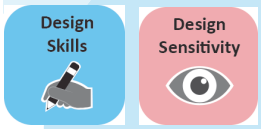
6.0 **Module 6**

Fundamentals of Sustainability and Design :

18 hours (12 in school and 6 at home)



Exposure 1 - What's and Why's of Sustainability
Exposure 2 - Sustainability - linear and cyclic life cycles
Exposure 3 - Strategies and Technologies for Sustainability

Task 6.1 (at School + Home) - Understanding Sustainability through Food

Task 6.2 (at School + Home) - Understanding Sustainability as a System with linear and Cyclic life cycles

Task 6.3 (at School + Home) - Sustainability Strategies and technologies: Re-design a sustainable product

Final Output - Make a presentation of the re-design of an object with sustainability features

+ Reflections, Self Assessment and References

6.0 **Module 6**

Fundamentals to Sustainability and Design

(12 hours at school + 6 hours at home)

Introduction

This module on fundamentals of Sustainability and Design raises some important questions that need to be understood:

- Can we continue the current relationship we have with our environment?
- What does “sustainability” mean to us?
- Can we view the things we use as a part of a bigger system?
- How are things made? How can we ensure what we take from Earth is utilized fully and returned?
- Are there strategies for sustainability that we can see in our daily lives?

Aim of Course

Aim of the course:

To expose school students (Grade 10) to fundamentals Sustainability. The students at the end of the module should be able to:

- Summarize why we need to change the way we use resources and design the things we use.
- Explain the various aspects of sustainability and how a balance is required to achieve sustainability, with an example.
- Visually depict the ecosystem in which a product exists, and map out all the entities and stakeholders involved.
- Think holistically, suggest changes to existing ecosystems and judge the potential consequences of each decision.
- Map out the lifecycle of a product, identify issues in the different phases and suggest alternative methods to resolve them.
- Apply sustainable design strategies during different phases of the design process of their product or service.
- Redesign a product using the learning’s from this module and present their redesign concisely and creatively.

Place:

Place: Task 6.1, 6.2, 6.3 and 6.4 done at School and at home

Grouping:

Grouping: Class tasks are done in groups of 3-4 and Home tasks are individually

Equipment:

Equipment: Smart Mobile phone with Camera, Notebook/Sketchbook for sketching, Stationary (Pencils, Pens, Colours, Tracing paper, Black Ink and brush or brush pen, colour pens), students may use digital devices like computers or tablets (if available, but not necessary).

Exposures:

Exposure1: Fundamentals of Sustainability
Exposure 2: Sustainability as part of a system
Exposure 3: Sustainability Strategies and Technology

Task Sequence

Task 6.1 + 6.2 + 6.3 + 6.4
Exposure1: Fundamentals of Sustainability (20 minutes)
Task 6.1: Observation + Food across ages (5 hrs 40 min)
Exposure 2: Sustainability as part of a system (20 minutes)
Task 6.2: Classify and its part of a System (5 hrs 40 min)
Exposure 3: Sustainability Strategies and Technology (20 minutes)
Task 6.3: Analysis and Re-design of a product (5 hrs 40 min)

Design Thinking & Innovation Process involvement:

This Module involves the following phases of the DT&I Process:
Phase 1. Observe/Empathise/Research (Sketching Observation of Sustainability)
Phase 2. Understand/Analyse/Define (Understanding Sustainability)
Phase 3. Ideate/Alternate/Create (Alternatives)
Phase 4. Build/Prototype/Detail (Thinking of Solutions)
Phase 5. Evaluate/Reflect/Implement (Presentation of Models)

Mapping SDG Goals:

The following SDG goals need to be considered while solving this task. While documenting elements and expressions, do think of gender equality and reduced inequalities and concern for life on our planet.

Task 6

Task 6 = 6.1 + 6.2 + 6.3 + 6.4
School Hours: 12, Home hours: 6

Task 6.0:

Overall Task (Task 6.1 + Task 6.2 + Task 6.3 + Task 6.4):

Task Topic:

Sustainability and Design:
Food – procurement, cooking, eating, preserving, storing, disposing

We shall look at different aspects of sustainability from the point of view of a very common activity that we do – that of eating food.
We'll look at it from a historic perspective, it being part of a larger system, it being part of a cyclic process, strategies considered important and then apply these leanings in designing a simple product.

Task 6.1a
(done at Home)

Task 6.1a:
Home hours: 2, done individually

Topic Title:

Understanding sustainability through observation and analysis of breakfast at home:

1. Note down all the items that are part of the breakfast (solids, liquids, utensils, vessels, etc.)
2. Study the prepared breakfast items to see what ingredients are required to make them, how they are prepared, how the ingredients are procured, stored, cooked, wasted, served and leftovers either preserved or disposed off
3. Make a mind-map of the breakfast showing the above aspects on an A3 size sheet
4. Mark the ones that are completely used those that have parts that are not used (for example, bread maybe fully used but its wrapper is left unused)
5. Can you note down what needs to be done with the left over items
6. Ask the question if the process of eating food at home is a sustainable activity
6. Identify components in this activity that are not sustainable

Output 6.1: Submission of the Mind-map with analysis of the use of different items during breakfast

Task 6.1b
Done at School

Task 6.1b:
School hours: 4, done in groups of 3-4

Topic Title:

Food across ages:

The students will need to study how people ate breakfast (or the first meal of the day) during the following periods:

Time period 1 - Hunter-gatherers

- Hunter-gatherer culture was the way of life for early humans until around 11 to 12,000 years ago

Time Period 2 - Indus Valley Civilisation

- Cultivation of crops as well as rearing of animals was done during this period from 5000 to 3000 years ago

Time period 3 - Gupta period

- Cereals were cultivated and the south of India was known for its spice cultivation around 1600 to 1400 years back

Time period 4 – Industrial period

- Industrialization in India started in 1850's and has continued during the 21st century which brought changes to ways in which food was produced, marketed and consumed

You'll need to find answers to the following questions:

a. What kind of Food did they eat during these periods?
b. How did they get the food?
c. How did they cook the food?
d. How did they eat the food – individually or together?
e. What did they do with the leftover food?
f. How did they preserve the food for the next days?

The above tasks would involve the following:

1. Finding out through secondary sources about food during these periods
2. Make a chart with the periods on one axis and the answers to the above-mentioned questions a, b, c d, e and f on the other axis
3. Choose one period and create a scenario of the process of procurement, kinds of food, cooking, eating, preserving and recirculating. The scenario could be a set of visuals illustrating these 6 stages.

or

The group can choose one of the periods and perform a skit showcasing how the food was eaten presenting the process of procurement, kinds of food, cooking, eating, preserving and recirculating

4. Identify activities in this period that are sustainable and those that are not sustainable

Output 6.2: Comparative Chart + Scenario sketches or preforming a skit on the subject of Food

Task 6.2a
(done at Home)

Task 6.2a:
Home Hours: 2, done individually

Topic Title:

Classify Objects around your house into Linear and circular lifecycles:

How do we humans make things?
Can we use the resources that we borrow from nature carefully?
Students will understand the lifecycle of a product, how resources move from one state to another, the activities that happen in each phase, and linear and circular lifecycles.

In linear lifecycle model, we take materials from the earth, convert these into products, use the products for a while and then discard them as waste. Example is an old toothbrush, plastic food packaging
In circular lifecycle model, the materials that we take from the earth are made into products that are recycled back either as products or goes back to earth as materials. An example is a magazine that is recycled, eating on banana leaves

1. look at the different objects at home – as part of the kitchen, living room, bathroom and bedroom
2. Discuss with your family members if it is part of the linear lifecycle or part of the circular lifecycle
3. Make this classification for a dozen objects around the house
4. The ones that are part of the linear economy, think of ideas on how to make it part of the circular economy

Output 6.2a: Classification of objects at home, according to linear vs circular economy and suggestions on how to make objects in linear economy be part of circular economy

Task 6.2b
Done at School

Task 6.2b:
School Hours: 4, done in groups of 3-4
Topic Title:

It is part of a System:

In this task, we'll study and analyze a pickle business from sustainability point of view.

(A) Parvati Pickles
Parvati makes great pickles, which she learnt, from her mother. Everyone loves her pickles – the favourites being mango pickle, lemon pickle and red chilli pickle. The most frequent request was that she should make it a business.
So she makes up her mind, rents a place to make it, gets all the clearances and starts producing it. Parvati Pickles becomes quite popular and she is able to grow her business.

You are free to assume to size of her business, amount and kinds of pickle she

produces, the location of her production facility and the region for her market.

Lets try to understand this activity from a sustainability point of view. That means we should understand how and from where she gets her raw materials, what are the ingredients for making pickle, do some part of the raw material go waste, how does she package it, how does she market it and what are the components that can be reused or recycled.

The task would involve the following steps:
1. Make a map of the journey of the pickle business from its source to its production, to packaging, to marketing and its consumption. Do the map on A3 size sheet.
2. Add to this map the following to make it an ecosystem map for the product:
a. transportation requirement at different stages of the process
b. Energy requirements at different stages of the process
c. Human involvement at different stages of the process
d. Technology requirements at different stages of the process
e. Map the source of the raw materials
f. Map if some components are left over during production, transportation or after consumption
g. Identify components that can be reused or recycled

Doing this task will demonstrate the interconnected nature of things. Students learn to look at a product's context as a big system of interconnected things, people, living organisms and much more. In doing so, they get a bigger picture of how things are interconnected; helping them design more carefully and assess the impact of whatever decision we take.
This task helps students understand that sustainability is not just about the impact on ecology, but also socio-cultural and economic factors. Students can understand how the introduction of one product can bring about so much of dependence on other factors.

Output 6.2b: System mind-map of the Pickle Business with many interconnections on A3 size sheets

Reference:
You are encouraged to look at this video on the topic 'the whole world is one single family':
https://vandanashivamovie.com/vasudhaiva-kutumbakamwhats-that/

Task 6.3a
(done at Home)

Task 6.3a:
Home Hours: 2, done individually

Topic Title:

Analysis of a sustainable product:

In this task, we look a sustainable and affordable product and analyse it for features and properties that are important for sustainability.

The product is MittiCool, a grassroots innovation enterprise founded by Mansukhbhai Prajapati producing usable objects made of earthen clay.

1. Students can watch this video about MittiCool: Making earth look cool - https://www.youtube.com/watch?v=kxHGb8YlqzM
and look at the website of MittiCool: https://mitticool.com/about-us/
2. Make a list of all the products made by MittiCool and discuss their advantages and disadvantages
3. Find answers to these questions:
a. How are these products different from those available in the market?
b. Is this an innovative product?
c. Why was this product designed?
d. What was the motivation behind this product?
e. What can you comment on the level of resource use?
f. What are the sustainability issues addressed by these products?
Output 6.3a: Submit the summary of your findings of MittiCool on an A4 size sheet.

Reference: Students are then encouraged to visit Grassroot Innovations at India Science, Technology & Innovation website: https://www.indiascienceandtechnology.gov.in/innovations/grassroot-innovations
Grassroots innovation at National Innovation Foundation: https://nif.org.in/GTIAF

Task 6.3b
Done at School

Task 6.3b:
School Hours: 4, Done in groups of 3-4

Task Title:

Sustainability Strategies and Technologies:
Re-design a sustainable product

In this task you will look at strategies and technologies for sustainable design and apply this in redesigning an existing object of your choice.

These are some of the sustainable strategies and technologies:
a. Form: How the form of the object can be made suitable for easy production, packaging, transportation, etc.
Function: Can the product be used using less energy, in less time and with ease
b. Materials: How can the material of the object be chosen so that it is not a rare material, that it can be recycled or reused, that it can be grown in shorter duration, etc,
c. Durability/Life: Can the object be used for along period of time? Can it become better with age?
d. Affordability: Can the product be affordable to a large number of people?
e. Sharability: Can the product be shared among many users? Sharing is an efficient way of utilizing resources?
f. Reuse or recycle: Can the object be put to another use or the materials of the product be recycled?
g. Waste: Can the product be made with less waste in different stages of the product?
h. Energy: Can the energy that is used to produce, transport, use the object be part of the green energy sources?
i. Resources: Can the object be made with less use of resources?
j. Technology: Can the technology used to produce the product be made more efficient, use less energy, use less resources, etc.?
k. Respect for Life: Can the solution that you conceive have respect for other forms for life on earth? Can you make sure that your solution does not harm or make it difficult for other forms of life on earth such that they also enjoy the befits of sustainability as much as we do?

1. Identify objects from task 6.3a involving linear lifecycle that you would like to take up for re-design from all your group members (you could choose products connected with food)
2. Discuss and chose one object that you would like to work on (it could be simple object like the packaging of biscuits, your water bottle or your pen)
3. De-construct the object in terms of its components and identify its material and the process used
4. Discuss how each of the above-mentioned strategies and technologies can be used to make this product much more sustainable or be made to be part of the circular lifecycle
5. Make a lifecycle journey map for each of the components to see if they can be made part of the circular lifestyle
6. Make a system level map for your product connecting it its procurement, production, transporting, marketing, consumption and recycling or reusing.
7. Make concept sketches of your redesigned product and present on A3 size sheets

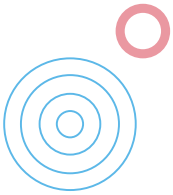
Output 6.3b: presentation of the redesigned product with application of strategies and technologies for sustainable design

Reflection:

Questions to ponder:

- Do you feel you have understood the implications of sustainability on our living world?
- Can you apply what you learnt by looking at instances that are f=good practices of sustainability?
- Will you share this information on the use of the sustainability strategies and technologies with others – like your friends and cousins?
- Will you think of ways to make your house, apartment, building adopt sustainable practices?

Self Assessment:



Assessment Criteria (Task 6.1 + 6.2 + 6.3 + 6.4 + 6.5) - Assess yourself:

- Submission of the Mind-map with analysis of the use of different items during breakfast were done well. (individual task 6.1a)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

- Comparative Chart + Scenario sketches or preforming a skit on the subject of Food was done well. (group task 6.1b)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

- Classification of objects at home, according to linear vs circular economy and suggestions on how to make objects in linear economy be part of circular economy were done well (individual task 6.2a)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

- The System mind-map of the Pickle Business with many interconnections were done well (Group task 6.2b)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

- The summary of the findings and analysis of MittiCool was done well (individual task 6.3a)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

- The presentation of the redesigned product with application of strategies and technologies for sustainable design was done well (individual task 6.3b)

☐ *Beginning* ☐ *Developing* ☐ *Promising* ☐ *Proficient* ☐ *Excellent*

Other References:

Other suggested References:

1. The UN Sustainable Development Goals (SDGs) are the blueprint for achieving a better and more sustainable future for all: https://www.un.org/sustainabledevelopment/sustainable-development-goals/