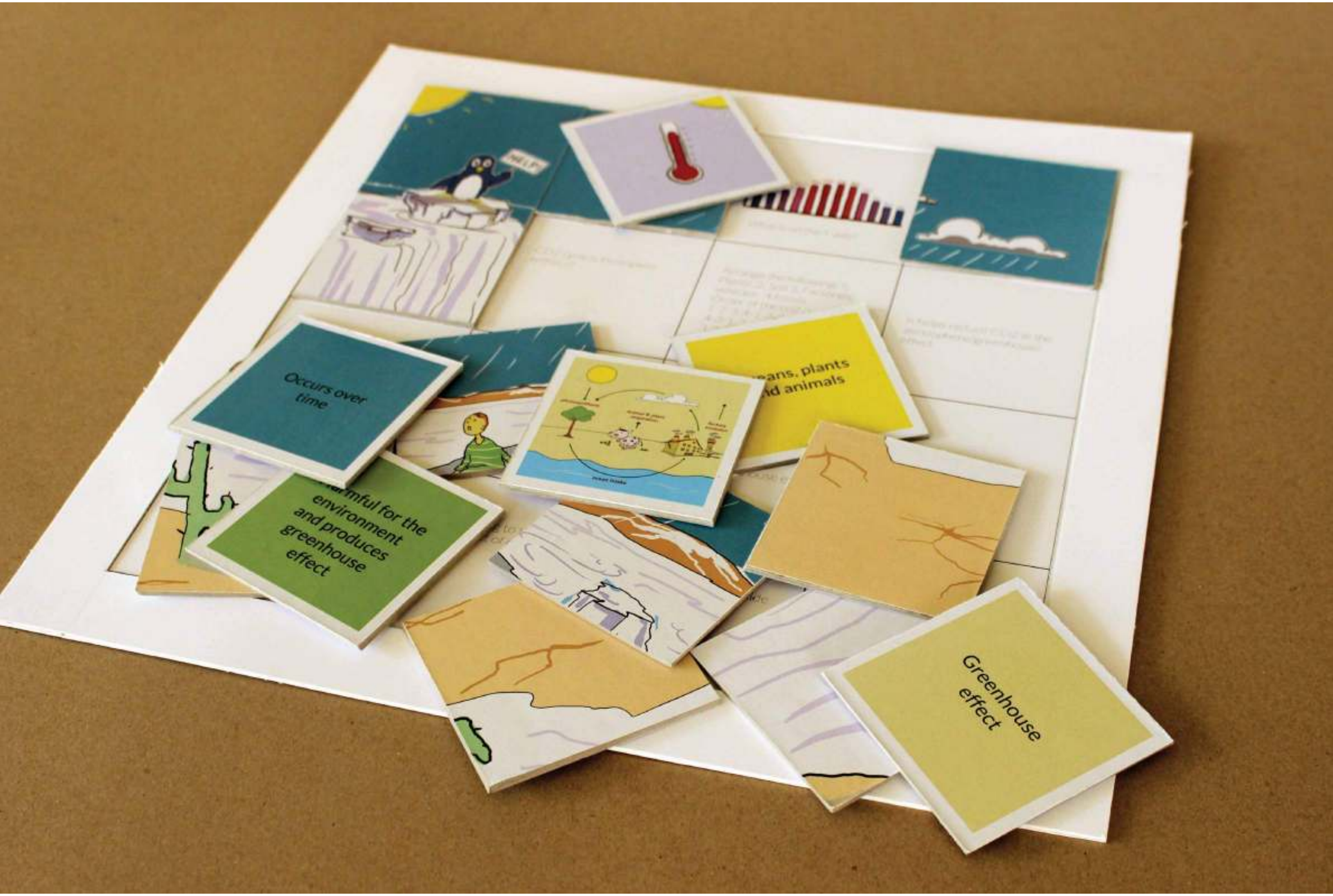
QUESTIONS

What factors constitute weather? Seasons and time of the day Temperature and Humidity Sunrise and sunset All the above	..... Climate is defined by? Weather pattern Carbon dioxide increase Ozone depletion Atmosphere	 What is on the Y axis?	Its solid form is known as 'dry ice'.
Carbon dioxide is good if?	CO_2 cycle is incomplete without?	Arrange the following: 1. Plants 2. Soil 3. Factories, vehicles 4.fossils Order of the co2 cycle is 1-2-3-4-1-2-3-4_ 4-3-1-2-4-3-1-2_ 3-2-1-4-3-2-1-4_ 4-2-3-1-4-2-3-1_	It helps reduce CO_2 in the atmosphere/greenhouse effect
It is necessary for human existence, it is like our blanket. If it is not there we will be able to survive. If it increase we still won't be able to survive.	Plants absorb carbon dioxide through photosynthesis, and plants and soil return some carbon dioxide to the atmosphere through respiration. A similar transfer takes place in the oceans, with absorption being slightly greater than what is released. What is this cycle?	CO_2 produced by burning fossil fuels is: Good for photosynthesis and carbon cycle to get completed Harmful for the environment and produces greenhouse effect Resists the greenhouse effect Causes rainfall	Global warming
Oceans have no role in global warming	What is happening to the sea level by the effect of climate change?	It produces Carbon Dioxide in the process	This reaction Carbon Dioxide + Water + Light ----> Sugar + Oxygen takes place in? Plants Cars Humans Animals

ANSWERS



FLIP SIDE


Occurs over time
mful for the environment and produces greenhouse effect
ans, plants d animals
Greenhouse effect

WEEK 2 EXPERIMENTATION

LEARNING OBJECTIVE

To test the temperature change in the presence of extra carbon dioxide
The objective was defined to make children believe they can prove things by testing

CASES

Earth in one and Plant in one – note the temperature
Soil with Carbon Dioxide and Soil without Carbon Dioxide – note the temperature
Plant with CO2 and just CO2 – note the temperature
Plant with or without Carbon dioxide – note the temperature

INSTRUCTIONS

Divide the class into groups of 4 and distribute the 4 cases among them (repeating is not a problem).
In each case-2 are observing the behaviour in each of the bottle
Give each of the group a specific location in the class. (They can use the duct tape to mark their area of experimentation)
You may put charts in class and write the driving questions, hypothesis and conclusion.

MOTIVATION AND PREPARATION

Let them know that nothing might happen to any of the temperatures and this is the first time they are going to find out, just like how scientist do

PART 2
STORYTELLING

Learning object: To understand the human impact and reasons of climate change

Presentation: Story scroll on the wall

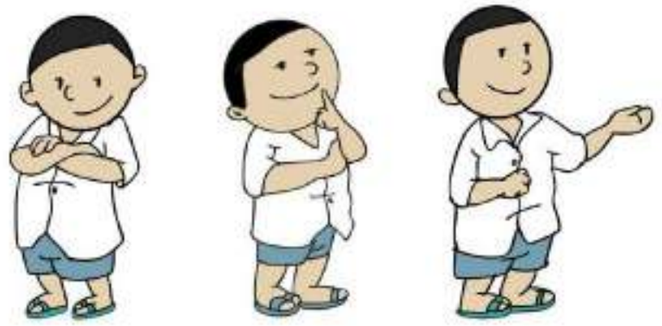
Human impact was chosen to be explained through storytelling as stories can eplain the most difficult concepts in the most simplest manner.
For students to accept what has happened to the environment and what has to be done, it is most suitable to explain concepts through storytelling.

MAKING OF THE STORY

The story has to be precise and to the point.

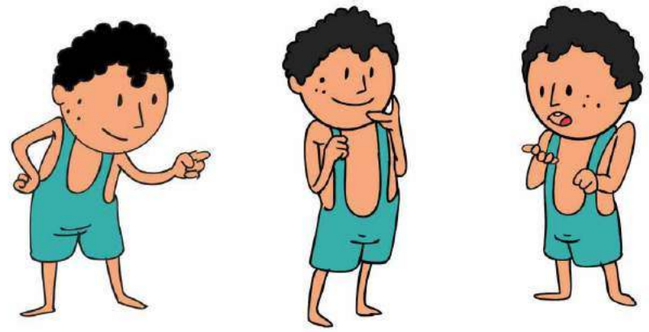
Direct Characterization is used as it tells the audience what the personality of the character is.

CHARACTERS



Naveen is a young boy who goes to school and really likes to studying. He is very obedient and his goal is to make the world a better place.

Nagaraj, on the other hand, is naughty and always creates trouble with his friends. But he also likes to learn in his school and keeps trying out new things



Sneha has a very pleasant personality and cares too much about her surroundings and community. She is always on her toes, trying to solve problems around her.

The 3 are very good friends who explore their world together

STORY

There were 3 friends who lived in Kundapur. They enjoyed spending time with their family and were always enthusiastic to go to school. But they understood that there was a need to change things for their community to live problem-free. And that's why they studied hard. They loved solving problems and creating new thing. To get clean water in their community they made a water filter out of corn cobs. They were enthusiastic and believed they can solve the problems around them.

Nagaraj, Naveen and Sneha

Frame 4:

Sneha sitting alone, getting irritated

Naveen and Nagaraj come to her. Naveen: Hey Sneha, What happened?

Sneha: I am getting fed up of this heat! It's just getting too much. It's more than even last year.

Frame 5:

Nagaraj: oh ya! You know my grandmother said it wasn't so hot earlier. She has lived for so long and seen so much.

Nagaraj: Remember our teacher talking about global warming? I think it's that!

Frame 6:

Sneha: You know what! We should find out what happened in these years!

Naveen: Yes! Let's first talk to the older people. Wouldn't they know?

Frame 7:

Sarpanch: It's true children! It has changed a lot since I was your age. Earlier it was always pleasant. And our mud houses were really cozy to stay in.

Frame 8:

And now because of this change in weather, our crops also don't have much yield. Bilal was saying- this year he had to use so many pesticides. That caused a lot of problems too.

Frame 9:

Nagaraj: You know it's not just this. There is more to it. Let's find out what happened.

Note: When industrialization started they started using fossil fuels and burning it all to make energy

Frame 10, 11:

Visuals of mining, coal collection, factories vehicles, deforestation, cattle rearing, landfill, plastic abundance

Frame 12:

All this produced CO2 and Methane. Causing greenhouse

Nagaraj, Naveen and Sneha: This is at a level where it's so messed up.

Naveen: But I think people are trying to bring about a change.

Frame 13:

Visual on wind energy, solar, paper bags etc.

Frame 14:

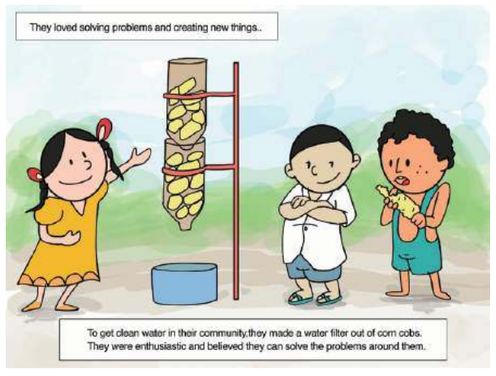
Sneha: That's good. But is it enough??

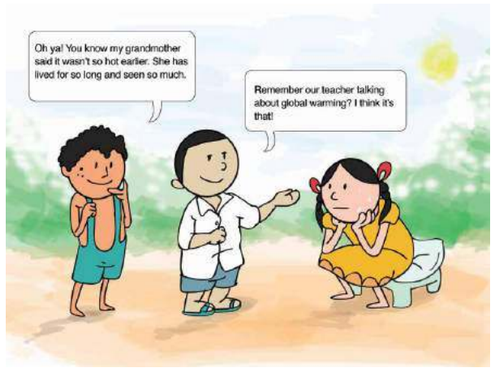
Naveen: Well, no! We need to work at every level. Let's start from somewhere! Let's bring about a change

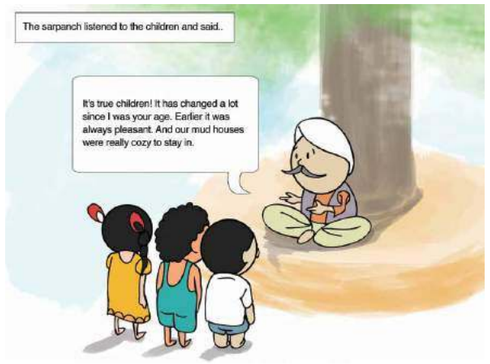
Nagaraj: Let's look around us where can we invent using sustainable resources

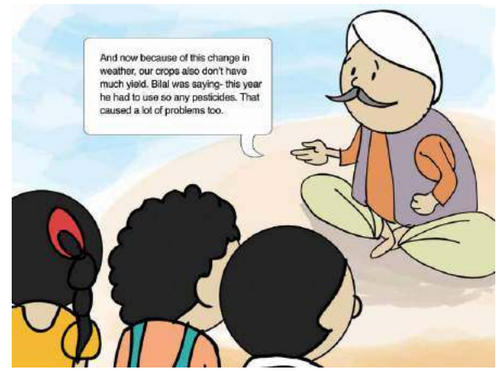
A series called 'Let's find out' is made and it will have a new story for all human impacts.

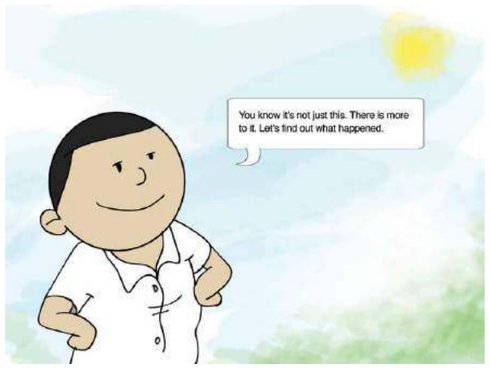
FRAMES

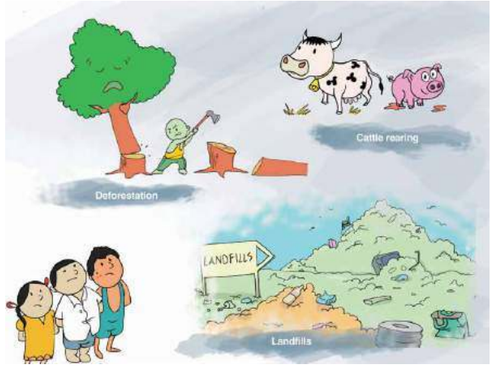


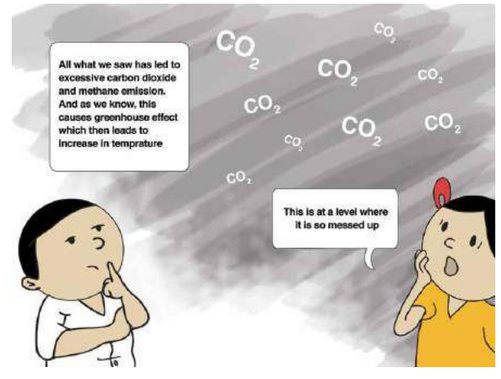












Illustrations: Abraham Jacobs

MEDIUM CHOSEN

SCROLL ON THE WALL

REASON

Individual booklets can be distributed to the children. In that case, not only the cost of printing increases, but also the experience of reading it decreases. The story is meant to be read with friends, get motivated and work towards changing the current scenario.

STICKERS

Assessment

HOME ACTIVITY

Sticker pasting

page 198

The topics are:
» Products that are made by deforestation
» Smoke
» Cattle rearing
» Waste that cannot be reused
» Things that use fossil fuel in them
» Plastic collection

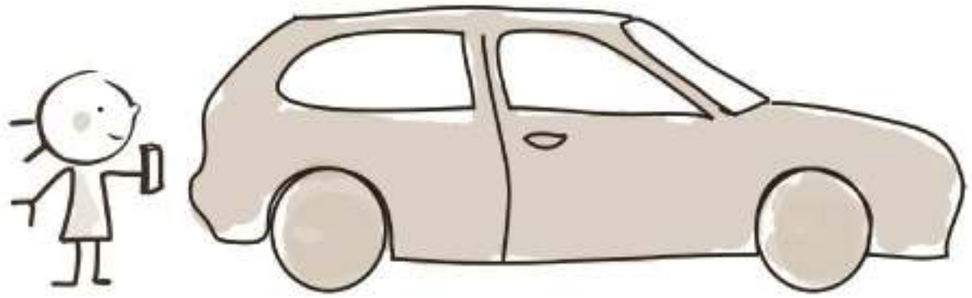
INSTRUCTIONS

Distribute stickers to each child. Ask them to observe their surroundings and place the stickers according to what they see.

REASON

Stickers to be made as assessment:
To make students concerned about the environment and spread the message. Also, to check if they understood the concepts.

Object made
by deforestation



Fossil fuel use

LEVEL 3 - GRADE 8
ROLE-PLAY

OBJECTIVE

To understand different scenario
To role play entities around them
To brainstorm and look for solutions that can solve the problems around them

BRAINSTORMING ACTIVITY

Through storytelling and scenario building

This activity is to make them discuss about the problems around them.
Role-playing, plays, dramas are a different way to make students handle problems.

Once they understand the idea, there has to be a discussion leading to solutions based on the scenarios they are told.

Cards and booklets were chosen as it can hold the attention of the child.

SCENARIO BASED LEARNING

INSTRUCTIONS

Divide the students into groups of 5.
Distribute the booklets. One to each child
They read the booklets; share and discuss their roles with the other group members.
The facilitator gives a scenario (given below) – read the scenarios to each group/ give them a printed copy
They discuss for some time and look for solutions. Ask them to break the problem and find it's root cause to be able to find a solution. Then each child will weigh if that solution is good for them (their role) or not.
Then the facilitator changes the scenario.
All these solutions are noted on the paper and checked by the facilitator.
The potential solutions are asked to me made into prototypes /models.

SCENARIOS

FARMING

The changes in the weather will affect the types of crops grown in different parts of the world. Some crops, such as wheat and rice grow better in higher temperatures, but other plants, such as maize and sugarcane do not. Changes in the amount of rainfall will also affect how many plants grow.
The effect of a change in the weather on plant growth may lead to some countries not having enough food.

DEFORESTATION:

About 80% of the world's documented species can be found in tropical rainforests—some of the forests most vulnerable to deforestation. When species lose their forest homes, they are often unable to subsist in the small fragments of forested land left behind. They become more accessible to hunters and poachers, their numbers begin to dwindle and some eventually go extinct. Even localized deforestation can result in extinctions as many unique species exist in small isolated geographic locations in the world.

WASTE MANAGEMENT:

Waste can be regarded as a human concept as there appears to be no such thing as waste in nature. The waste products created by a natural process or organism quickly become the raw products used by other processes and organisms. Recycling is predominant, therefore production and decomposition are well balanced and nutrient cycles continuously support the next cycles of production. This is the so-called circle of life and is a strategy clearly related to ensuring stability and sustainability in natural systems. On the other hand there are man-made systems which emphasize the economic value of materials and energy, and where production and consumption are the dominant economic activities.
All kinds of waste i.e. plastic and wet waste are getting disposed at landfills. At these landfills, a lot of methane is produced and thus causes climate change.

DISAPPEARANCE OF LAKES AND WATER BODIES

Lakes and water bodies are getting minimized
Half of the water bodies in and around the cities have disappeared over the last century under the pressure of rapid, and badly managed, urbanization.
According to the state water mission, water bodies are the worst victims of human interference and rapid urbanization. Massive erosion in the catchment area is resulting in these lakes becoming silted up, thereby converting water areas into landmasses. Other water bodies have disappeared due to natural causes like glacial action and low precipitation. Some are on the verge of extinction

FLOODS AND DRAUGHT

Wetlands can act as sponges and soak up a lot of moisture, but they are often drained to make room for agriculture and development. By stopping deforestation and reforesting upstream areas, by halting wetland drainage and restoring damaged wetlands, we can significantly soften the impact of climate change on flooding.

Draught

Activities resulting in global climate change are expected to trigger droughts with a substantial impact on agriculture throughout the world, and especially in developing nations. Overall, global warming will result in increased world rainfall. Along with drought in some areas, flooding and erosion will increase in others. There are agricultural droughts that can impact crop production and cause changes to the natural distribution of various species. The farms themselves can also cause droughts to happen as soil is depleted and therefore cannot absorb as much water, but they can be impacted by natural droughts as well.

PETROL, DIESEL, KEROSENE, COAL PRICE INCREASE`

Because of the extensive demand of oil, coal etc; the price has gone up. These are non-renewable resources and we will soon run out of them. It also adds to the greenhouse effect.
This is a major concern for climate, air.


CLIMATE 2
CLIMATE 1
Oceans, plants and animals
YOU ARE THE ENVIRONMENT
YOU ARE AIR
YOU ARE WATER

MODULE 2

THEME: MATERIAL WORLD

TOPIC: CHEMISTRY IN DAILY LIFE

Chapter 4

MODULE 2

Meghshala was the content partner for this module

SPIRALLING OF THE CURRICULUM

Chemistry was treated as a process.
Children get the idea of why and what is happening than just doing.
Spiralling of sustainability was also a major consideration
Based on their course and level of the topics the content was divided.

CONTENT HOOK

Not spiralling the content, but spiralling the skills.

LEVEL 1- GRADE 6

CHEMISTRY IN FOOD

FLOW OF LESSON

Students are introduced to the concept of fermentation as a chemical process

They understand they useful benefits of chemistry in food

Along with that, they are then introduced to adulteration as a harmful use of chemistry in food

They then test for adulterants

Perform a skit on different scenarios where adulteration is observed

Skill to be developed by this course end

Knowing the why and what of things around them.
Effective communication.

WEEK 1
CONTENT

The yeast or leaven, which is a fungus, causes the decomposition of sugar, with the release of CO2. It's the formation of CO2 bubbles, trapped in the gluten network that makes the dough grow and produce the" perforated" texture of bread.
A chemical change in animal and vegetable matter brought about by microscopic yeasts, bacteria, and molds is called fermentation.
When we ferment the batter for making dosa or idli, or when we mix maida for making bread, the yeast that is added mixes with the sugar present in the batter to release carbon dioxide. This carbon dioxide that is released makes the bread fluffy and soft.
Baking soda acts like the yeast and bacteria, producing carbon dioxide when reacting with the sugars in the batter. Usually for large scale fermentation and production of breads/idli/dosa/ cakes we use baking soda. Just a small pinch of baking soda added to the batter will release enough carbon dioxide that will make the product fluffy and soft.

LEARNING OUTCOMES:
Learn how chemicals are used in food preparation - (fermentation) using yeast.
Learn about the chemistry of fermentation using yeast and ENO. (Using chemical to test the purity of food items)

LESSON HOOK

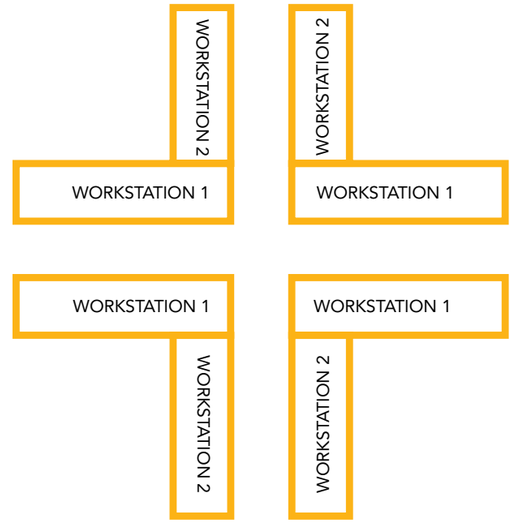
Based on that objective, there was a need to start with an experiment; hence the workspace itself was treated as the lesson hook.
A layout was made based on the existing furniture and class space.

Assistance of collaterals – as the lesson hook was the workplace, there is a need for it to be assisted with the collaterals. The collaterals that are needed for the workstation are workstation names and instructional guidelines.

HANDS - ON ACTIVITY

SETUP

There are 4 groups. Each group has 2 workstations. On each workstation there are tags and instructional cards.



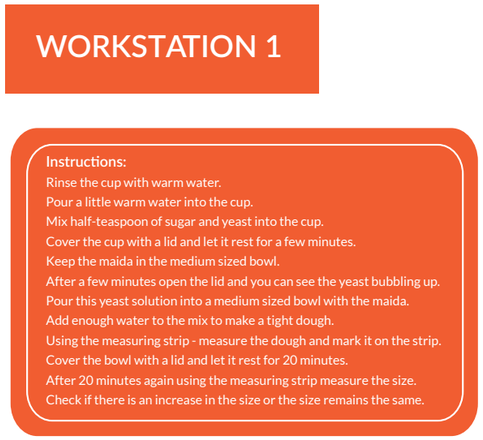
Layout

ACTIVITY I: WORKSTATION 1

Inside the class (Around 25 mins)
Small group or divide the class into 3 groups.
Hook - Classroom setup for the experiment - Workstations for 2 activities. Arranged in L forms - center point: center of class
Facilitator:
Set the class in the layout before all the students enter the class. Put the placard for workstation 1 and workstation 2 and place the materials on the desks.

STEPS

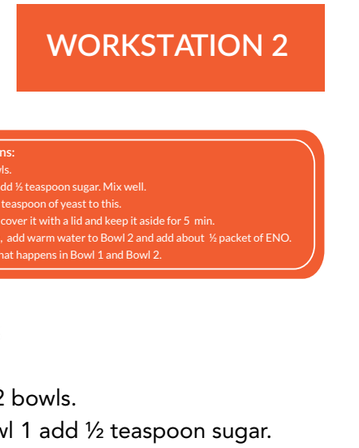
» Rinse the cup with warm water.
» Pour a little warm water into the cup.
» Mix half-teaspoon of sugar and yeast into the cup.
» Cover the cup with a lid and let it rest for a few minutes.
» Keep the maida in the medium sized bowl.
» After a few minutes open the lid and you can see the yeast bubbling up.
» Pour this yeast solution into a medium sized bowl with the maida.
» Add enough water to the mix to make a tight dough.
» Using the measuring strip - measure the dough and mark it on the strip.
» Cover the bowl with a lid and let it rest for 20 minutes.
» After 20 minutes again using the measuring strip measure the size.
» Check if there is an increase in the size or the size remains the same.



Materials required (for each group)
1.Yeast
2.Warm water
3.Sugar
4.Spoon
5.Cup
6.Lid
7.Maida/wheat flour/jowar/ragi (around 50 g)
8.Water
9.Medium sized bowl
10.Lid
11.Measuring strip

FLOW OF CLASS
Facilitator notes:
Bring to attention how different doughs react to the fermentation process - Questions to lead to the second activity: Let us rest the dough for 20 minutes because there is a chemical reaction happening,

Till then, let us try and find out what is happening inside the dough.



ACTIVITY II: WORKSTATION 2

Time Required: 25 minutes
Inside the class
Small group activity,divide the class into 3 groups

Materials Required / Needed : For each group
1.2 small bowls
2.1 packet ENO
3.½ Spoon of yeast
4.Warm water
5.½ teaspoon Sugar
6.A small lid

Followed by:
Facilitator note: They will see that the dough has risen up (doubled in size) and small pores on the surface of the dough. This indicates the fermentation process where the yeast releases the carbon dioxide and causes the dough to rise.

Revisit the dough after 20 mins. Height of the dough is measured by a measuring strip

STEPS

Take 2 bowls.
To Bowl 1 add ½ teaspoon sugar.
Mix well.
Now add ½ teaspoon of yeast to this.
Mix gently, cover it with a lid and keep it aside for 5 min.
After 5 min, add warm water to Bowl 2 and add about ½ packet of ENO.
Observe what happens in Bowl 1 and Bowl 2.

WORKSTATION TAGS

WEEK 2
CONTENT

Adulteration is to (illegally) add impure ingredients to a product or to substitute a cheaper ingredient for a more expensive one.

ACTIVITY 1

» Divide the class into small groups.
» The facilitator will pass two plates - one with black peppercorns and the other with dried papaya seeds.
» Students have take one from each plate.
» They have to observe how it looks and taste both.
» The facilitator then passes another plate which has both black peppercorns and papaya seeds mixed.
» Students have to say if they notice anything markedly different - i.e. if they can just by looking at it can they make out that it has papaya seeds in it.

ACTIVITY 2

Four workstations have to be set up. Each of the workstation must have the material needed for that testing with an instruction card placed on it.
Materials required:
1.A cup of milk (each group gets two to three teaspoon of milk)
2.Iodine solution
3.Glass tumbler
4.Red chilli powder
5.Acetone (nail polish remover)
6.Common salt
7.Water
8.Tea leaves
9.Filter paper

TEST FOR ADULTERATION OF FOOD

1.Milk

Take a teaspoon of milk in a glass tumbler and add a few drops of iodine to milk. If the milk changes to blue, it has starch in it. Milk is adulterated.

FACILITATOR EXPLANATION - Starch is added to diluted milk (milk with water) to make it thick. Too much starch can cause can cause stomach problem and digestion problems.

2.Tea leaves

Take some tea leaves and put it on wet filter paper. Wait for a few minutes. Remove the tea leaves. If you see pink or red spots on the filter, the tea is adulterated. Fresh tea leaves give a brown or dark brown colour, on filter paper.

FACILITATOR EXPLANATION - Used tea leaves are added to fresh tea leaves and sold in shops. The used tea leaves are coloured to look like fresh leaves. To test if the tea has old tea leaves, we use wet filter paper.

3.Red chilli powder

Take a pinch of red chilli powder in a transparent test tube. Add a few drops of acetone to it, so that the chilli powder is completely covered by acetone.
Shake the test tube well. If the acetone layer turns red, it shows presence of rhodamine.

FACILITATOR EXPLANATION - Rhodamine is a colour that is used in many experiments. If this is used in any food product, and it is eaten, it can cause different types of cancer in animals

4.Common salt -

Take a glass of water and add a big pinch of salt to it. If there is anything settled at the bottom of the glass it means that the salt is adulterated.

FACILITATOR EXPLANATION - White powdered stone is not digested by our stomach. It can cause cuts and wounds in parts of body, as it passes through them. This is very dangerous for the health of the animal or man that eats this adulterated salt.

Take a pinch of red chilli powder in a transparent test tube. Add a few drops of acetone to it, so that the chilli powder is completely covered by acetone. Shake the test tube well. If the acetone layer turns red, it shows presence of rhodamine.

Common adulterants used in Red chilli powder – red lead powder, brick powder, red tar colour

What is the adulterant added?

Why do you think this chemical is added?

What do you think will happen if too much of this enters your body?

WORKSTATION TAGS

ASSESSMENT

ROLE-PLAY

Assessment has been made into a lesson outcome where the students are made sensitive to their surroundings to find the reason of why and what is happening. They have to empathize with the different scenarios and different people.

Role Play:
This methodology was selected based of the time and empathy it involves while increasing their knowledge about their surroundings.

Instructions

Each group will be given a different scenario and will have to present the idea in the form of a role-play or skit in their school assembly after 3 days.
Group 1: You are the buyer (Think of it from a customer point of view buying a food product)

Group 2: You are the seller (Think of this scenario from a shopkeeper point of view. How can you make a profit - by selling less and making more money)

Group 3: Creating awareness - This is to educate people and make people aware about how adulterants are commonly added to food.

Group 4: Harmful effects of adulteration: This is to show how some adulterants are commonly added to food, adding a large quantity of the adulterant can cause harm and affect health.

You are the seller (Think of this scenario from a shopkeeper point of view. How can you make a profit - by selling less and making more money)

You are the buyer (Think of it from a customer point of view buying a food product)

Creating awareness - This is to educate people and make people aware about how adulterants are commonly added to food.

LEVEL 2- GRADE 7

CHEMISTRY IN SOAPS

FLOW OF LESSON

Pre-activity poster

Scenario build-up conversation between boy and girl for the LATHER activity.

A comic strip with girl and boy having conversation about clean hands.

Soap cleaning + cloth activity

WORKSHEET activity: they put it up on the wall.

Talk about lather being considered as a factor while cleaning.

Discussion leads to explanation of the soap mechanism through a prop

Introduction of students to REETHA as a natural soap

Ask the students to dip their hand into the solution and create lather.
Followed by questions/discussion.

Begin week 2 activity with scenario introduction by facilitator

Students understanding that chemistry cleans - by the advertisement activity

Students do the activity of making 3 soap solutions with man made soap/reetha solution as a base

Students present their products again by advertisement.

LEARNING OUTCOMES

Understanding that soaps are cleaning agents - by testing different kinds of soaps

Understand that there are natural cleaning agents available, that can be used instead of a soap. Also, make a soap with natural detergent and learn about its properties

Learning how soap works as an insecticide by making one.

ACTIVITY 1

Students fill the poster that has columns to fill various types of cleansing agents

LESSON HOOK

A poster
There was a need to involve the children in a discussion based on recalling the things they see around them

Class hook:
A Wall – everything in this module goes on the wall
The wall is the element that links the entire session together.

Why

A poster/chart is a lesson hook that is used to start the lecture; we need to generate their interest and it has to be briefly done. The poster is just a medium of starting a conversation with the children and involving them in writing their answers.

How

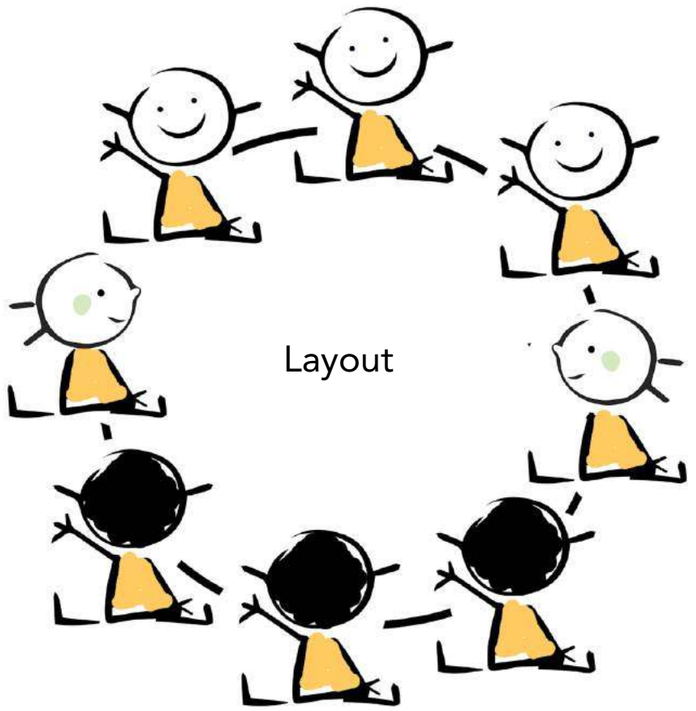
The facilitator sits with the children in a circle with a poster in the middle and one of the children write the chemicals.

Why a circle formation?
To involve all the children in the discussion

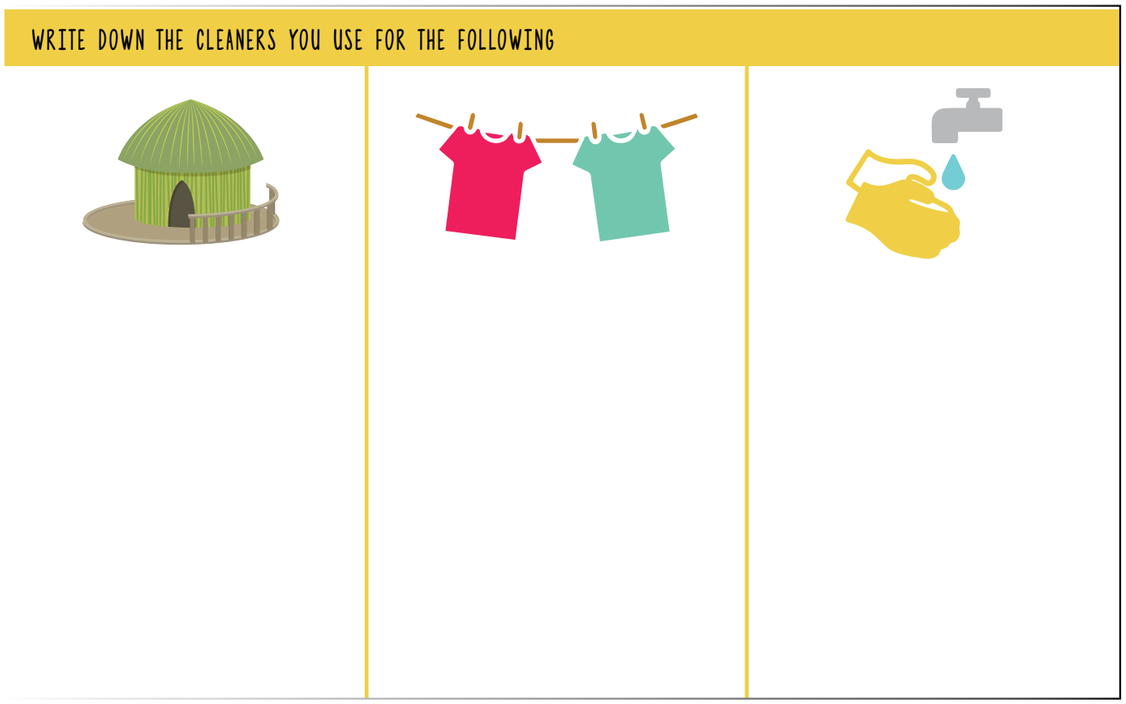
Outcome

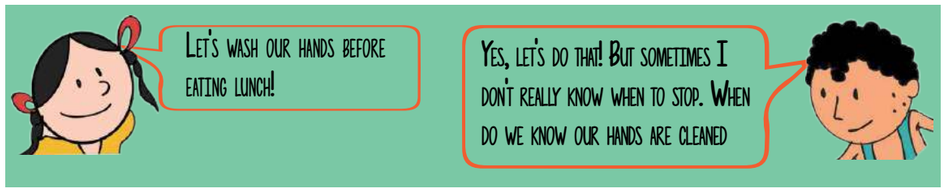
The children have start thinking about the cleansing agents around them, they have to start observing the chemicals they use in their daily lives (post class)

They have to understand it is because the chemical properties of the materials that causes cleaning.



POSTER





To be put on the wall

PRE-ACTIVITY QUESTION

Conversation with pictures:
Picture/poster activity: Conversation between Sneha and Nagaraj
Sneha: Let's wash our hands before eating lunch
Nagaraj: Yes, let's do that! But sometimes I don't really know when to stop. When do we know our hands are cleaned?

Bringing in of characters

Reason: Instead of directly asking the question, it is better is to make them relate to the characters and understand the concepts and questions through them. Eventually each child will relate to one or the other character.

ACTIVITY

Experimentation with different soaps

PART I: Outside the class - preferably near a water tap.
Small group activity - 3 -4 persons

Materials required (for each group)
1.Three different pieces of soap (preferably Lifeboy, lux and Khadi)
2.Three pieces of dirty cloth
3.Access to a tap with running water or a bucket of water and a mug.

STEPS

1.Give the students their piece of - each student gets a different piece.
2.They will have to wash their hands with it.
3.After their wash their hands, they will have to come inside the class and fill up the table that will be given to them.

PART II: Let's clean the piece of cloth.

Steps:
1.In the same groups as they were in before students will take the same piece of soap that they used before and clean the piece of dirty cloth given to them.
2.They will observe if more lather was produced by the soap did that help clean the cloth better.

HOW DO WE KNOW OUR HANDS ARE GETTING CLEANED BY THE SOAP?

ANALYSIS

Question them in a set format so that their observation; reasoning and analysis improve.

How

A worksheet; Not putting in comparison directly but indirectly making them analyse and compare (combining the earlier: table of lather and thinking of reasons)

Why

To record their observation; to analyse in groups

Outcome

They should become more observant and they have to record the observations and come up with reasons of why what soap is better? (secondary outcomes: their convincing power to others; peer working)

Medium

Write three things that you think is there in the soap that helps in cleaning your hand

Soap	Factor 1	Factor 2	Factor 3
Soap 1			
Soap 2			
Soap 3			

PROPS

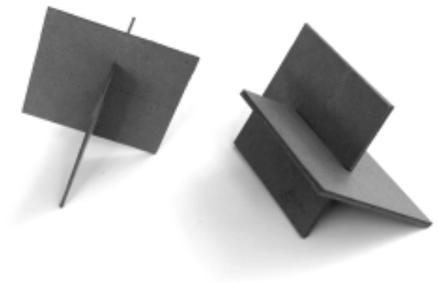
Once the groups come up with FOAM, facilitators correct them and explain the concept of soap using cardboard activity

Objective: to explain the action of soap.

4 cardboard pieces with slots: white-sodium, green: fatty acid, brown: dirt, blue: water

How: to be done in a circle facilitator sitting with the children

Cardboard piece fit activity
White cardboard + green = fat+sodium
White cardboard + brown = fat + dirt
White cardboard + water (blue) = sodium salts (dissolved in water)



DEMONSTRATION

Facilitator will have two bowls:
In one bowl create lather with a soap powder and in second bowl Reetha soaked in water will also have lather.

Facilitator explanation: The agent causing foam is the foaming agent. Many personal care products have a foaming agent added to them. That's how we get that frothy lather we know and love. The most commonly used foaming agents are cocamide DEA, MEA or TEA.

Imagine if we were to add a foaming agent to reetha - What will happen?

With the foaming agent do you think the Reetha got more power to clean?

Even without the foaming agent, Reetha still cleans your hands. The foam is not responsible for cleaning. Reetha has natural chemicals that react with dirt and remove it.

WEEK 2

They are given advertisements of products that have chemicals in them.

The products chosen can be recognised easily by children.

They start of with guessing the products in the advertisements they see everyday. They then guess the action it does, the property is has and the other natural elements where the same property is found.

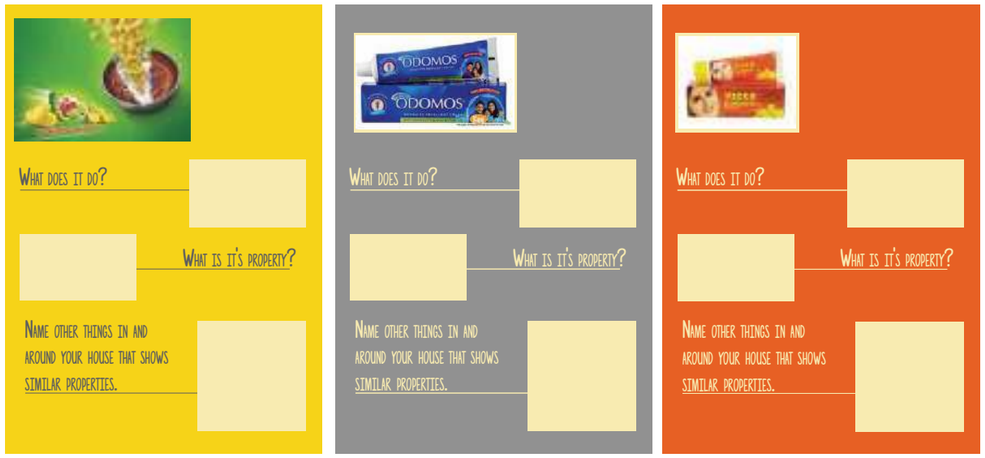
What does it do?

What is it's property?

Name other things in and around your house that shows similar properties.

MEDIUM

page 226



Once they name things, they use those natural chemicals to make their insecticides.

The module is made in such a way that it completes a loop.
In this module the hook was to start with an advertisement and end in the same way.

We know that soaps are used a cleaning agent. Did you know that we can use soaps to make an insecticide too.

Materials needed:
1.Reetha solution
2.Vinegar (Available in shops) (Facilitator note - Vinegar and lemon have the same chemical property)
3.Garlic (Powdered or fresh)
4.Dry red chilli powder
5.Hot water (2 litres to soak)
6.3 empty Colin spray bottles / spray bottles (for filling the insecticide soap)

To make homemade 2% insecticidal soap, mix together:
Soak about 250 grams of Reetha in 2 litres hot water for 3-4 hours to make a natural soap solution.
Use this to make the different insecticide soap solutions given.

Now, we can make different combinations from the same solution, as described below:

GROUP 1
Use the reetha solution as it is
FACILITATOR EXPLANATION:
Reetha is an insecticide. It kills the insects, without harming the environment and plants.

GROUP 2
Vinegar: To make a spray that also targets fungus on plants, add a teaspoon of vinegar to the bottle of reetha solution provided.

GROUP 3
Garlic: To help repel chewing insects, add a teaspoon of powdered or finely cut fresh garlic to the bottle of reetha solution provided.

GROUP 4
Dry Red chilli: To help repel chewing insects, add a teaspoon of ground dry red chilli powder to the bottle of reetha solution provided.
You can test the effectiveness of these solutions on the plants that you see around your house.

ASSESSMENT

Make the students prepare an advertisement.
Do an advertisement to sell your insecticidal soap!
It could be through a:
Role play, draw a picture etc. (they should be free to present it whatever way they like)

A part of the evaluation happens after a month by testing the pesticides and coming up with the best one for a given scenario.
For the formative assessment, they are just given a small brief and they have to come up with the a presentation.
By this, their spontaneity is tested and improved along with improving their presentation and decision making skill.

Application:
Spray it inside their school.
Try it on different plants.
Record your observation. Try it at the field.
Which solution will be most effective?

LEVEL 3- GRADE 8

COMBUSTION AND ENERGY

LEARNING OUTCOME

Learn about Combustion using a candle.

a. Learn about soot formation using a candle, match sticks, kerosene

b. Use a picture grouping method to evaluate efficiency of different types of fuel.

Build a particulate collector

Learn about fuel efficiency by observing vehicle emissions and interpreting the data collected

List out the different sources of smoke and fill in the framework that will help them think of a solution.

CONTENT

Delivered by the facilitator

We see that the candle burns brightly for a few minutes. It uses the oxygen/air that is present in the glass.
Towards the end, the candle goes off completely (because there is no air for it to burn), and the level of the coloured water starts rising inside the glass. This is because the air inside the glass is used by the candle to burn. This creates a vacuum, which causes the water level to rise inside the inverted glass.

HANDS-ON

ACTIVITY 1

Candle flame oxygen experiment

Correlation with the Syllabus:
Grade 8 - Heat
Grade 7 - Combustion, Energy

Lesson Outline
Inside class - 20 min; Done in small groups of 3-4

Materials required:
a. Candle
b. Match box
c. Glass tumbler
d. Colour water
e. Large Plate

STEPS
1.Pour Coloured water onto a plate.
2.Place the candle in the centre of the plate.
3.Light the candle.
4.Cover the candle with the glass tumbler .
5.Observe what happens to the candle and the water.

CONTENT

Delivered by the facilitator

The black deposit on the bottom of the spoon, after the match stick burns, and the black deposit that is formed on the glass are all SOOT.

SOOT is formed when the fuel is not burnt fully.

Examples of fuels that do not burn fully (soot formation)- Wax, Kerosene, Petrol, Firewood, Cow dung cakes; Examples of fuels that burn completely (less/no soot formation) - LPG, Biogas

a. Soot is formed when fuel does not burn fully.
b. When a fuel burns completely, it produces less or no soot like LPG.
c. To study fuel efficiency in cooking fuels, we look soot formation on vessels
d. To study fuel efficiency in vehicles, we look at the colour of smoke emitted.

When we burn fuel we can see soot formation and emission, in the same way to find out what are the particles that are found in our environment we can make a particulate collector and check the quality of the air we breathe.

HANDS-ON

(Inside class - 20 min; Done in small groups of 3-4)
If there are 6 groups of 4 students each, divide part 1, 2 and 3 among the groups. 1 per group.

PART I
Materials required:
a. Candle
b. Steel spoon
c. Match box
d. Insulation tape

STEPS

1.Wrap the spoon handle with insulation tape.
2.Light the candle.
3.Hold the spoon over the candle flame for 3-5 minutes.
4.Turn the spoon around and observe.
5.Write down your observation.
6.Touch the spoon after it cools down.

PART II
Material required:
Match sticks-10
Steel plate

STEPS

1.Cut the match stick head and collect in a steel plate.
2.Light up the match sticks.
3.Observe the soot left behind after the matchstick burns.

PART III
Material required:
Kerosene lamp
Kerosene
Matchstick

Steps:
1.Light the kerosene lamp.
2.Let it burn for 5-10 minutes
3.Observe what happens to the protective glass covering.

MODEL

ACTIVITY 2

Make students develop model of a particulate matter for testing of the particulate deposit placed at 3-4 different locations.

Use of models

The model of particulate matter is also a hook as they try a model in the real scenario. **It is good to give such things to students that can be tested easily and have instant results.**

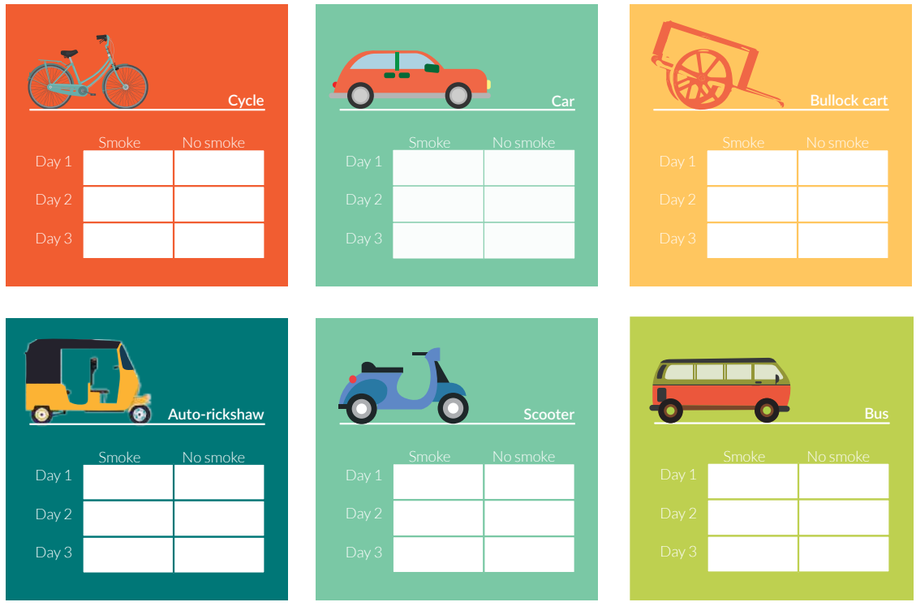
Materials needed: (This is for one - need material enough to make 3 collectors)
Two glass jars - one big and one small. (The small one must fit into the bigger glass jar)
Petroleum jelly

Steps:
1.Apply Petroleum jelly outside the small jar.
2.Place the small jar inside the big jar.
3.The particulate collector is ready .

WHAT TO DO

What to do with the particulate collector?
The whole class will make three collectors.
The collectors have to be placed at three different locations outside school collectively decided by the facilitator and the students.
The collector has to be placed in a place where it does not hinder any public or people trip.
Two students have to go and check everyday to make sure the collector is in place.
In case it rains, collect the rain water in a separate bottle and keep it safely. The collector is again placed there.

Students will do this for 4 days.
After four days, the collectors will be taken and kept in their classroom until the next class.



PREPARATION FOR THE NEXT WEEK'S ACTIVITY AND DISCUSSION

To know how pollution-free our surroundings are, we will do a small exercise
Use the printed tabular column to record/write your observation.
For 4 days, after school, observe the number of vehicles you see, for 30 minutes.
In the TABULAR COLUMN, make a note in the 'smoke column' , if you see smoke coming out of the vehicle; if there is no smoke, make a note of it in the 'no smoke' column.
All these observations will be discussed in the NEXT CLASS.

DISCUSS AND INTERPRET

After recording your observations, DISCUSS and INTERPRET the observations (in your groups), with the help of the following questions:

What are your interpretations from the observations made?

Among the vehicles that use fuel, which type of vehicles give out more smoke?

FACILITATOR EXPLANATION - Fuel that is contaminated with another type of fuel - petrol/diesel mixed with kerosene - can reduce the mileage, and damage the engine. If the vehicles are not well-maintained. This can also cause the fuel to burn inefficiently.

Why do you think some vehicles give more smoke than the other?
FACILITATOR EXPLANATION - Vehicles need to be looked after regularly. If the vehicles are not regularly serviced, the engine can develop problems due to blockage, or leakage. This can also cause the fuel to burn inefficiently. This causes vehicle to produce more smoke.

Let us look at a tractor and bike here in particular:
- Do you think the scooter and tractor use the same fuel?(In case a student says they both use the same fuel, correct them at that point and say they are different fuels used for both the vehicles)
- Which do you think is more efficient or a better fuel?

Review: In case they are not able to answer this question, remind the students of the vessel burning activity- Where they connected the pictures of how different vessels looked after being cooked over different fuels. Here the idea of efficiency will come in.

Where do you see examples of smoke and combustion in your daily life? Make a list of these

From the list that students give, choose one of it preferably a chulha and show students how to fill the framework. Then from the list they will choose one aspect that they want to work on. They will fill the framework and come with a workable solution for the problem. If they need help with going forward with the solution, like making a prototype they will take help from the facilitator after the class.

PROJECT BASED LEARNING

Making them build their own solution

Approach/pedagogy followed:
Project based learning:

Here the project was on combustion and the solution of a problem can be found by breaking the existing problems/ solutions into smaller parts or by adding and replacing solutions.

The tool that could be used for the same is SCAMPER which was simplified and put in a chart form for execution

FRAMEWORK

DEFINE

What is the challenge you want to take?
What is the problem you want to address?
Consequence of the problem?
What is done about it till date?

APPROACHES

What if we minimize the effect by:
1.Substituting (elements that cause the problem):
2.Adding (elements in the environment to solve the problem)
3.Make people adapt to the current scenario:

HOW?
(Choose the most valid solution)

How will you PACKAGE it?

EXAMPLE OF A COMPLETED FRAMEWORK

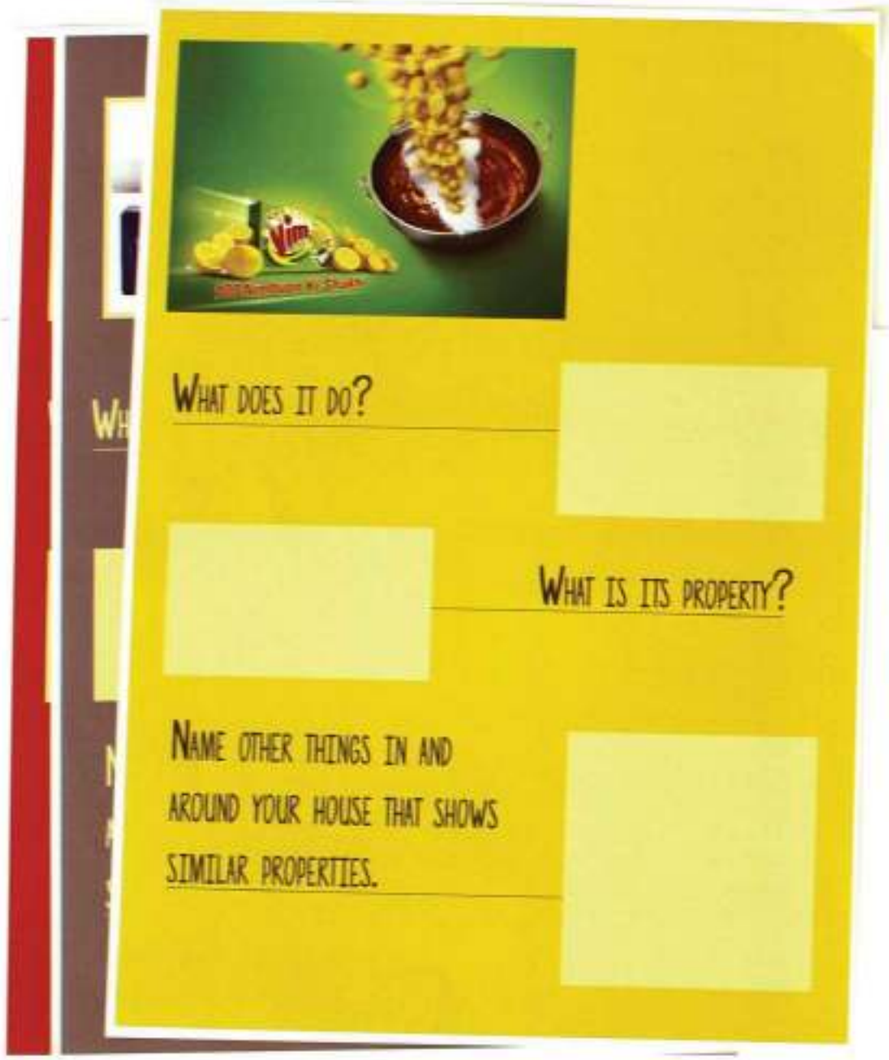
The scenario is : **My mother uses a Chulha. When she cooks, it produces a lot of smoke.**

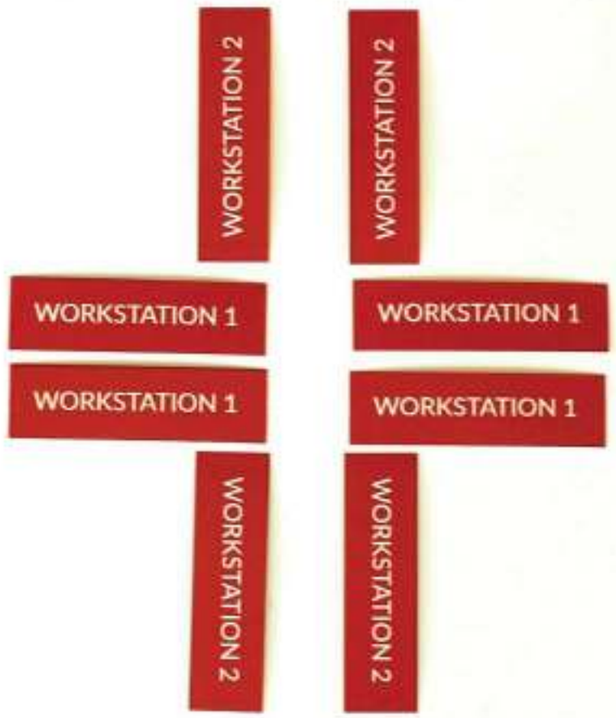
1.What is the challenge you want to take?
The challenge is the smoke produced by the Chulha
2.What is the problem you want to address?
The problem is to reduce the amount of smoke produced by the Chulha.
3.Consequence of the problem:
My mother falls ill due to excessive smoke produced and finds it difficult to breathe. She uses a cloth or pallu to minimize the smoke inhalation but this is not enough.
4.Solution to the problem:

Approach taken: To add something to the Chulha to reduce the smoke produced
How will I do it? - Adding a filter to the chimney .which will reduce the smoke from the Chulha.

To build a Filter which will minimise the amount of smoke that is emitted and reduce the carbon particles

At this point the facilitator will show an air filter and explain how it works and what it's made up of. The same principles can be used to make different kinds of filters.


WHAT DOES IT DO?
WHAT IS ITS PROPERTY?
NAME OTHER THINGS IN AND AROUND YOUR HOUSE THAT SHOWS SIMILAR PROPERTIES.


WORKSTATION 2
WORKSTATION 2
WORKSTATION 1
WORKSTATION 1
WORKSTATION 1
WORKSTATION 1
WORKSTATION 2
WORKSTATION 2


LET'S WASH OUR HANDS BEFORE EATING LUNCH!
YES, LET'S DO THAT! BUT SOMETIMES I DON'T REALLY KNOW WHEN TO STOP. WHEN DO WE KNOW OUR HANDS ARE CLEANED
YES, LET'S DO THAT! BUT SOMETIMES I DON'T REALLY KNOW WHEN TO STOP. WHEN DO WE KNOW OUR HANDS ARE CLEANED


Write three things that you think is there in the soap that helps in cleaning your hand
Soap
Factor 1
Factor 2
Factor 3
Soap 1
Soap 2
Soap 3


SOAPS

MODULE 3

THEME: PHYSICAL WORLD

TOPIC: ELECTRICITY AND ELECTROMAGNETISM

MAPPING AND SPIRALLING OF CONTENT

The content was mapped on the basis of the state board curriculum but was altered based on the how simply the content be presented to level 1, 2 and 3

LEVEL 1 - GRADE 6

CONTENT

Every substance is made up of atoms.
-Atoms have particles such as electrons and protons, and neutrons.
-Electrons are negatively charged, protons are positive & neutrons have no charge.

When an atom has the same number of protons as electrons, the charges cancel each other out and the atom is electrically neutral.
But atoms can lose or gain electrons. For example-Through rubbing in the above experiment, the hair loses electrons and the balloon gains electrons and gets a slight negative charge. (Remember….An atom that loses electrons becomes positively charged. An atom that gains electrons becomes negatively charged). The negative charge of the balloon creates a static electricity that attracts the pieces of the paper. The build-up of electric charge (either positive or negative) on an object is called static electricity. (The word static means “not moving.”)
Static electricity is the imbalance of positive and negative charges.

Every substance is made up of atoms.

-Atoms have particles such as electrons and protons, and neutrons.
-Electrons are negatively charged, protons are positive & neutrons have no charge.

All matter is made up of positive charges and negative charges. The protons are heavy and hence are not usually free to move. The electrons are lighter and are free to move. Negative charges are attracted to positive charges the same way mice are attracted to cheese.

Atoms contain charged particles called protons and electrons. Protons have a positive charge, while electrons have a negative charge. When an atom has the same number of protons as electrons, the charges cancel each other out and the atom is electrically neutral.
But atoms can lose or gain electrons. For example-Through rubbing in the above experiment, the hair loses electrons and the balloon gains electrons and gets a slight negative charge. (Remember: An atom that loses electrons becomes positively charged. An atom that gains electrons becomes negatively charged). The negative charge of the balloon creates a static electricity that attracts the pieces of the paper. The build-up of electric charge (either positive or negative) on an object is called static electricity. (The word static means “not moving.”)
Static electricity is the imbalance of positive and negative charges.

CHARGE

The fundamental electric quantity is charge.
–Atoms are composed of charge carrying particles: electrons and protons, and neutral particles, neutrons.
–The smallest amount of charge that exists is carried by an electron and a proton.

CURRENT

–Current is rate of flow of negatively-charged particles, called electrons, through a predetermined cross-sectional area in a conductor.

ELECTRON and PROTON

All matter is made up of positive charges and negative charges. The protons are heavy and hence are not usually free to move. The electrons are lighter and are free to move. Negative charges are attracted to positive charges the same way mice are attracted to cheese.

RESISTANCE

When the electric current flows through a wire experiences some stopping force, that is called the resistance.

VOLTAGE

Symbol: V
Unit: Volt
Potential difference across two terminals in a circuit “across variable.”
– In order to move charge from point A to point B, work needs to be done.
– Like potential energy at a water fall.
– Let A be the lower potential/voltage terminal
– Let B be the higher potential/voltage terminal
Then, voltage across A and B is the cost in energy required to move a unit positive charge from A to B.

One of the most important and basic laws of electrical circuits is Ohm’s law which states that the current passing through a conductor is proportional to the voltage over the resistance.

EXPERIMENTATION AND DERIVATION

I = current in amps,
V = voltage in volts, and
R = resistance in ohms

I=V/R

This same formula can be also be written in order to calculate for the voltage or the resistance:

I=V/R or V=IR or R=V/I

ACTIVITY BASED LEARNING

LEARNING OBJECTIVE

To study about static electricity; electric current; current, voltage and resistance

ACTIVITY 1: Static electricity

Static electricity forms the foundation for understanding the role of charges (positive, negative, neutral) in atoms.

A topic may not be in the order as per the curriculum of the state board but if the topic can generate curiosity in the child to know about the 'why' behind it then the order of the curriculum should be altered.

Explanation:
Assistance of props is taken into consideration to explain difficult concepts easily.

LESSON HOOK

Starting with an activity
that leads to a question

Assessment through Application:

Visual assessment: 2 atoms.. Electrons goes from one point to the other.
Electrons jumping from one to the other.
Which is what charge: guess.
3 balls/circle - show heavier, lighter and they have to mark.

ANALOGY

LEARNING OUTCOME

To make students understand the concept of current voltage and resistance

Medium:
Outdoor visit:
Make the students understand about the current voltage and resistance by taking them to the tap (used for washing plates)
Material required:
Wire and pipe
Explanation:
Take a wire and a pipe. Make them understand pipe and wire are analogous.

Analogies make a concept extremely simple to understand. For a concept like electricity where the elements like Voltage, Current and resistance are new - analogies can be helpful to explain the concepts easily.

Criteria to choose an analogy: Something that students already are aware of.

Mouse cheese analogy

Current water analogy

ASSESSMENT THROUGH ANALOGY

ACTIVITY 3

How to build a circuit
Methodology: demonstration

Facilitator demonstrates the circuit and explains a battery wire and LED

ASSESSMENT AND APPLICATION

Methodology:
Indirect methods of finding out; application
Pre assessment discussion:
You have understood the principle of water flowing in streams. Here is another analogy.
Bottle with holes (refer to fluid activity)
Now show them the bottle experiment and ask them to make the circuit representation
Provide them with 3 batteries and 3 LEDs and ask them to make the circuit

WEEK 2

The rest of the module was chosen to be experiment based learning along with facilitator explanation as it needs to be delivered by assessing level of the class.
Where experimentation was done to calculate the Voltage, Current and Resistance and derive to Ohm's law.

Learning outcome:
To measure V, I and R
After seeing this; ohms law formula can be introduced.
Materials required:
1. Different resistance (330 ohm, 500 ohm,1kohm and 3kohm)
2. Voltmeter (Digital)
3. Ammeter (Digital)
4. Rheostat
5. Connecting wires
6. Power supply
7. Key (Switch)

Diagram:

Part 1: Procedure to measure/calculate Resistance:
1. Arrange all the components of the experiments as shown in the diagram
2. Resistance is unknown in this experiment
3. Use the rheostat and vary the resistance
4. Take the readings of voltmeter and ammeter
5. Repeat the experiment and find the mean of the resistance

INTRODUCTION OF OHM'S LAW:
Ask them to observe the reading of V and I and make them come up-with the relation between the 2. i.e. V is directly proportional to I.
Then explain the Ohm's LAW.

Resistance(R) =voltage (v)/ current (I)

Procedure to measure/calculate Voltage:
1. Arrange all the components of the experiments as shown in the diagram
2. Paste sticker to the voltmeter
3. Use the known resistances in this experiment (330ohm, 500ohm, 1000ohm and 3kohm)
4. Use the rheostat and vary the resistance
5. Take the readings of ammeter
6. Repeat the experiment and find the mean of the voltage

Calculation:
Voltage (V) = Current (I) *Resistance (R)

Part 3: Procedure to measure/calculate Current:
1. Arrange all the components of the experiments as shown in the diagram
2. Paste sticker to the ammeter
3. Use the known resistances in this experiment (330ohm, 500ohm, 1000ohm and 3kohm)
4. Use the rheostat and vary the resistance
5. Take the readings of voltmeter
6. Repeat the experiment and find the mean of the current

Calculation:
Current (I) =Voltage (v)/ Resistance(R)

LEVEL 2 - GRADE 7

FLIPPED CLASSROOM

REVISION

Methodology
Peer teaching; Student driven classroom; flipped classroom

Description
Give them 4-5 sheets of reading material: Make them go through it for 3 days (home assessment).
Ask the students to read the material, understand what is given,create 4-5 questions on the content that they read,write the questions in the space provided on the workbook and come to next class with those questions.
The questions that the students create can be either on the topics they understood as well as the topics that they did not understand.
After 3 days: they are divided into 4 groups of 5 and asked to discuss the questions amongst themselves and choose 5 questions which they then write on the cards.

GROUP NUMBER: _____	GROUP NUMBER: _____
Q 1: _____	Q 1: _____
Q 2: _____	Q 2: _____
Q 3: _____	Q 3: _____
Q 4: _____ 	Q 4: _____ 

PART 2

Learning outcome

Students will be able to understand the Series and parallel connection
Students will be able to measure the effectiveness of resistance
Methodology:
Activity and demonstration

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DEMONSTRATION

ACTIVITY:
Magnetism through electricity
Ask the children about how do they think it happened?
And then explain electromagnetism
Electromagnetism:
Magnetism developed by a current of electricity

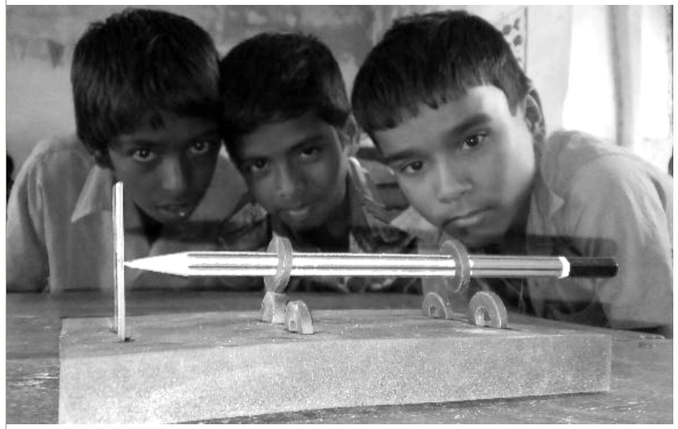
Electromagnet is a temporary magnet that is made by soft metal core made into a magnet by the passage of electric current through a coil surrounding it. When an electric current flows through a wire, it generates a magnetic field. The magnetic field can be increased by coiling the wire. This allows more current to flow through a smaller distance and increases the magnetic field.
(A permanent magnet retains the magnetic field without need for passing electricity.)

Right hand rule:
When current is flowing through a wire, the magnetic field rotates around the wire. The direction of the current determines the direction of the magnetic field. You can figure out the direction of the magnetic field using the “right-hand rule”.

To determine the direction of the magnetic field, look at the picture above. Take your right hand and point your thumb in the direction of the current (I). Now wrap your fingers around the wire. Your fingers will point in the direction of the rotation of the magnetic field (B).

ACTIVITY BASED LEARNING

Experiments, models, toy-making



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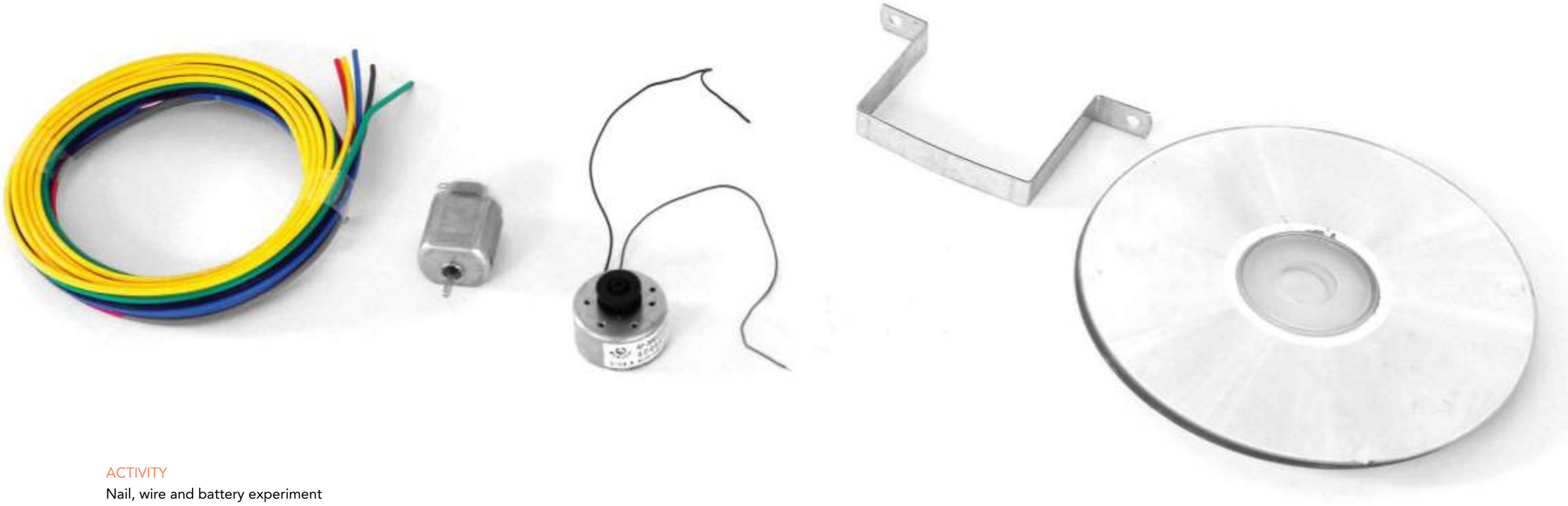


ACTIVITY

Nail, wire and battery experiment
Applications of electromagnet:
Creation of temporary magnets which can be controlled by electrical supply.

MOTORS

Explanation:
One of the important applications of electromagnetism is the electric motor. An electric motor converts electrical energy into physical movement. Electric motors generate magnetic fields with electric current through a coil. The magnetic field then causes a force with a magnet that causes movement or spinning that runs the motor.
A Motor is found in a fan, water pump.
(Ask where all students have seen a motor)

ELECTROMAGNETIC INDUCTION

Just as electricity may be harnessed to produce magnetism. Magnetism may also be harnessed to produce electricity. The latter process is known as electromagnetic induction. Another important application of electromagnetism is induction. Induction is when movement is used to create electricity (the opposite of using electricity to create movement). As a wire is moved through a magnetic field, current will begin to flow through it.

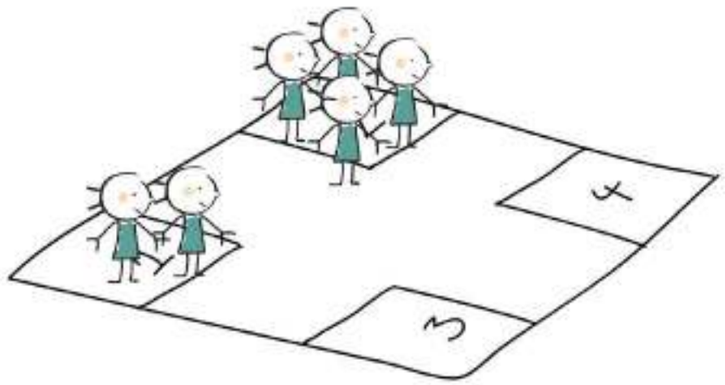
An example of electromagnetic induction is:
Generator
Explanation:
Electric generators convert mechanical energy into electrical energy using induction. As a coil of wire is spun between two opposite magnets, an electric current is generated that can be used to power electronic devices.

Generators can get their power from a wide variety of sources. Two popular electric generators of renewable energy include hydro-power and wind power.

LEVEL 3 - GRADE 8

An activity is added to a question-answer session to keep the students motivated throughout the session
Description:
There will be a question answer session where there are 4 options. Class has 4 spots: Spot 1-4
Children decide their option and run to spot 1, 2, 3, 4 – depending on the answer

LESSON HOOK
INQUIRY BASED ACTIVITY



QUESTIONS

The area around a magnet is called a .....
Magnetic area
Magnetic field
Magnetic force
Magnetic space

The ends of a bar magnet are called .....
East and west poles
North and south poles
North poles
South poles

If two north poles are near each other .....
Nothing will happen
They will attract
They will be demagnetized
They will repel

If a north and a south pole are near each other .....
Nothing will happen
They will attract
They will be demagnetized
They will repel

When a magnet is suspended .....
It will line up in E-W direction
It will line up in N-S direction
It will not move
It will point up-down

Two identical bulbs are in parallel in a complete circuit. If one breaks .....
The other bulb is brighter
The other bulb is dimmer
The other goes off
The other stays on

Two identical bulbs are in parallel in a complete circuit. A third identical bulb is connected in parallel. What happens?
All the bulbs are dimmer
All the bulbs are the same brightness
The third bulb is brighter
The third bulb is dimmer

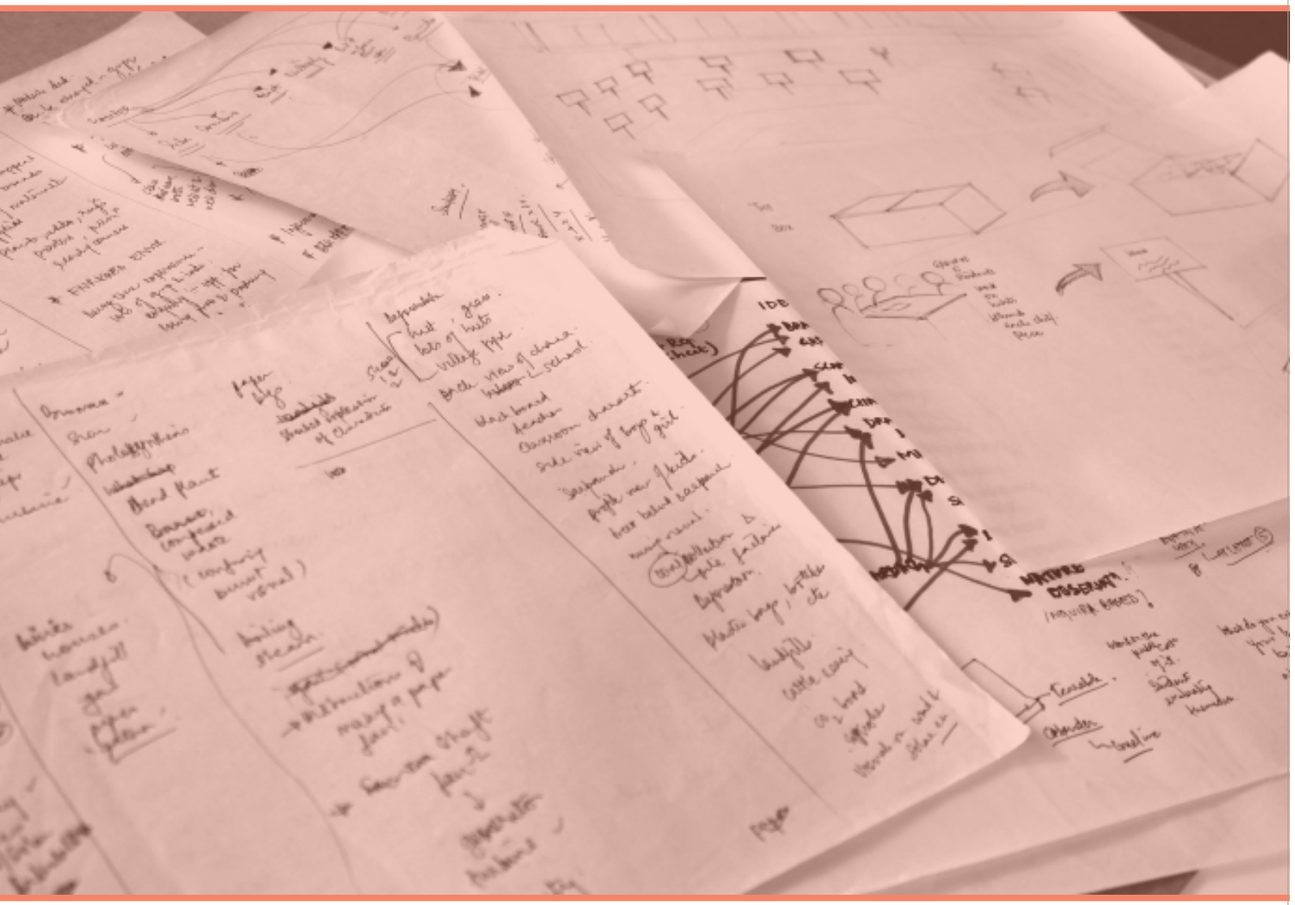
The current in a series circuit containing two bulbs .....
Is larger between the bulbs
Is larger nearer the battery
Is smaller nearer the battery
Is the same at every place in the circuit

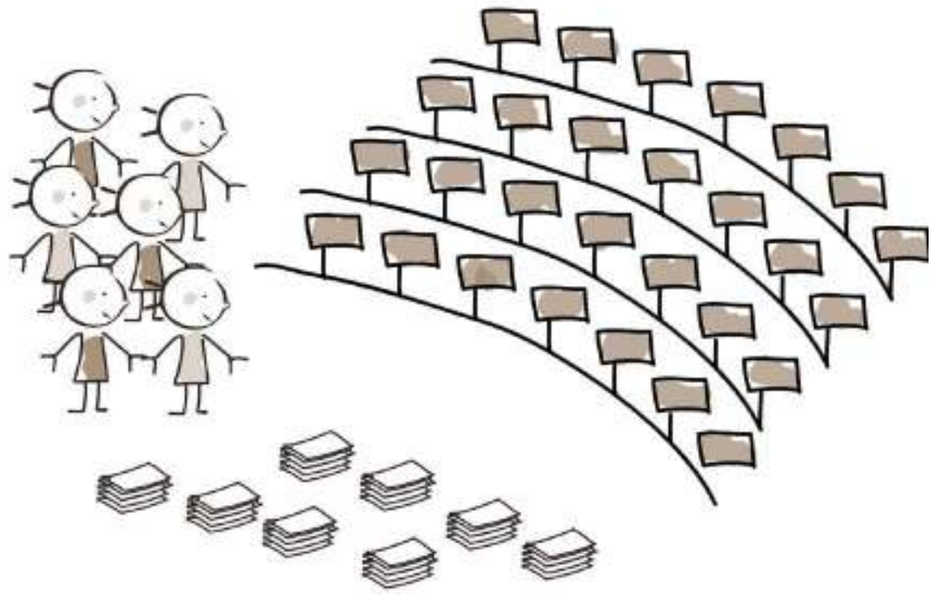
Three identical bulbs are in parallel in a complete circuit.

Chapter 4
MODULE 3

PART 2

Activity methodology: Game and activity based learning
Inquiry based learning and treasure hunt





INQUIRY BASED
TREASURE HUNT
GAME DESIGN

Reason:
Inquiry-based is one of the most effective tools for learning especially when it has to do with joining the dots. Treasure hunt is a tool used when step based learning is required.
Treasure is considered to be in formation, truth, or knowledge, and hunt implies inquiry, which is a systematic investigation.
Treasure hunt is an inquiry activity in which one systematically seeks knowledge with questions.

OBJECTIVE

To make the students understand the grid system and how the electricity flows
To make them aware about the different ways of producing electricity

INSTRUCTIONS

This game is to understand the grid lines and the channelizing of the different ways to produce energy.

In each way, we want them to know the different steps to produce energy
For example: For factories/coal the path is:
Coal is collected by mining - it is burnt in factories- water is heated with the heat produced-steam is generated-steam turbines move-that further moves the shaft of the generator-generator produces electricity- this electricity flows through wires. Wires are held by the poles and then electricity is transmitted in different houses.

By this activity: These stages and steps have to be explained to the children for each method.

In the game; Corresponding to each stage, there is a question; to this question – there is a corresponding answer.
Example -For coal:

What is the mostly used non- renewable source of energy? (ans.: Is a visual of the coal)
» How is it found? (Ans.: Mining)
» How is this coal treated? (Ans. Visual of fire)
» Where is this process done? Ans. Factories
» Water is heated to produce? Ans. Steam
» [For the turbine stage- they have to construct a turbine from scrap material]
» How can we use this to generate electricity? Ans. Generator
» How does the electricity get transmitted? Ans. - Wires
» What holds the wires in to make it go from place to place? Ans. Electricity poles
» And then they have to place the houses on the extra spot of their line – [Place the houses at the mentioned spots]

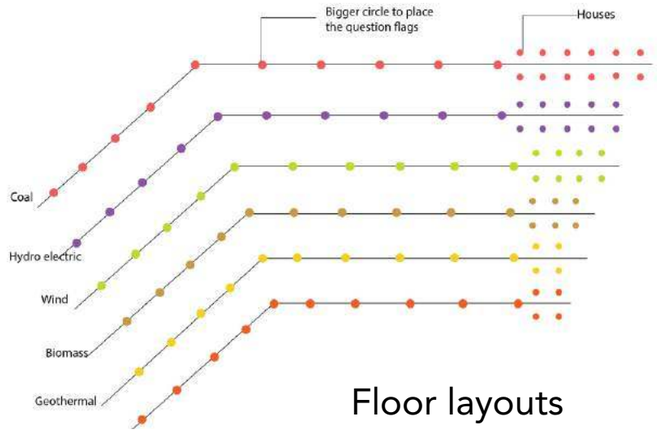
For coal it'll be the maximum and for solar – minimum divide the student in equal groups and give them one resource. (you may or may not assign roles of the each child within the groups)
Punch the toothpicks in the flags.(show pics)
Place the dough or clay balls at the marked location for each channel as shown in the layout.
Now put the question flags in order(make sure it is in the correct order).
For the answers:
Mix the options all 6 lines such that answers to the first question for all 5 groups are placed together. Answer for 2nd are placed together and so on and so forth. (In the ground: place these groups of options at different locations to ensure some movement in the groups)

Once the group is done with answering, students are asked to tie a thread and connect their answer flags in order.

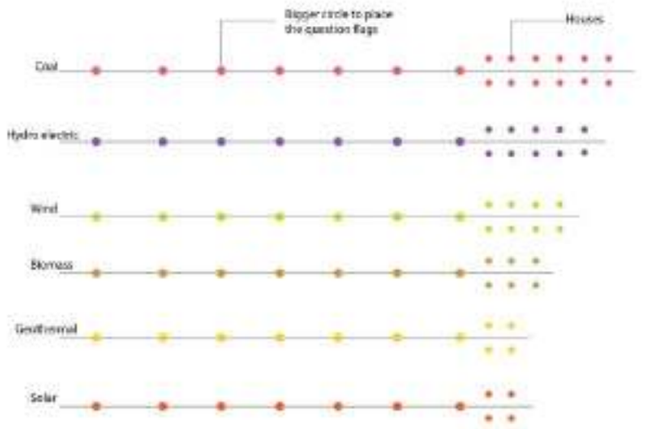
They have to later explain the whole class their understanding with the facilitators help.
In the end the facilitator has to explain that in the current scenario coal is used the most but now other ways to produce electricity is also available and we need to use them as well.

PRIOR EXPLANATION

Non renewable energy resources and Renewable energy resources



Floor layouts



PART 3
PROJECT BASED LEARNING

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VILLAGE EVALUATION AND ENERGY EFFICIENCY

1. Conducting energy audits
2. Evaluating the benefits of renewable energy sources
3. Exploring ways to reduce energy consumption

Find one house in the village that uses any kind of renewable energy source. For example, does anyone use solar water heaters? Does anyone have solar home lights? Does anyone use a biomass cook stove? Does any household use biogas?

Conduct an **audit** by asking questions which lead you to find out which is the most efficient energy source

Analyse in groups to conclude

Brainstorm to think of more ideas

How can we trap or capture this energy?

It helps in transportation of clouds and occurence of rain

FACT

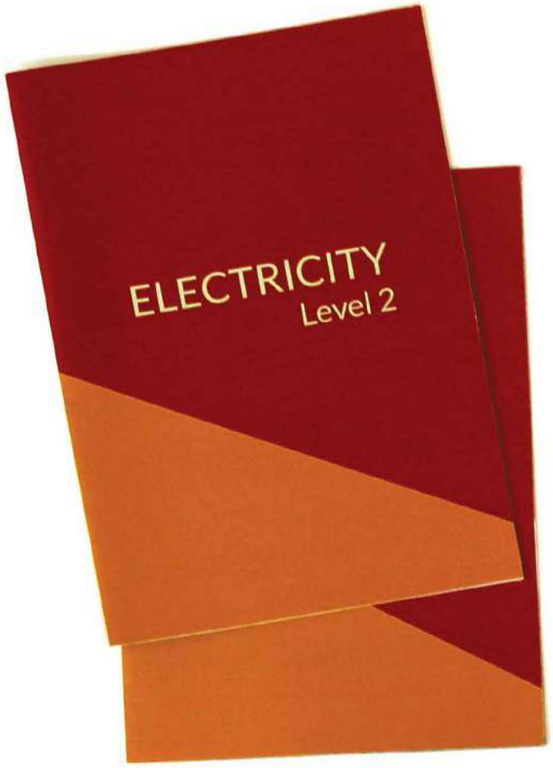
What is this energy called?

where else was it be used in ancient times?

Create a component which turns when wind blows through it

ELECTRICITY
Level 2

GROUP NUMBER:
Q 1:
Q 2:
Q 3:
Q 4:



MODULE 4

THEME: LIVING WORLD

TOPIC: INTERACTION AND INTERDEPENDENCIES

SPIRALLING

Skill and sustainability are the aspect that spiralled in all the levels, along with the content.
For higher grades- There is no direct revision but an application of what is done in the lower grades.

Skill to be developed

OBSERVATION
EXPRESSION
EMPATHY

Meghshala was the content partner for this module

LEVEL 1 - GRADE 6
BIODIVERSITY

LEARNING OBJECTIVE

Students learn about biodiversity by doing a Panorama drawing based activity

Material:
A3 sheet of paper (with guide), HB pencils, erasers, Exam writing board/ drawing boards, Cello tape (for sticking)

Activity guidelines: 360 degree panorama drawing - refer to the sheet guide
Place - Outdoor ground/school ground

INSTRUCTIONS

1.Find an open spot inside/outside school(not far) where you can make children sit in a big circle.
2.Make them count from 1-last number(depending on total number of students: for example if the total number is 30, they count from 1 to 30)
3.Make the students sit in a circle facing outwards.
4.They draw the view in front (the ground level view, the eye level view and the view above them), individually, as per facilitator instruction
5.They do this for 30 minutes.
6.Once they finish drawing outside, they return to the classroom.
7.The facilitator helps them stick the drawing number wise (from 1 to 30) on the wall - 10 minutes
8.They observe each other's drawings.
9.They have a whole class discussion

The students have to come up with the following observations:
They are different in terms of plants, number of animals and insects, the sky and the birds that they see around them.
There is a lot of variety seen. That variety is the biodiversity. These species coexist and that form a habitat.
They need to be told that Panorama means a 360° view of an area. The part that one student sees and draws is a part of the view.

LESSON HOOK

Observation through drawing

Main idea - The main idea that needs to come out through the drawing activity is the idea that even though the same area was observed, everyone observed very different things in their space.
So within the same area there was a lot of variety seen in vegetation, flora and fauna. So there was biodiversity seen even within a small space.

DISCUSSION LEADING TO CONCEPTS

What do you observe in all these drawings?
Do you think all the drawings are the same?
What differences do you see in these drawings? List them

WEEK 2 CONTENT

Living Things Need Energy From Food:
Energy can be defined as the capacity for change. Living things need energy for everything they do. For example, a butterfly needs energy to change position when it flies, and a daffodil needs energy to change size as it grows and blooms.
All living things get energy from food.
Green plants use energy from the sun to make their food. Plants use the food they make for energy to grow.
Animals get energy by eating plants or other animals.

The Sun is the Source. The energy in living things originates from the sun. Green plants are the only living organisms that can use the energy from the sun make food.

The relationship between the sun's energy and the energy required by living things will become clearer as the children learn about food chains and webs.

Children may cling to the idea that plants draw in usable food from the soil through their roots. It is true that plants absorb water and essential minerals from the soil and that they need water to make food.
Food contains energy, however, and the water and minerals in the soil do not contain energy. So plants use the energy from the sunlight plus water and minerals along with carbon dioxide from the air to produce food that contains energy.

Food Chains: A food chains' energy is transferred in sequence. For example, energy comes from the sun, to green plants, to animals that eat plants, and to animals that eat other animals.

Green plants use the sun's energy directly to make food. When animals eat green plants and other animals eat those animals, the energy moves from one living thing to another along the food chain.
Animals that eat plants are called herbivores, animals that eat both plants and animals are called omnivores, and animals that eat only other animals are called carnivores.
Ultimately, all members of a food chain depend on the energy from the sun that green plants transform into food energy.

Food Webs:
Food webs are more complex than food chains. They consist of many food chains that are interconnected. The following example is a series of food chains, which together make a food web.

FLOW OF CLASS

Divide the class into 2 groups.

Each student in the group gets a card with a variable in it. The card will have two or three lines on its role in the pyramid.

Each variable will then introduce who they are and what they eat.

Then they do the web activity.

After the web activity the facilitator places the food pyramid chart (trophic level) in the middle of the group.

Each variable will discuss in their group where in the food pyramid do they fit.

Then according to the colour of the food pyramid the students will colour their variable card according to where they fit in the pyramid.

Then the facilitator explains in detail the food pyramid and the components in each layer of the pyramid.

After this discussion, each group is given three scenarios. These scenarios are those that create imbalance in the food web.

Students will discuss in their groups how the imbalance affects the food web and in turn the food chain.

Materials
1. Ball of yarn
2. Activity Sheets 1- 8 (pictures of prairie plants and animals)
3. Tape to attach pictures to clothing

Note: The activity has to be conducted in an open space either inside or outside the class to form a large circle .

HOW TO CONDUCT

CONCEPT 1 AND 2

Have students tape the picture each to their chests.
Tell the students that they will make a food web. Have them stand in a circle and introduce themselves as the plant or animal they represent. The student with the sun picture should stand in the center. They should look around and ask themselves:
Who in the circle could I give my energy to? (Who might eat me?)
Who in the circle could give me energy? (Whom could I eat?)

Explain that the ball of yarn represents sunbeams, or energy from the sun.
Ask the student representing the sun to hold the end of the yarn tightly and toss the ball to someone who can use that energy (a green plant). When a student representing the green plant catches the ball of yarn, he or she should hold a piece of the yarn and throw the ball to someone else who could use the energy.

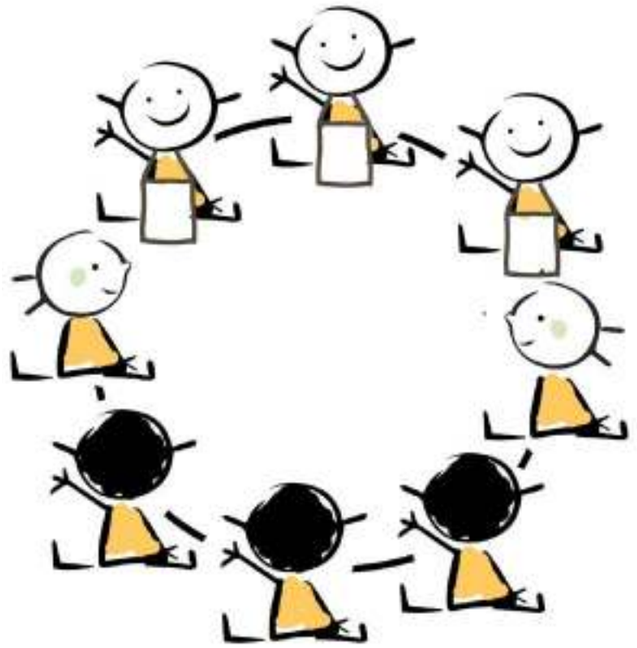
For example, the sun might throw the yarn to the grass, the grass to the grasshopper, and the grasshopper to the meadowlark. After the yarn reaches a carnivore, break it off to represent one food chain.
(Explain that humans, bears, raccoons, etc. are omnivores and can end a food chain, or they could be eaten by a carnivore.) After the first food chain is completed, a view from above might look like this.

Ask: How can all these other plants and animals get the energy they need?(Through different food chains)

Return the yarn to the sun to start another chain. This time the sun might throw its energy to the grass, the grass to the field mouse, and the field mouse to a great horned owl. Again, break the yarn, throw it back to the sun, and have the sun start another chain. Continue making chains until every student holds at least one strand of yarn.

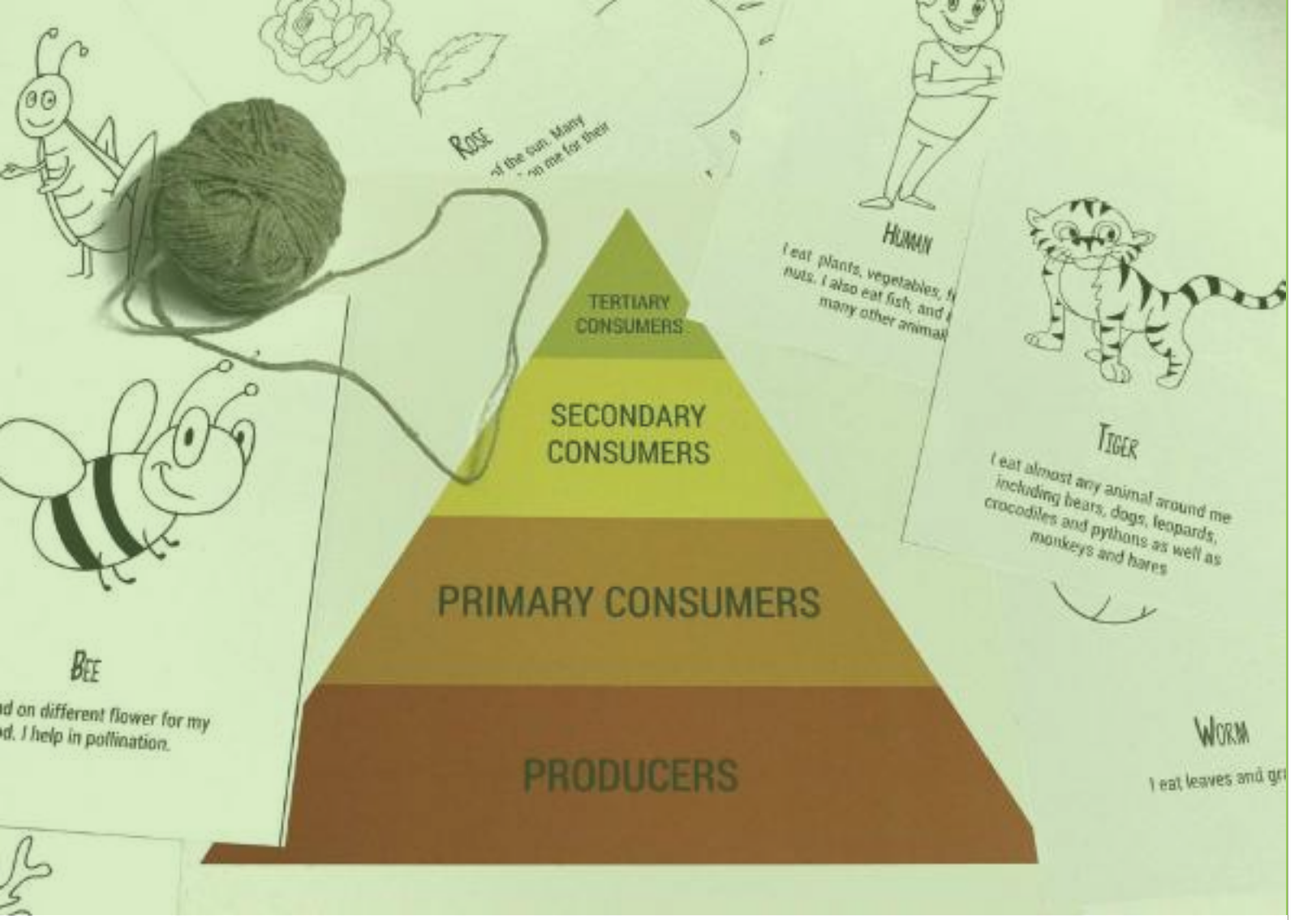
Ask: Have we made food chains? (Yes, lots of them!)
What do all of our food chains together look like? (A food web.)
What is the difference between a food chain and food web? (A food web is made up of several food chains. A web is more complicated than a chain because it has connections among the chains.)
Who is holding the most pieces of yarn? (The sun.)
Why? (Because each food chain starts with the sun.)
Who else is part of many food chains? (Green plants)

What would happen if all the green plants died? (Nothing else in the food web could survive?
If all the sunflower is gone, who may have trouble getting enough food?



FLOW OF ACTIVITY

When multiple concepts need to be explained through one activity, it needs to have a flow. In this activity there are 3 concepts and concept has to lead to the other



CONCEPT 3

SCENARIOS FOR IMBALANCE

1.Imagine in your habitat the only producer is rose - how will it affect the food chain.
Rose is a thorny plant. Most primary consumers do not eat the rose plant because it is thorny. Only pollinators and insects will visit the plant. The other animals avoid it, which means these animals do not have food to eat. So eventually the number of these animals will come down and this in turn will affect the animals in the secondary and tertiary trophic levels.

2. Have you ever noticed Sparrow are going extinct? Do you think that will affect the humans in any way?
Lack of sparrows affect the ecosystem in agricultural area. Sparrows help in controlling pests that attack the crops. Of late due to the installation of microwave tower (mobile towers) the numbers of sparrow is decreasing, as the radiation from the towers kills the sparrows. Sparrows

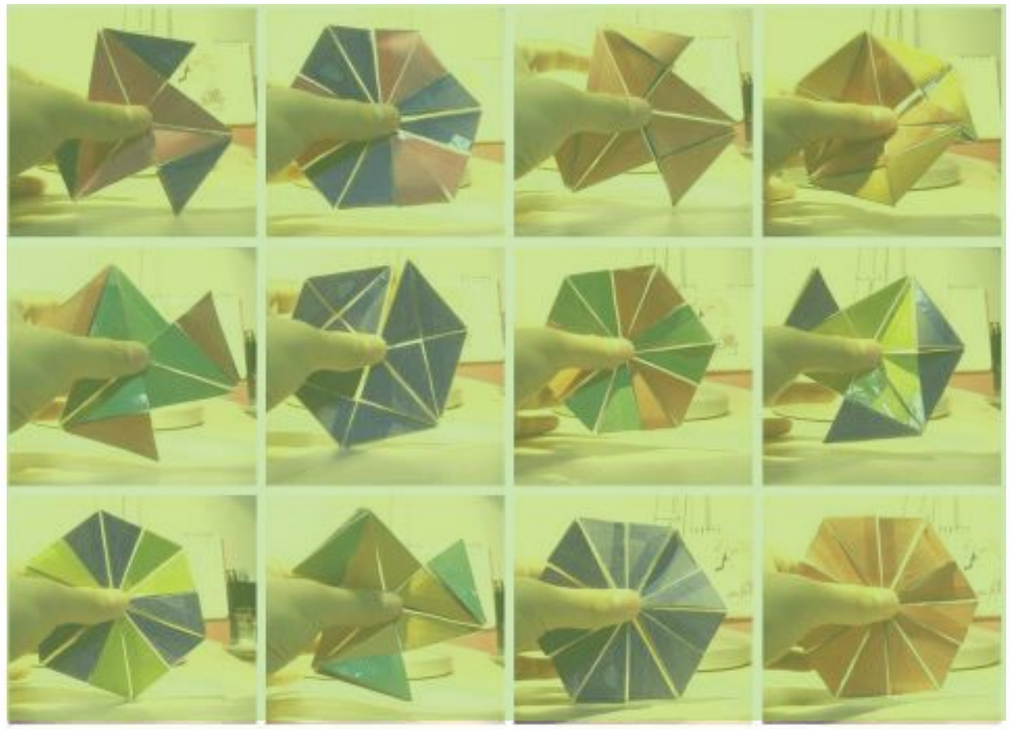
3. Imagine if there were no bees in your habitat?
Bees play an important, but little recognized role in most terrestrial ecosystems where there is green vegetation cover for at least 3 to 4 months each year. In tropical forests, savannah woodlands, mangrove, and in temperate deciduous forests, many species of plants and animals would not survive if bees were missing. This is because the production of seeds, nuts, berries and fruits are highly dependent on insect pollination, and among the

pollinating insects, bees are the major pollinators. In rain forests, especially in high mountain forests where it is too cold for most bees, other pollinators like bats and birds play a greater role in plant pollination. In farmed areas, bees are needed for the pollination of many cultivated crops, and for maintaining biodiversity in 'islands' of non-cultivated areas. The main role of bees in the different ecosystems is their pollination work. Other animal species are connected with bees: either because they eat the brood or honey, pollen or wax, because they are parasitic to the bees, or simply because they live within the bee's nest.

INVENTIONS

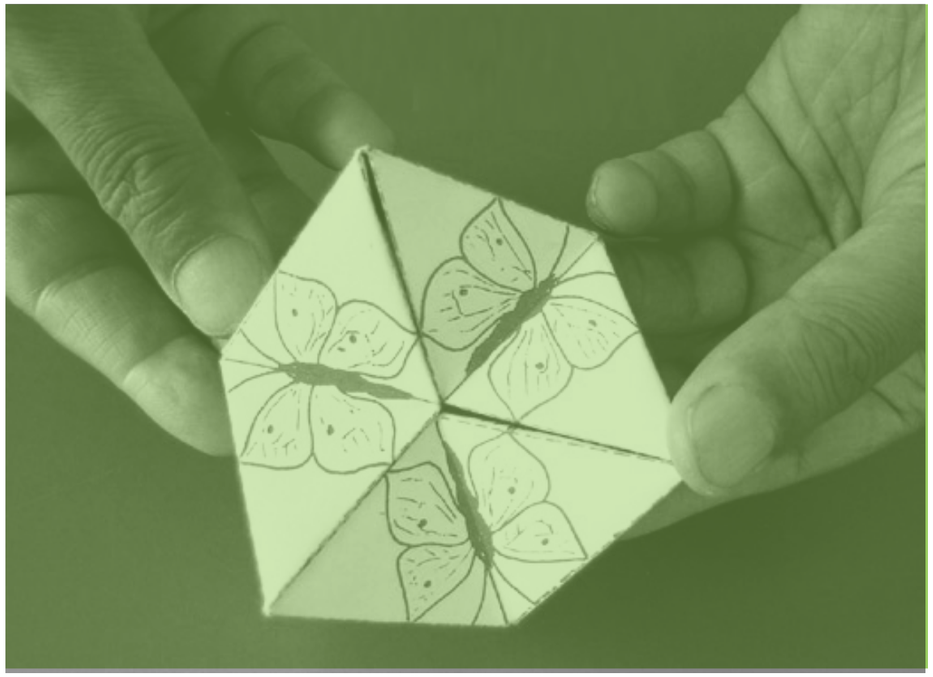
The popular inventions in this field are put in corridors for children to read and get inspired.

ASSESSMENT



Assessment here is a homework which looks like a craft based activity where students are creating, drawing and indirectly memorizing the chain.

Students construct a flexagon and draw different animals of a food chain on each side of the flexagon. This can be later used as a memory game.



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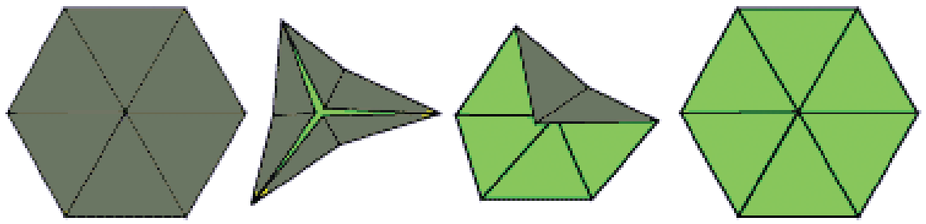


LEVEL 2 - GRADE 7

LEARNING OBJECTIVES

Understand the structure of Habitat by quadrat sampling method
Understand the interactions and interdependencies at different levels by making a BOTTLE ECOSYSTEM and interpreting the interactions.
Understand that ecosystem is sustained only if all interactions within an ecosystem are balanced.

All the objectives are explained using Activity and experiment based learning as the methodology
The activities were made to improve the observation; thus spiral of skill.

Habitat analysis by Quadrat sampling method

This activity is an outdoor activity.
It can be done in a place inside the school compound or a field where they can find a green patch with plants in it.
The activity is best done in small groups of 5-6 students.

Materials required:

1.Cardboard sheet from a carton box cut into 1m X 1m square
2.Small pieces of stick (to mark the area made by the cardboard square)

STEPS:
1.Students make a 1m by 1m square by cutting it out of a carton box. They can make one cardboard square per group.
2.They take this square to the field, and choose to place in an area of their choice.
3.Once they place the square, they mark the corners of the square using the sticks.
4.They will be observing this part of the field between the stick border.
5.Observation rules -
a. Observe and record minimum two to ten types of plants that they find in the small patch.
b. Record all the non-living that you see in the small patch.
c. Every five minutes, Observe the number of insects that visit/ you can find in that patch for 1minute.
d. Note down the number in your sheet, as per the tables given below.

After listing
They predict why there is no/more diversity
What do non-living things do?

GAME – FOOD HUNT

BACKGROUND

This game would create conditions where students would imagine themselves to be animals and look for food.
Being in the position of animals, they will encounter some of the obstacles encountered by the animals while looking for food.
This game is intended to make students. think about human activities such as throwing plastic or creating certain structures that can affect the survival of animals, and in the process students empathize with other living beings.
The game is not only intended for students empathize with animals but would encourage them to
think about the impact of every action on the elements of nature around them.

Preparations for the game:
Take a bag containing the following objects:
A number of small stones
Pieces of chalk/ any small white objects
Plastic bag

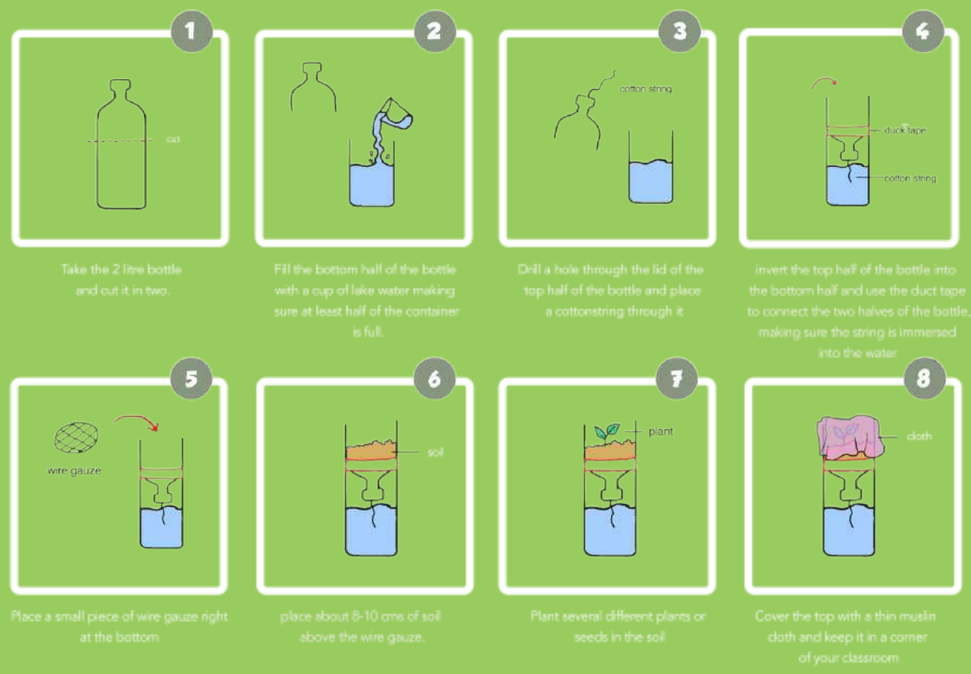
Scenarios for the facilitator:
Animals face various obstacles for getting food.
The cow tried eating a plastic bag which got stuck in the throat due to which it cannot eat properly anymore.
To represent this, the student should put one hand around his neck and use only the other hand to collect.
The goat's leg gets entangled in a wire found lying around.
To symbolize this, the goat has to skip with one leg.
The crow's feather gets clipped in a mesh.
To symbolize this ask students to hold their hands behind and clasp the little finger together, and ask students to pick up the stones with this.
The fish gets itself into a net which makes it difficult to move freely. To represent this bend, hold the ankle with a hand and try moving.

1. Give 30 seconds and ask the students to collect as much food as they can.
3. Come back and count the amount of stones they have collected.
4. Discuss what happens to the food collected for survival when we change the environments and bring various obstacles on the path of animals such as throwing plastics, wire mesh and so on.
Discuss the following questions with class:
1. What happens to the animals when they mistake plastic as food items? What happens to the effort they put in, while looking for food?
2. What are the various problems created by humans that affect the food or shelter of animals? (Think of other animals too that were not mentioned in the game)
3. Is it important that we prevent such activities from taking place?
Yes or no
4. If yes, why? If no, why not?

ROLE-PLAY

WEEK 2

MAKING A BOTTLE ECOSYSTEM



ACTIVITY BASED LEARNING

LEARNING OBJECTIVES

To make a bottle ecosystem
To understand the different interactions that exist within the bottle ecosystem
To understand what are the aspects an ecosystem is depended on -both living and non-living.

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Materials Required
15 transparent (2 litre empty coke bottles), duct tape, cotton string, soil, plants, lake water, scissors

This activity will be carried out in pairs - assuming there are 15 pairs each pair will be given

1 - Empty 2 litre bottle
1- Duct tape
1- Cotton string
10-12 cm Small portion of potted soil
A few plants
1 cup of lake water
1- Pair of scissors
1- thin muslin cloth
1- small piece of wire gauze

LEARNING OBJECTIVE

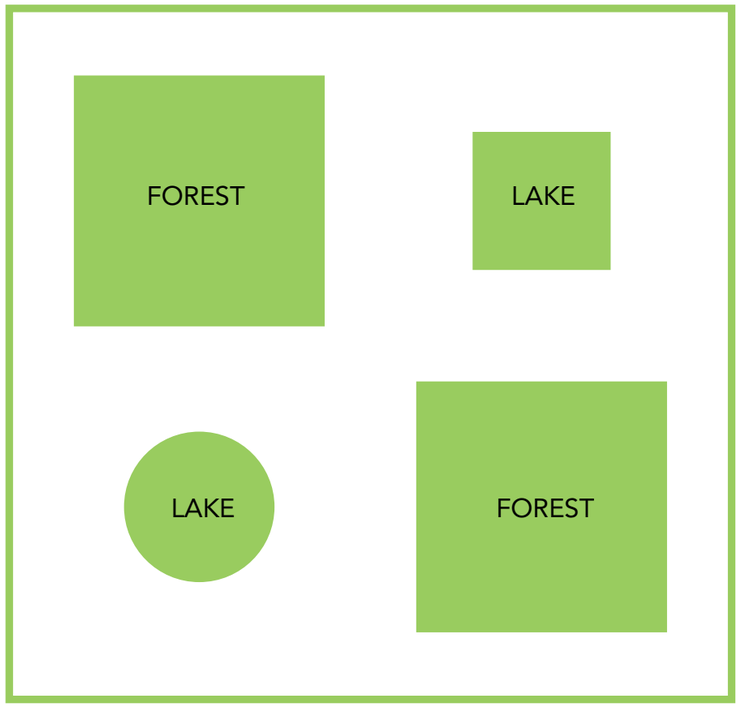
End of this class, students will be able to: Understand the extinction of species with habitat loss Know about the various processes that cause destruction of habitat.

LESSON HOOK

Activity to explain the content.
The activity itself is made to explain the content and not just for experimental purposes.

Take the students to the ground.
2. Using a stick draw this on the sand in the playground

a. The circles should be big enough to accommodate a group of students, at least 7 of them in the forest and 4 in the lake.
b. Choose about 22 students.
3. Divide them into groups and make them stand inside the circles.
4. Now choose about 10 students as taggers to stand in the square between the circles.
5. Give names of birds that live in forest to students who are standing in the forest square.
6. Give names of birds that live in lakes to students who are standing in the lake circle.
7. Tell that some of these birds migrate to another forest and island in a particular season.
8. The taggers are causes for extinction of species. Ask students to name a few causes.
E.g. pollution, diseases, predators, severe weather and soon.
9. When you shout 'migrate' the birds in one forest have to move to the other. Similarly the birds in one lake have to move to the other lake.
10. The taggers have to try and prevent the birds from migrating to the other habitat.
11. Give about one minute for the birds to try to migrate.
12. If the taggers catch the bird they, leave the game.
13. End of the game see how many birds successfully moves to the other forest or lake. Also, count the number of birds that are left behind.
14. Do the following calculation:
Percentage of birds that became extinct = Number of birds that were tagged * 100/ Total number of birds



FLOOR LAYOUT

Game 2

1. Repeat the game.
2. This time make the circle much smaller to accommodate only about 3 students each. This is to indicate that the habitats have been destroyed due to deforestation and drying up of lakes.
3. After playing look at the percentage of species extinct now.
4. Compare the two.

Discussion points:
1. What are the different reasons for extinction of species?
2. Have you noticed any habitat in you village getting extinct?
3. Do you know of any species that has not been able to survive because of its habitat getting destroyed?

CREATE YOUR SUSTAINABLE ECOSYSTEM

-Choose an ecosystem that you are going to create- (it can be a combination of two types of ecosystems)

-Once you have chosen your type of ecosystem write its name
-Decide the location on Earth. Write the location
-What is the temperature of your Ecosystem
-How much rainfall does your Ecosystem get?
-Choose your plants for the Ecosystem. List them
-Choose your animals for the Ecosystem. List them
-Design your Ecosystem, by preparing a rough plan
-Draw the layout of your ecosystem
-Write the steps that you will take to ensure that your ecosystem is sustainable.

PROJECT BASED LEARNING

It aims on applying the concepts they've learnt and observed in the lower grades.

Methodology: Project based learning (PBL)
In PBL, there is no need not make an additional assessment; the process itself becomes the assessment.

In this, the project is to build an ecosystem.
It is a project which includes the entire system.

A problem solving project was purposely not given as it can become overbearing for the child to deal with the content

WORKSHEET

CHOOSE AN ECOSYSTEM THAT YOU ARE GOING TO CREATE (IT CAN BE A COMBINATION OF TWO TYPES OF ECOSYSTEMS)

What is your Ecosystem:

Give it a name:

Decide the location on Earth. Write the location

What is the temperature of your Ecosystem?

How much rainfall does your Ecosystem get?

Choose your plants for the Ecosystem. List them

Choose your animals for the Ecosystem. List them

POINTS TO REMEMBER:
Think about the characteristics of the forest you are choosing .
Think - How does change in seasons affect the green cover and animals living of the forest?
Plan the ecosystem in such a way that it is sustainable for the next few generations.

Choose your plants, animals

FOREST	DESERT	MOUNTAIN	GRASSLAND
Evergreen forest: Dense and green all round the year **Rainfall is 200 cm** **TREES:** Rosewood -visuals Mahogany Bamboo Sandalwood **Deciduous forest:** Trees and plants shed leaves between September and December **Rainfall is 100-200 cm** **TREES:** sandalwood, teak, Deodar, Maple, Ebony, sal, Sisam, Oak, Jackfruit, Palash	**PLANTS:** Cactus Elephant tree organ pipe cactus Desert sage Desert marigold Desert lily Desert willow tree Palm coconut trees Saguaro Cactus Barrel cactus	**TREES:** Pine trees Rhododendron Walnut Cedar Fir Oak Plants: Mosses Ferns blue poppy	**PLANTS:** grass **SOIL NEEDED:** Black soil sandy loam soil marshy area
ANIMALS: Ants Mosquitoes Caterpillar Butterfly Honeybee Jaguar Wolf Owl Eagle Giant squirrel Deer rodent species Tiger Woodpeckers Antelope (deer like) Blackbuck (deer like) Gaur (wild buffalo) Wild dog Sloth bear Beaver Humming birds (small birds) sun birds (small birds) Hornbill bulbul Bustard babbler Bee eaters (bird) racoon	**ANIMALS** Ants Mosquitoes Caterpillar Butterfly Honeybee ostrich lizard black widow spider desert toad (frog) spotted hyena black tailed jack rabbit Rattlesnake	**ANIMALS** Ants Mosquitoes Caterpillar Blue sheep Black bear Musk deer Himalayan wolf Himalayan Tahr (mountain goat) Red panda (red bear-cat) Palm civet (wild cat) Butterfly Honeybee Yak snow leopard	**ANIMALS** Ants Mosquitoes Caterpillar Honeybee African buffalo African wild dog anaconda (snake) anteater (pangolin) antelope (deer like) baboon (monkey) Bandicoot (rat) Bee eater (small birds) Spotted hyena Elephant Black rhino Malay tiger Butterfly
	Extremely hot in day and extremely cold in night - 0° C to 50° C	-1° C to 14°C	8° C to 18°C
High to medium rainfall	Scanty rainfall	High rainfall	Average rainfall

This chart consists of all the possible flora and fauna children can use to make their ecosystem. This psoter is meant to be put on the class wall.

PROJECT

45 mins designing and writing down
15mins for presentation (5 mins each group - 3 groups)

Give a layout to understand the area
The layout contains an A4 sheet marked with 6 equally divided squares that students can use to plan the ecosystem.
Here, the students will arrange the plants, animals and other things that make up the Ecosystem, in the squares. This will tell them what portion of the Ecosystem is occupied by animals (A) and plants (P).

BUILDING A FOOD CHAIN FOR YOUR ECOSYSTEM :
FACILITATOR
-Please remind/give the students information about Food chain/ Food web from Grade 6 manual, if needed
Ask your students to build a food chain using the flow diagram given below
Name the plants
Name of a primary consumer
Name of a secondary consumer
Name of a tertiary consumer

QUESTION -
Using this food chain as an example, explain how will you make this ecosystem sustainable for the next generation that will live there? Write two paragraphs about the steps you will take to do this.

PRESENTATION

Last 15 mins- There are three groups, each group will be given 5 mins to present their layout and the steps they took to ensure their ecosystem is a sustainable one.

TAKE-HOME BOOKLETS

Take home booklets are made for every module and are given out to the children after the module is over.

It is not meant to be a used as a medium to teach.

It's purpose is to provide students with a reference material once the class is over.
It should also be referred to recall the concepts before the invention fair.

CONSIDERATIONS

Concept explanation has to be properly articulated in it.
Facilitator notes are to be consulted for the content.
Examples of inventions that have happened in the corresponding field should be included in it.
Use as many visuals and graphics as possible

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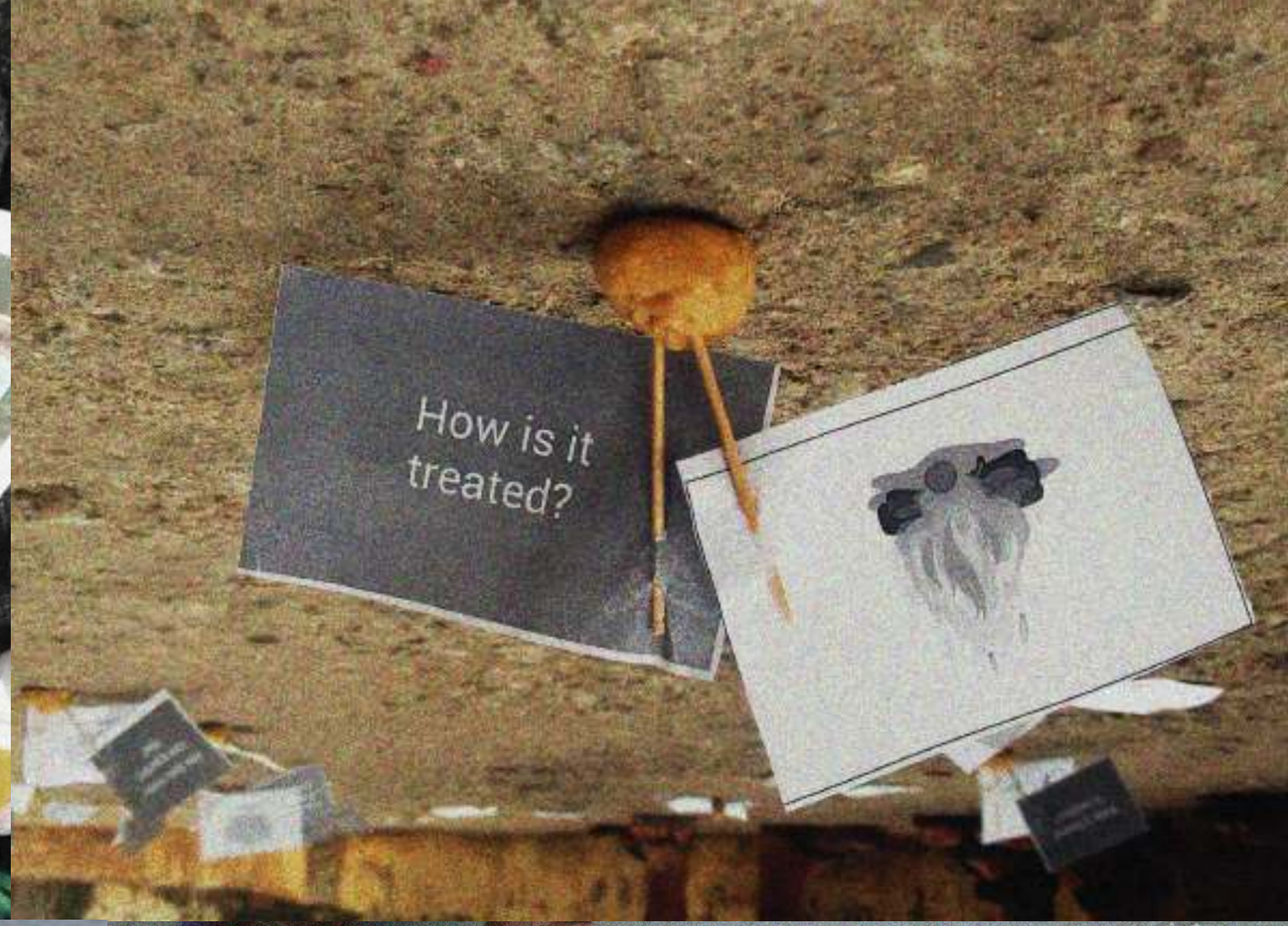
PROTOTYPING AND TESTING


WORKSTATION 1


How is it
treated?

COSTING

Rs. 2.7 for back to back A4 printing on 100 GSM paper for 1000 copies

A 4 page take home booklet will be printed and folded for Rs. 3

Rs. 3.2 for single side A3 paper on 100 GSM for 1000 copies

Scroll cost: Rs. 50 for fixture. Scroll making: Rs. 60

FURTHERANCE

Once the curriculum is completed and translated in the regional language, it'll run as a pilot project in 15 schools of Karnataka during the academic year of 2016-17. Once the entire curriculum is tested, adjusted and improvised based on the feedback, it can spread throughout the schools of Karnataka. The guidelines for the curriculum are set in such a manner that they facilitate the replication of the process to any school board, across all the states of India.

MODULE DESIGN TOOL-KIT

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There are about 20 topics in ISEC and so far four modules have been created. In order to replicate the process of making the rest of the modules, a tool-kit was made to design the remaining modules.
This tool-kit consists of guidelines for selecting the content, spiralling the curriculum, flow of content, different methodologies and other aspects.
It also contains the explanation of the 4 modules designed so far. With each activity, a reason of why a particular methodology is chosen has been explained in it.

SUGGESTIONS AND TRIALS

Make your own furniture

This is an activity to help students in making their own classroom furniture.
There are 5 different types of cards in this deck.
Students have to be divided into groups. Each group has their own deck.
There are cards of different colours in this deck.
Each colour corresponds to a different criterion.

INSTRUCTIONS:
First select the card corresponding to the 'number of students per desk'.
This should be followed by the type of sitting that the students want. Based on the sitting type, select the posture position which will be appropriate.
Once all the above 3 things are decided, the material should be selected. More than one material can be chosen.
After that, Select the cards corresponding to the layouts and arrangements. More the better!

There are blank card if students want to select their own material and their own desk arrangements and layouts

5 types of cards:

Number of students

Type of sitting

Posture type

Different materials they can use

Layout and arrangement

RETROSPECTION

‘Less is more’

This is the most commonly used adage in design but was extremely useful during my project. As a design student, one wants to apply one’s skills as much as possible. But I think real design happens when one knows where to draw the line between technical expertise and simplicity of application. There were times when I went beyond the basics and planned a module which had minimum involvement of a facilitator. But after introspection and the right guidance I came to realize that there is a need to establish a system where one has to create balance more than anything. The involvement of a teacher/facilitator is of paramount for a child and to take most of that away is not an ideal solution. A more sustainable solution is if we are able to improve the quality of facilitation to enhance the process of learning.

This project has been a great chance to explore the extent of my capabilities, grasp new dimensions and applications of design thinking.

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