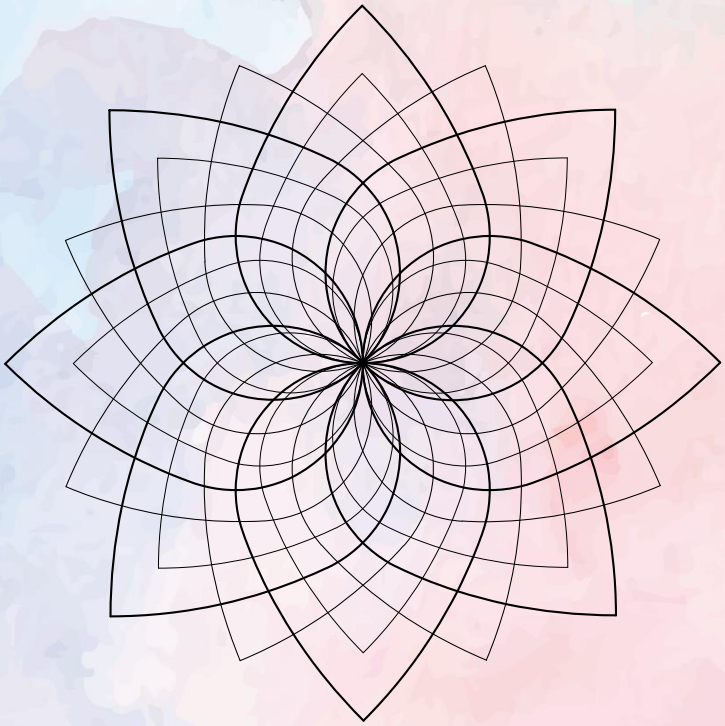
Design Thinking and Innovation for Grade 6 / 7 / 8

Workbook/Taskbook

2022



Taskbook

CBSE, New Delhi

Design Thinking and Innovation Curriculum for Grade 6 / 7 / 8

Contents:

Module Contents

Design Thinking and Innovation Workbook for Grade 6 / 7 / 8

Introduction:

0.1
What is Design?

"Design is solution to a problem"
-John Maeda, Designer and Teacher

"Essentials of design are- purity, precision, details "
-Prof Sudhakar Nadkarni, Designer and Teacher

"Design is thinking made visual"
-Saul Bass, Graphic Designer

"Design is plan for arranging elements in such a way

-Charles Eames, Designer and Film Maker

"Design is not just what it looks like and feels like.
Design is how it works."
-Steve Jobs, Designer and Businessman

In a nutshell, design is about understanding needs and being sensitive to issues, identifying problems that need to be solved, creating innovative appropriate solutions, considering aspects of sustainability such that it makes a positive difference to life in our universe.

0.2
Who is a Designer?

A designer is a highly creative person who enjoys solving problems. The reason why they enjoy being creative is that they are sensitive to the needs of people and understand the extent of the issues in society. This sensitivity allows a designer to be intuitive and to think of opportunities that enhance the lives of people. It makes them appreciate the intricate aspects of a problem or a situation to help better it through creative designs. (Ref: 2)
Design being an important part of the creative industry has many options for you to pursue, such as: Communication/Graphic Design, Product Design, Animation Design, Automobile Design, Architecture Design, Environmental Design, Digital Design, Textile/Fashion Design and such.
So, if you are looking for something which will give the creative streak in you an outlet and also provide you with innovative problem solving skills, design may be the option for you.

0.3
What is Design Thinking?

One can understand Design Thinking as a method to solve problems using a process. It is one of the most effective ways to create something new.
A process that first understands users, identifies and analyses a problem or need, and researches relevant information, after which ideas are explored and analyzed, until an appropriate innovative solution to the problem or need is arrived at.

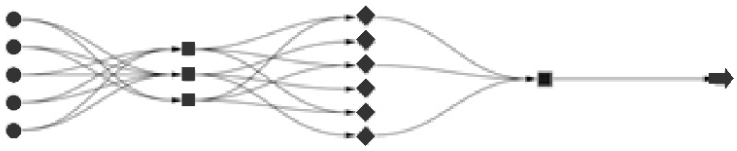
Hence Design Thinking could be viewed as the process that translates an idea into a blueprint for something useful, whether it's a vehicle, a building, a graphic, a service or a system. (Ref: 2)

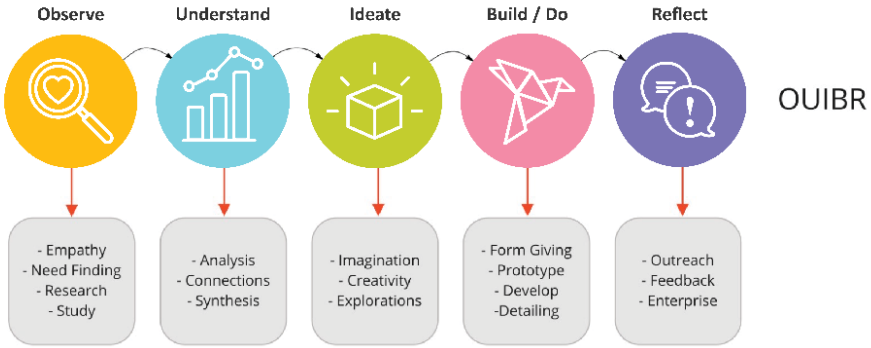
0.4
Who is a Design Thinker?

Designer Thinker is a person who applies the Design Thinking process to solve problems and finding creative innovative solutions in any field or domain. For example, you could apply Design Thinking to solve problems in arts, social sciences, law, medicine, engineering, business, etc. It could even be applied to solve problems at home or in your neighbourhood or your place of work. Whether it is a simple problem or a complex problem, a design thinker finds creative ways to tackle them.
If everyone could adopt this method to solve problems then we would be moving towards a creative society that finds solutions to many of its problems.

0.5
What is Design Thinking Process?

It involves these following five phases in the process of solving a problem:
Phase 1. Observe/Empathise/Research,
- The first phase helps you to identify needs and locate issues to be solved through observation and empathy
Phase 2. Understand/Analyse/Define,
- The second phase of the process helps you to understand, define and analyse the problem area
Phase 3. Ideate/Alternate/Create,
- The third phase helps you to come out with several alternate creative innovative solutions to the problem
Phase 4. Build/Prototype/Detail and
- The fourth phase helps you to actualize the solution by building mock-ups, creating scenarios and then prototyping and detailing
Phase 5. Reflect/Feedback/Implement
- The last fifth phase is to get feedback through evaluation so that the suggestions can be implemented in the final solution.





0.6
What is Innovation?

Innovation involves implementation of something new and replacing or reframing of the existing mindset. It is about translating a concept, idea, thought or invention into artefacts and services that creates value to life. It is the process of transforming ideas into commercial reality. Innovation plays a major role in society. It helps us cater to the needs of people that arise from constant physical and emotional changes. It helps identify the crucial applications of technology and scientific inventions.

As compared to Innovation, Invention happens once in a while. However, each Invention may produce millions of Innovative Products – like the invention of Wheel has produced and continues to produce Innovative Products for the benefit of mankind. Innovation is in how an invention can be used to solve problems. Hence, Design pursues Creativity of Innovation.

1.9
What is the overall vision and aims of Design Thinking and innovation Curriculum?

The overall vision of DT&I curriculum is to be able to instill the following in the students:

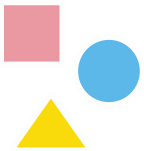
• Explore student's **sensory** abilities, **cognitive** abilities and **social** abilities

• Create awareness in the students through **observation**, **discovery**, **analysis**, **experience**, **collaboration** and **reflection**

• Nurture their **curiosity** and enhance their **explorative** abilities

• Foster **creativity** and **innovation** in students

• Identify **problems** and be able to find **solutions** + Apply **Design Thinking** process and methods to **solve** various **problems**



• Learn the fundamentals/essentials of **creative design discipline**

In addition, DT&I will promote socially responsible practice through enlightening the students with ways to solve problems within the Sustainable Development Goals as mentioned by the United Nations. The course also helps students derive culturally rooted understanding of design from information documented under the Indian Knowledge Systems.

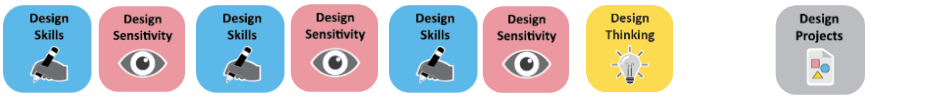
References:

Reference 1: https://dsource.in/resource/quotes
Reference 2: http://designindia.net/institutions/design-information/design-questions

Design Thinking and Innovation Workbook for Grade 6 / 7 / 8

Overview:

0.7
Modules for grade 6 / 7 / 8



Elements of Design + Story-creation	Exploring Form Transitions + Discover Forms in Environment	Sketching for Ideation + Creative Exploration of Product Concepts	Design Thinking Process	Environment Design Project

0.8
Overall Vision for grade 6 / 7 / 8

- Explore Sensories
- Create Awareness and a sense of Discovery
- Nurture Curiosity and Creative Explorations
- Experience of problem solving and Reflection upon what they did

0.9
Overall Learning Objectives

- Introduction to Elements of Design and Story-creation
- Observe and Discover Forms in Environment and Explore Form Transitions
- Fundamentals of Sketching and Product Concepts Explorations
- Fundamentals of Design Thinking Process

0.10
Additional Competencies

- Enhance Observation Skills
- Improve Sensitivity to Design
- Improve Communication and Presentation skills

0.11
Matching SDG Goals

Design Thinking and Innovation Workbook for Grade 6/7/8

Overview continued:

0.12
Grading

Grade Awarded	Grade	Points
Outstanding	O!	10 (or Extra Points)
Above Excellent	A1	10
Excellent	A2	9
Above Proficient	B1	8
Proficient	B2	7
Above Promising	C1	6
Promising	C2	5
Above Developing	D1	4
Developing	D2	3
Above Beginning	E1	2
Beginning	E2	1

0.13
Assessment

• Define the criteria for assessment for the Modules
(mentioning the factors for grading/assessment preferably on a Matrix)

Beginning FF-EF-EE 0.0-0.1-0.2	Developing DE-DD 0.3-0.4	Promising CD-CC 0.5-0.6	Proficient BC-BB 0.7-0.8	Excellent AB-AA 0.9-1.0
Criteria 1	Criteria 1	Criteria 1	Criteria 1	Criteria 1
. . . .	Criteria 2	Criteria 2	Criteria 2	Criteria 2
. . . .	. . . .	Criteria 3	Criteria 3	Criteria 3
. . . .	. . . .	. . . .	. . . .	. . . .
			. . . .	. . . .

Grade for the Task = Grade/Points (Marks)
Credits for the Module = Sum of Grades for all the Tasks / Total credits for the Module

0.14
Validation/Feedback

• The task done needs to be validated with feedback from both students as well as teachers (so that this can become an input for making changes for the next year)

0.15
References

• References are mentioned at the end of each task
• As much as possible, these should be made accessible to both students and teachers

0.16
Exhibition/Presentation

• As most of the design tasks have a visual output, the class is encouraged to put up the tasks as an exhibition (for a short period) in the classroom / in common areas of the school or as a group presentation for others in the school to see.

1.0 Module 1:
Introduction to Elements of Design and Story- creation

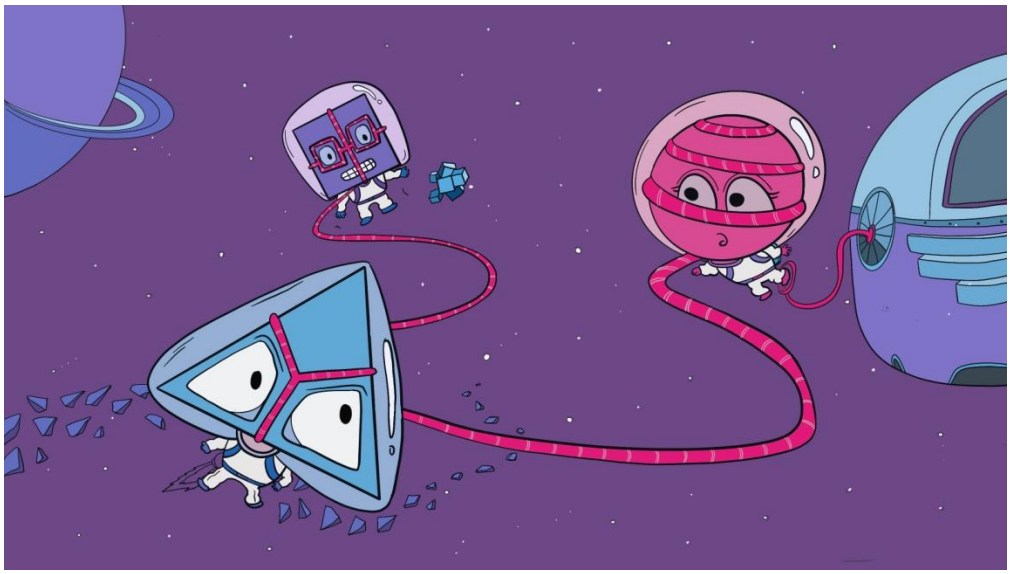
(2 hours at school, done in groups of 3-4 + 1 hour at home)

Exposure 1	- Fundamentals and Elements of Design.
Exposure 2	- Elements of Story /Narratives (Types, forms, structure).
1.1 **Task 1a** (at School)	- Make a puppet using the basic elements of design out of paper cut-outs and joineries + make a story and enact it out.
1.2 **Task 1b** (at Home)	- Create a Character out of your imagination that can do things that you cannot do + sketch and colour + write a short story or - 'The World in your Palm' – Trace the outline of your palm and inside this represent your vision of the world + draw and colour + do a short write-up in around 50 words.
Final Output	- Puppet Making from Elements of Design + Story- creation in Class and - Imaginary Character or The World in your Palm + short story/ write-up at Home

1.0 **Module 1:**

Introduction to Elements for Design and Story-creation

(2 hours at school + 1 hour at home)



Introduction

Introduction to Elements for Design and Story-creation

- This Module introduces the basic Elements of Design in terms of shapes – Circle, Square and Triangle and aspects of story creation.

The students will learn about these subjects by exploring two tasks, one at school and the other at home.

- The first task done in school is to create a puppet character out of their imagination, using the basic elements of design out of paper cut-outs and joineries + make a story and enact it out
- The second task done at home is to create a Character out of their imagination that can do things that they cannot do + sketch and colour + write a short story about it or trace the outline of their palm and inside this represent their vision of the world + draw and colour + do a short write-up in around 50 words entitled 'The World in your Palm'

Aim of the Module

Aim of the Module:

This Module introduces students (Grade 6/7/8) to the Elements of Design through basic shapes as well as understanding the basics of creating their own stories.

It should create an interest in this field, nurture their sense of curiosity and motivate them to explore and discover this area.

The students will become sensitive to using form as building blocks and being able to create a story on their own will take them through the process of using their imagination and creativity.

This knowledge can be applied in many fields of design, media and performing arts.

Place:

Task 1a, Task 1b - done at both school and at home

Task 1a, Task 1b - 

Equipment:

Sketchbooks for sketching and taking notes, Students need access to normal paper, drawing paper, Chart Paper, scissors, pencils and clay.

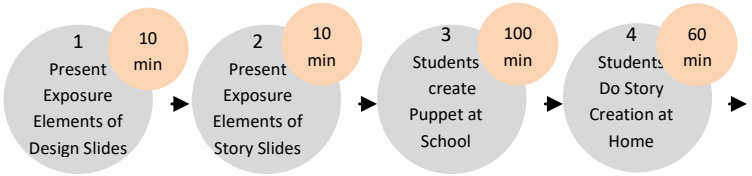
Grouping:

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

Exposures

Exposure 1: Elements of Design – Circle, Square and Triangle and their characteristics (expressions, associations) in 12 slides
Exposure 2: Elements of Story /Narratives (Types, forms, structure) in 12 Slides

Task Sequence:



Design Thinking & Innovation Process involvement:

This task involves the following phases of the DT&I Process:
Phase 1. Observe/Empathise/Research (who, how and what of character)
Phase 2. Understand/Analyse/Define (characteristics of character)
Phase 3. Ideate/Alternate/Create (creative alternatives to the character)
Phase 4. Build/Prototype/Detail (making or drawing the character & enacting the story)
Phase 5. Evaluate/Reflect/Implement (feedback from others)

Mapping SDG Goals:

The following SDG goals need to be considered while solving this task. While designing your character and solving this task, do think of gender equality and reduced inequalities between characters.

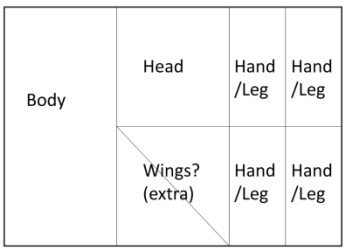
Task 1:

Task 1 = 1a + 1b:
School Hours: 2, Home hours: 1

1.1 **Task 1a:**

Task 1a:
School hours: 2, Done in groups of 3-4

Topic title: Creating Imaginary Puppet Character using Basic Shapes
- Take an A3 sized Chart paper or thick drawing paper (around 270 GSM)



- Cut the Chart paper according to the shapes given in this drawing – it's easy: fold in thirds across the vertical and mark the middle across the horizontal.
- You'll get pieces that can be used for the body, head, hands and legs and an extra piece to make something out of – maybe wings
- Choose these shapes to create the head, body, arms and legs. You decide the number and shape of heads, legs, arms, body and legs for your character.
- Cut the shapes and colour them (optional)
- You can join the different parts together with clips or gum
- Name your character and note down what is interesting about the character
-Think of a story for your character along with other characters from your group and write it down
- enact it out along with your group.

1.2 **Task 1b:**

Task 1b:
Home hours: 1, Done individually

Topic title: Imaginary Character or 'The World in your Palm'


Hand Tracing

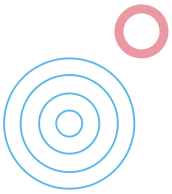
- The second task done at home is to create a Character out of your imagination that can do things that they cannot do
- Draw this on an A4 size paper
- sketch and colour
- write a short story about it in around 150 words
or alternatively
- Trace the outline of your palm
- inside this represent your vision of what the world should be
- draw and colour your vision+
- Do a short write-up in around 100 words entitled 'The World in your Palm' (credits 1.0)

Reflection:

Questions to ponder:
- Could the Puppet character be done using sustainable materials?
- Could your story have a social relevance?

- Can the Puppets be used for creating multiple stories?
- Can all the Puppets with their characteristics be displayed as an exhibition?

Assessment:



Assessment Criteria (Task 1a + 1b):

- Puppet Design and Construction: Puppets are original, creatively designed, and capture the essence of the elements of Design through basic shapes. (Individual Assessment, Task 1a)

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

- Puppet Manipulation: Puppeteers always manipulated puppets and integrated them with the story (Individual Assessment, Task 1a)

☐ *Beginning* ☐ ☐ *Promising* ☐ ☐ *Excellent*

- Story creation: Strong organization and structure of story with all elements of story writing. Vivid supporting details included. (Group Assessment, Task 1a)

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

- Collaboration and Enactment: Clear evidence of original, creative ideas throughout the presentation. All storytellers showed a lot of expression and emotion and the story was well enacted. (Group Assessment, Task 1a)

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

- The Imaginary Character/the drawing of the 'World in your palm' was original, creative and represented the character or the vision of the world clearly. (Individual Assessment, Task 1b)

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

- The Short story/Write-up about the vision was novel, and written well. (Individual Assessment, Task 1b)

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

Other References:

Other suggested References:

1. Using Elements of Design in Designed by Apple, short film 1min 30 sec
https://www.youtube.com/watch?v=XjgoZua3BoY
2. The Elements of Design/Theory
https://www.youtube.com/watch?v=01ZoynsM7Vw
3. Elements of Story
https://www.youtube.com/watch?v=1M0pFLXegG0

2.0 Module 2:
Exploring Form Transitions + Forms in Environment

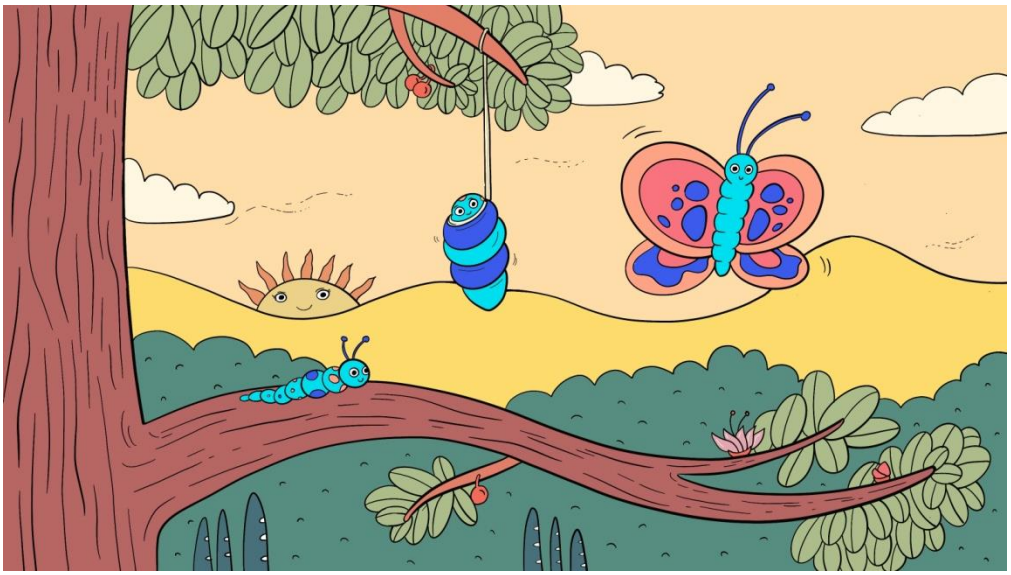
(2 hours at school, done in groups of 3-4 + 1 hour at home)

Exposure 1 Exposure 2	- Fundamentals/basics of Form Transitions through a slide show/ - Forms and patterns in environment and man-made objects as a slide show.
1.1 **Task 2a** (at School)	- Create Five transitions in shapes or forms from one to another and play them together. - (Optional) - Animating the sequence through stop motion photography.
1.2 **Task 2b** (at Home)	- Document through photography/sketching: 1. letter-forms or 2. Patterns or 3. Faces in Objects from immediate Nature or at Home.
Final Output	- Form Transitions and optional Stop-motion animation in Class - Identifying forms in nature and documenting through photography, presented as slides

2.0 **Module 2:**

Exploring Form Transitions + Forms in Environment

(2 hours at school + 1 hour at home)



Introduction

Introduction to Exploring Form Transitions and Discovering Forms in the Environment

- This Module introduces the basic principles form transitions and how these parts are an important part in transforming one image to another. It is also the basic principle of animation design. It is meant as a brief exposure to this creative field and makes the students sensitive to changes in form..
- The students will use paper cutouts or soft clay, and look at the transformation of form either in 2D or 3D from one letter to another. For example, the challenge is to transform a letter, let's say the letter 'A' to the letter 'B' in 5 steps. By discovering the in-between shapes or forms, the students will begin to become sensitive to changes in shape and its transformation. This task is done at school.
- The students could animate the transformation of letterforms through stop-motion photography. By doing this, they experience the foundations in the field of animation.
- The students will document through photography/sketching any one of these A. letter-forms hidden in the environment or B. Patterns in objects/plants/animals or C. Faces in Objects. This task is done at home.

Aim of the Module

Aim of the Module:

This Module introduces students (Grade 6/7/8) to Form Transition for creating moving images as well as documentation of Forms in the Environment. It should create an interest in this field, nurture their sense of curiosity and motivate them to explore and discover this area. The students will become sensitive to changes in form and get to know that this knowledge can be applied in product, communication and animation design.

Place:

Task 2a, Task 2b, Task 2c - done at both school and at home

Equipment:

Smart Mobile phone with Camera, Sketchbooks for sketching and taking notes, Students need access to normal paper, drawing paper, scissors, pencils and clay.

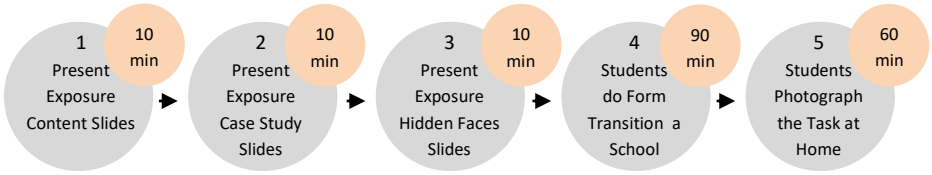
Grouping:

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

Exposures

Exposure 1: Fundamentals/basics of Form Transitions through a slide show
Exposure 2: Forms and patterns in environment and man-made objects objects as a slide show

Task Sequence:



Design Thinking & Innovation Process involvement:

This task involves the following phases of the DT&I Process:
Phase 1. Observe/Empathise/Research (discovering where and what of forms)
Phase 2. Understand/Analyse/Define (identify how of forms)
Phase 3. Ideate/Alternate/Create (exploring form variations)
Phase 4. Build/Prototype/Detail (making or documenting of forms)
Phase 5. Evaluate/Reflect/Implement (presentation & feedback from others)

Mapping SDG Goals:

The following SDG goals need to be considered while solving this task. All forms of life on our earth and its environment are important and we have to empathise and respect this. You could think of this while solving this challenge.

Task 2:

Task 2 = 2a + 2b + 2c:
School Hours: 2, Home hours: 1

2.1 **Task 2a:**

Task 2a:
School hours: 2, Done in groups of 3-4

Topic title: Exploring Transitions in shapes and forms
1. The main task is to make a transition between two sets of shapes or forms. (We refer to it as shape when it is flat and two dimensional and as form when it is solid and three dimensional)
2. The students will use paper cutouts or soft clay, and look at transformation of form either in 2D or 3D from one letter to another or from one form to another. For example the challenge is to transform a letter, let's say the letter 'A' to the letter 'B' in 5 steps.
3. The students can either chose to do it on drawing paper or on clay
4. Clue: First draw the two end letters in the same size as outlines or create the form in clay in the same size. Then do the middle shape/form in-between the two letterforms. Then do the one in-between the middle shape/form and the first or last letter.
5. If you are using drawing paper, after having drawn the 5 variations, use a scissor to cut around its outline. Arrange it in the order of transition.
6. You can colour each of them such that the colour gradually changes from one letter to the last.
7. By discovering the in-between shapes or forms, the students will begin to become sensitive to changes in shape and its transformation.
8. The task involves sensitivity to minor changes in shape and form and creation of new forms by transitions.
9. This task is done at school.
Output 2 – 2.1.1: Paper cut-outs/plaster models of transition

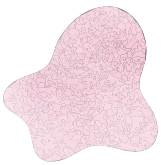
2.2 **Task 2b:**

Task 2b (optional)
Topic Title: Animating the sequence through stop motion photography
- The five transitions in shape or form need to be photographed five times, each transition in a separate photograph.
- the photograph needs to be taken from a fixed of view without moving the camera – for this the easiest is to use a mobile camera stand or if this is not available, then stack two bundles of books on either side of your drawing sheet, keep rulers across, keep the camera still on this and take the photographs.
- You can paste the photos on 5 slides and play the slide one after.
- The initial shape/form will change into the later shape/form. You'll see that it is a bit jerky. So instead of 5 transitions, if you had 9 transitions, then the change in shape/form from one to another will become smoother. (This is optional to try out)

Output 2 - 2.1.2: Stop Motion Photo of the transition

2.3 **Task 2c:**

Task 2c
Topic title: Discovering Forms in the Environment
Home hours: 1, Done individually



- Document any one of these through photography. Make use of the camera in your mobile:
A. Alphabets or letterings from immediate Nature or
B. Patterns found in the Environment either in Objects/ Plants or animals or
C. Faces in Objects.
- Shoot at least 3 alternatives for each of them and select what you feel is the best one out of them.
- Make sure the lighting is enough and the subject is composed properly.
This task is done at Home and from surrounding environment

Output 2 –2.1.3: Selected Photos in a arranged in a sequence
|

Reflection

Have I understood and Questions to ponder:
- Which other instances are form transitions important?
- Will you look for inspiration of shapes, colours, textures, structures and principles from your environment/nature?
- Can you start identifying different types of trees, birds and insects?
- How do forms change subtly within a family of living beings?

Assessment:

Assessment Criteria (Task 2a + 2b + 2c) – Assess yourself:
- Creating letters/forms using paper/clay: The student is able to create the 2 end shapes/forms for this task. (Group task)

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

- Discovering in-between shapes and forms: Creates transitions clearly showcasing the in-between letters that represent the transition. (Group task)

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

- Sensitivity towards new forms by transitions: Displays heightened sensitivity to changes in shape and form and creation of new forms by transitions. (Group task)

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

- Discovering Forms in Nature: Is able to document through photography easily identifiable forms of alphabets, patterns and faces from the environment. (Individual task)

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

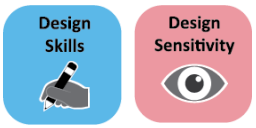
3.0 Module 3:
Sketching for Ideation + Exploration of Product Ideas

(2 hours at school, done in groups of 3-4 + 1 hour at home)

Exposure 1	- Idea Sketching by Scientists and Designers.
Exposure 2	- Film on 'Powers of Ten' based on the 1957 book Cosmic View by Dutch educator Kees Boeke: https://www.youtube.com/watch?v=44cv416bKP4
Exposure 3	- Product Design creative Ideas for Scissors or Cycles.
3.1 **Task 3a** (at School)	- Sketch different types of Sun-dials and note down different names of Sun.
3.2 **Task 3b** (at School)	- Design a portable sun-dial that you can carry or wear on you. Tips: Transparent Umbrella with a tip? Use of Lens? Coconut leaves for a wrist watch? Triangle on a circle?
3.3 **Task 3c** (at Home)	- Turn your final concept sketch into a Final Presentation Drawing.
Final Output	Design of a portable Sun-dial and presentation of the final concept.

3.0 **Module 3:**

Sketching for Ideation + Exploration of Product Ideas



(2 hours at school + 1 hour at home)

Introduction

Introduction to Sketching for Ideation and Creative Exploration of Product Ideas or Concepts

- The initial part of the Module is to expose school students (Grade 9) to basics of sketching for ideation. The emphasis of sketching is mainly for representation of different ideas or concepts as visual representations. The easiest and simple way is to take a pencil and sketch ideas or concepts on a sheet of paper. The sketching becomes an extension of thinking with the output as visual representations.
- The second part of the Module is to try out several variations of ideas or concepts. In the process of design, it is important to think of several alternative solutions to a given problem. This way one has the option of choosing the best alternative.

Aim of the Module

Aim of the Module:

This Module introduces students (Grade 6/7/8) to Sketching for Ideation along with exploring creative variations in Product Forms. It should create an interest in this field, nurture their sense of curiosity and motivate them to explore and discover this area. The students will become sensitive to creating creative variations and understand its significance for creative alternate concepts for Design.

Place:

Task 3a, Task 3b – DINE AT School and Task 3C done at Home

Equipment:

Smart Mobile phone with Camera, Sketchbooks for sketching and taking notes, Students need access to normal paper, Drawing paper, Chart paper, some sticks, Soft aluminum wires, Scissors, Pencils and Clay.

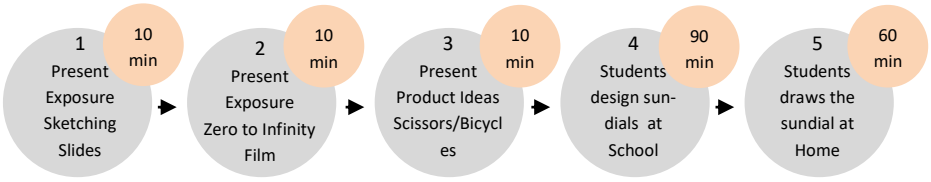
Grouping:

Class tasks are done as individuals + in groups of 3-4 and Home tasks are individually

Exposures:

Exposure 1: Side show (12 in no.) on Idea Sketching by Scientists and Designers
Exposure 2: Film on 'Powers of Ten' based on the 1957 book Cosmic View by Dutch educator Kees Boeke: https://www.youtube.com/watch?v=44cv416bKP4
Exposure 3: Product Design creative Ideas for Scissors or Cycles

Task Sequence:



DT&I Process involvement:

This task involves the following phases of the Design Thinking Process:
Phase 1. Observe/Empathise/Research (where, when and what of sun-dials)
Phase 2. Understand/Analyse/Define (understand how of sun-dials)
Phase 3. Ideate/Alternate/Create (sketch & explore alternate concepts)
Phase 4. Build/Prototype/Detail (build and make a prototype of sun-dial)
Phase 5. Evaluate/Reflect/Implement (presentation & feedback from others)

Mapping SDG Goals:

The following SDG goals need to be considered while solving this task. Sun is the source of clean sustainable energy. In addition, your solutions could make use of sustainable materials.

Task 3:

Task 3 = 3a + 3b + 3c:
School Hours: 2, Home hours: 1

3.1 Task 3a:

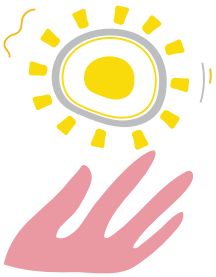
Task 3a:
School hours: 1, Done individually

Topic title: Sketch Different Ideas for Sun-Dials
Sun is the source of energy and represents one of the elements of nature -'Fire'
- Write down different names for the Sun in our culture (at least a dozen)
- Figure out how the position of the sun can be used to tell the time of the day
- Figure out how shadows formed by objects due to the position of sun can be used to tell the time of the day
- Study ancient sun-dials
- For reading the shadow formed by objects, it looks like you need two things – (1) the object and (2) the surface on which the shadow is cast
- Can you think of shape alternatives for the (1) Object and (2) the surface and sketch these on A4 size sheets.

Surya, Ravi, Bhanu, etc.

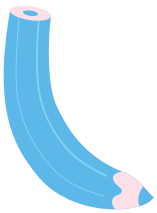
Tips: The object could vary from a linear object, planar object to 3 Dimensional Object. The surface could be planar, curved, etc. The surface could have designs to indicate the time as well as reflect the characteristics of the region/place.
- Sketch at least 3 to5 alternatives

3.2 **Task 3b:**



Task 3b:
School hours: 1, Done in groups of 3-4
Topic Title: Design a portable sun-dial that you can carry or wear it on you
- Look at all the ideas that your group has, and group them in similar categories. If they are different from one another, keep them as a different category. Discuss on how you might be able to combine ideas or take forward one of the ideas. All ideas are essential (so do not be possessive about only your idea). Its important to make it better and make it suitable as a portable sun-dial.
- Figure out how to make the sun-dials small enough and comfortable enough to carry it with you.
- Can the design be such that it can be worn on you?
- You may choose 2-3 ideas to finalize and make a final sketch of your product.
- Make use of chart paper/sticks/to make the model of your idea
Tips: Transparent Umbrella with a tip? Use of Lens? Coconut leaves for a wrist watch? Triangle on a circle? Etc.
- Take a photograph of both your sketch as well as your final model

3.3 **Task 3c:**



Task 3c:
Home hours: 1, Done individually
Topic Title: Turning your final concept sketch into a Final Drawing
- The aim is to present your final idea/concept as best as you can
- Make a drawing of your idea on A4 size drawing paper using 0.5 ink pen and colour it using colour pencils.
- Mention the different parts of your concept and mention the materials used.
- Give a name to your final concept
- you can also describe in a few words how your concept can be used to tell time.

Reflection:

Questions to ponder:
- What design thinking principles were used?
- How did sun-dials help people? Why was it required?
- Is it relevant today? Can we make something in digital format with the same outcome?
- Can you use quick sketching as a means of trying out alternate concepts?
- Will you start a sketch book that you can carry with you to document ideas and your thoughts?

Assessment:

Assessment Criteria (Task 3a + 3b) - Assess yourself:
- Have detailed understanding of the concept of shadow formation and the use of Sun-dials. (Individual task)

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

- Created a sketch clearly showcasing the understanding of the design process and is able to use the basics of sketching for ideation. (Individual task)

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

- Presented 4-5 sketches that explore creative variations in Product Forms. Different alternatives like linear, planar, 3D objects and the use of planar and curved surfaces. (Group task)

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

- Displayed heightened sensitivity to creating variations and to understand its significance for creative alternate concepts for Design. (Group task)

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

Other References:

Other suggested References:

1. Design Idea Sketching:
https://www.youtube.com/watch?v=71vvkT2aaUQ
https://www.youtube.com/watch?v=4UwPiwbmj_8

4.0 Module 4:

Introduction to Design Thinking Process and Environmental Design Project

(2hrs x 3 sessions = 6 hours at school + 3 hours at home)
(At school done in groups of 3-4 and at home individually)

Exposure 1	- What is the Design Thinking Process.
Exposure 2	- Information classification/categorization using sticky notes or mind-mapping.
Exposure 3	- Design Case Study using Design Thinking process.
4.1 **Task 4a** (at School)	- Identify and document problems (positives and negatives) in your school environment (including outdoor and indoor spaces, built artefacts, objects, services and facilities) - look at it from different points of view of its users - students, teachers, staff, visitors, parents, etc. - Analyse the problems using sticky notes or through mind-mapping to classify and categorise them into buckets of problems.
4.2 **Task 4b** (at School)	- Ideation and Creative Options and short-listing of concepts.
4.3 **Task 4c** (at Home)	- Creating Scenarios and Design mock-ups.
4.4 **Task 4d** (at School)	- Final Design Solution, Detailing and Final Presentation. - Collate all the good ideas together and make a presentation.
Final Output Exhibition	Design Process documentation and presentation of the final solutions. All the Final Design Output for the Design and Thinking Course is encouraged to be put up as an exhibition in the school premises.

4.0 **Module 4:**

Introduction to Design Thinking Process and Environmental Design Project

(6 hours at school + 3 hour at home)

Introduction

Introduction to Design Thinking Process and Environmental Design Project

- Design Thinking may be seen as a method to solve problems using a process. A process that first understands users, identifies and analyses a problem or need, and researchs relevant information, after which ideas are explored and analysed, until an appropriate innovative solution to the problem or need is arrived at.
- It involves these five phases – 1. Observe/Empathise/Research, 2. Understand/Analyse/Define, 3. Ideate/Alternate/Create, 4. Build/Prototype/Detail and 5. Evaluate/Reflect/Implement.
- Design Thinking could be viewed as the process that translates an idea into an appropriate useful solution. This could be applied to any field, be it economics, products, services, health, environment and other such areas.

Here you will understand the basics of this design process and apply it to solve a problem concerning your school environment.

Aim of the Module

Aim of the Module:

This Module introduces students (Grade 6/7/8) to the Design Thinking Process. Using this process, the students will apply its principles and steps to identify, analyse, ideate and find suitable solutions to a problem concerning their school environment. It should create an interest in this field, nurture their sense of curiosity and motivate them to explore and discover this area. The students will understand the basics of the design process and be able to apply it to identifying and solving problems surrounding their immediate environment.

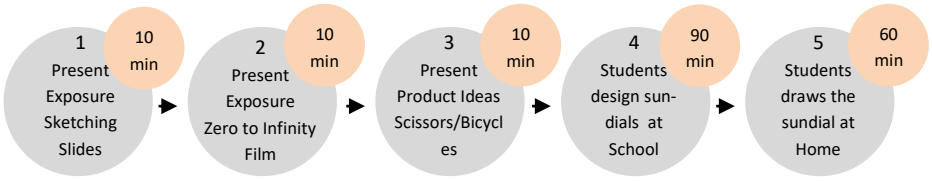
Place: Task 4a, Task 4b, Task 4d at School and Task 4c at Home

Equipment: Smart Mobile phone with Camera, Sketchbooks for sketching and taking notes, Students need access to normal paper, Drawing paper, Chart paper, some sticks, Soft aluminium wires, Scissors, Pencils and Clay.

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

Exposures:
Exposure 1: Side show (12 in no.) What is Design Thinking Process
Exposure 2: Slide show on how to use Sticky notes to Categorise information + how to do mind-mapping
Exposure 3: Slide show on a Design Case Study using Design Thinking process

Task Sequence:



Design Thinking & Innovation Process involvement:
Task 4 = 4a + 4b + 4c+ 4d:
This task involves all the following phases of the Design Thinking Process:
Phase 1. Observe/Empathize/Research (why and what of school environment)
Phase 2. Understand/Analyse/Define (understand how of school environment)
Phase 3. Ideate/Alternate/Create (sketch & explore alternate concepts)
Phase 4. Build/Prototype/Detail (developing & detailing of concepts)
Phase 5. Evaluate/Reflect/Implement (presentation & feedback from others)

Mapping SDG Goals: The following SDG goals need to be considered while solving this task. Discover positive and negative aspects in your school environment with respect to these SDG goals. You could suggest solutions to overcome the negative aspects.

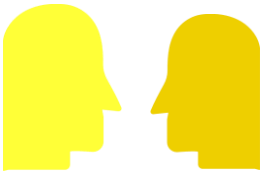
Task 4:

School Hours: 6, Home hours: 3
Topic: Applying Design Thinking Process in an Environmental Design Project

4.1 Task 4a:

Task 4a:
School hours: 2, Done in groups of 3-4

Topic title: Identify Problems in your School Environment
-The first task is to identify issues with the school environment in terms of its facilities, artefacts, buildings, greenery, playgrounds, laboratories, classroom spaces, cycle stand, common spaces, etc.



- Each group will look at issues connected with one or two of these areas
- Look at it from different points of view of its users - students, teachers, staff (watchman, maintenance staff, office staff), visitors, parents, persons with disability, etc.
- You will need to converse with them to find out their difficulties and you might need to look at the school environment from their point of view.
- Observe how they interact with the school environment – mark the places or spaces they use and find out problems faced by them and at the same time note down what is right or good about these.
- Document by taking photographs of your observations.
- Note down your observations in your sketchbook as a table in three columns, one for positives, one for negatives and one for suggestions

Positive aspects/issues	Negative Aspects/issues	Suggest Improvements

- Rewrite these points on sticky notes and which makes it easy to (1) classify and categorise them into similar categories/groups (ii) rearrange the points within the categories in order of importance and (iii) mark out interconnections/links between the different points.
- or instead you could use the mind-mapping method to (i) arrange the points on different branches, (ii) in order of importance and (iii) see if there are interconnections/links between the different points.
- Photograph your sticky notes arrangement or the mind-mapping exercise.
- Identify/select from these problems that you would like to solve and make a final list of them (at least 5).
- Summarise the work you have done less than 5 presentation slides (Problem statement + Photo/sketch documentation + Table + Categorisation/mind-mapping + Final list of solvable problems)

4.2 **Task 4b:**

Task 4b:
School hours: 2, Done in groups of 3-4

Topic title: Ideation and Creative Options and short-listing of concepts
-You have understood the problems that need solutions
- Your group could brainstorm, Ideate on possible solutions and sketch these out
- and make a list of possible solutions on this matrix of (easy to implement vs difficult to implement on the horizontal axis and low cost vs high cost on the vertical axis)
- collate all the good ideas together and short-list them according to its usefulness and ease of implementation
- Make a presentation of these in 3 slides (alternate sketches + Matrix +short-listed idea)

4.3 **Task 4c:**

Task 4c:
Home hours: 3, Done individually
School Hours 1, Done in Groups of 3-4
Topic title: Creating Scenarios, Design mock-ups and detailing
- Select the best of your solutions/suggestions
- create a scenario to demonstrate in 5 steps how to use your selected idea. You can use characters to build the scenario

- you could also try making a mock-up of your final idea using card-board/easily available materials.
- Detail out the final selected solution: the details could be about its shape/form, materials, listing of advantages/disadvantages and how to implement/maintain
- make a presentation of these in 3 slides (scenario + mock-up + details)

4.4 **Task 4d:**

Task 4d:
School Hours 1, Done in Groups of 3-4

Topic title: Final Design Solution Presentation
Presentation Details of points mentioned above:
Task 1: Prepare a presentation (of 6-10 minutes duration) to include all the stages of your project in 12 slides:
a. 5 presentation slides for Task 4a (Title/Problem statement with the names of team members + Photo/sketch documentation + Table + Categorisation/mindmapping + Final list of solvable problems)
b. 3 slides for Task 4b (alternate sketches + Matrix +short-listed idea)
c. 3 slides for Task 4c (scenario + mock-up + details)
d. 1 slide for Full References (Learn how to do references) and Acknowledgments – to all who have helped
e. Make a group presentation using your slides in the classroom
f. You could setup an exhibition of these projects in your classroom/exhibition room and invite other staff and students to come and see what you have done

Reflection:

Questions to ponder:
- What are the most interesting phases of the Design Thinking process that you liked?
- Can you apply what you learnt by solving problems around your school to other places and situations – starting at your home or neighbourhood?
- Will you share this information on the use of Design Thinking Process with others – like your friends and cousins?

Assessment:

Assessment Criteria (Task 4a + 4b + 4c + 4d) - Assess yourself:
- Identifies the key elements of 4-5 problems and clearly outlines the objectives in an effective manner with no assistance. (Group task)

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

- Develops strategies to interact with the school environment that are insightful and use logical reasoning to reach accurate results with no assistance. (Group task)

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

- Documents 4-5 representations that accurately reflect the problems and aids in solving the problem with no assistance. (Group task)

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

- Displays creative skills to ideate, collate and present 12 slides that reflect the basics of design process with very innovative solutions. (Group task)

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

Other References:

Other suggested References:

1. Design Thinking Process - explained with an example:
https://www.youtube.com/watch?v=uRtAzzitBmA
2. Design Thinking Framework - a short video:
https://www.youtube.com/watch?v=LhQWrHQwYTk

Assessment Criteria:

Module 1.0: Elements of Design and Story Creation

Achievement Levels	**1-2** **BEGINNING**	**3-4** **DEVELOPING**	**5-6** **PROMISING**	**7-8** **PROFICIENT**	**9-10** **EXCELLENT**
Puppet design and Construction (Individual assessment)	Needs to start making puppets beyond the basic outline.	Puppets are mostly complete. Some pieces fell off during storytelling.	Puppets are constructed fairly well. They have understood the use of form as building blocks to create puppets.	Puppets are original and constructed well. They seemed motivated to explore form and design.	Puppets are original, creatively designed, and capture the essence of the elements of Design through basic shapes.
Puppet Manipulation (Individual assessment while enactment)	Needs to complete puppets to incorporate in the story	Puppeteers rarely manipulated puppets	Puppeteers sometimes manipulated puppets	Puppeteers usually manipulated puppets so audience could see them.	Puppeteers always manipulated puppets and integrated them with the story
Story creation (Group assessment)	Needs to start developing the story	Story has a weak plot and organization	Story has a plot but confusing organization and structure. No supporting are details included.	Some evidence of original, creative ideas, organization and structure. Few supporting details are included.	Strong organization and structure of story with all elements of story writing. Vivid supporting details included.
Collaboration and Enactment (Group assessment)	Needs to start working on story enactment	Most of the group members' voice was monotone and not expressive.	Some storytellers showed a little expression and emotion.	Most of the storytellers' voices showed some expression and emotion and the group worked in collaboration	Clear evidence of original, creative ideas throughout the presentation. All storytellers showed a lot of expression and emotion and the story was well enacted

Assessment Criteria:

Module 2.0: Form Transitions + Discovery of Forms in Environment

Achievement Levels	**1-2** **BEGINNING**	**3-4** **DEVELOPING**	**5-6** **PROMISING**	**7-8** **PROFICIENT**	**9-10** **EXCELLENT**
Creating letters/forms using paper/clay (Group task)	The student: Needs to complete creating an alphabet	The student: Documents one alphabet using paper/clay	The student: Documents 1-2 alphabets using paper/clay	The student: Documents 3-4 alphabets using paper/clay	The student is able to create the 2 end shapes/forms for this task
Discovering in-between shapes and forms (Group task)	Needs to complete creating a transition form	Creates a transition form	Creates 1-2 transition forms with the middle shape/form in-between the two letter-forms	Creates 3-4 clear transition forms with the middle shape/form in-between the two letter-forms	Creates transition clearly showcasing the in-between letters represent the transition
Sensitivity towards new forms by transitions (Group task)	Displays poor sensitivity to minor changes in shape and form and creation of new forms by transitions	Displays very limited sensitivity to minor changes in shape and form and creation of new forms by transitions	Displays average sensitivity to minor changes in shape and form and creation of new forms by transitions	Displays sensitivity to minor changes in shape and form and creation of new forms by transitions	Displays heightened sensitivity to changes in shape and form and creation of new forms by transitions
Discovering Forms in Nature (Individual task)	Is not able to document through photography identifiable forms of alphabets, patterns and faces from the environment.	Limited ability to document through photography identifiable forms of alphabets, patterns and faces from the environment.	Average ability to document through photography identifiable forms of alphabets, patterns and faces from the environment.	Ability to document through photography identifiable forms of alphabets, patterns and faces from the environment.	Is able to document through photography easily identifiable forms of alphabets, patterns and faces from the environment.

Assessment Criteria:

Module 3.0: Sketching for Ideation + Exploration of Product Ideas

Achievement Levels	**1-2** **BEGINNING**	**3-4** **DEVELOPING**	**5-6** **PROMISING**	**7-8** **PROFICIENT**	**9-10** **EXCELLENT**
Making connections between shadows and use of Sun-dials (Individual task)	The student: Needs to understand the concept of shadow formation and use of Sun-dials	The student: Possesses a vague understanding of the concept of shadow formation and use of Sun-dials	The student: Possesses a limited understanding of the concept of shadow formation and use of Sun-dials	The student: Possesses understanding of the concept of shadow formation and use of Sun-dials	The student: Possesses detailed understanding of the concept of shadow formation and use of Sun-dials
Designing and sketching Sun-dials (Individual task)	Needs to complete a sketch of Sun-dial	Creates a sketch that is limited in design and operation, and the basics of sketching are not clear.	Creates a complete sketch that reflects limited basics of sketching for ideation, but lacks attention to detail.	Creates a sketch that reveals a fair understanding of the design process and the basics of sketching for ideation.	Creates a sketch clearly showcasing the understanding of the design process and is able to use the basics of sketching for ideation
Shape Alternatives (Group task)	Needs to present a complete design with shape alternatives	Presents an alternative sketch that reflects very basic creative variations in Product Forms. No alternative objects/surfaces used	Presents 2 sketches that explore in a limited manner the creative variations in Product Forms. A few alternative object/surfaces used	Presents 3 sketches that fairly explore creative variations in Product Forms. Some alternative objects/surfaces used.	Presents 4-5 sketches that explore creative variations in Product Forms. Different alternatives like Linear, planar, 3D objects and planar and curved, surfaces used.
Sensitivity towards creating creative alternate concepts for Design (Group task)	Displays poor sensitivity to creating variations and to understand its significance for creative alternate concepts for Design.	Displays very limited sensitivity to creating variations and to understand its significance for creative alternate concepts for Design.	Displays average sensitivity to creating variations and to understand its significance for creative alternate concepts for Design.	Displays sensitivity to creating variations and to understand its significance for creative alternate concepts for Design.	Displays heightened sensitivity to creating variations and to understand its significance for creative alternate concepts for Design.

Assessment Criteria:

Module 4.0: Design Thinking Process and Environmental Design Project

Achievement Levels	**1-2** **BEGINNING**	**3-4** **DEVELOPING**	**5-6** **PROMISING**	**7-8** **PROFICIENT**	**9-10** **EXCELLENT**
Problem/Issue Identification (Group Assessment)	Needs help to identify the key elements of the problem and/or the objectives with a great deal of assistance	Identifies the key elements of a problem and vaguely outlines the objectives with assistance	Identifies the key elements of 2 problems and outlines the objectives with assistance	Identifies the key elements of 3 problems and clearly outlines the objectives in an effective manner with little assistance	Identifies the key elements of 4-5 problems and clearly outlines the objectives in an effective manner with no assistance.
Ideation and Observation (Group Assessment)	Needs a great deal of assistance to interact with the school environment and note down observations	Needs some assistance to interact with the school environment and note down observations	Develops strategies to interact and use logical reasoning to observe and note down observations with assistance	Develops strategies to interact with the school environment and use logical reasoning to reach accurate results with little assistance	Develops strategies to interact with the school environment that are insightful and use logical reasoning to reach accurate results with no assistance
Analysis and Documentation (Individual Assessment)	Needs a great deal of assistance to document a representation that reflects the problem and solution	Documents a representation with assistance that accurately reflects the problem and aids in solving the problem	Documents 2 representations with assistance that accurately reflect the problems and aid in a limited manner in solving the problems	Documents 3 representations that reflect the problems and aid in solving the problems with little assistance.	Documents 4-5 representations that accurately reflect the problems and aids in solving the problem with no assistance
Presentation (Group Assessment)	Needs a lot of assistance to ideate, collate and present 2-3 slides that reflect the basics of design process with limited solutions	Needs some assistance to ideate, collate and present 4-5 slides that reflect the basics of design process with appropriate solutions	Displays average skills to ideate, collate and present 6-8 slides that reflect the basics of design process with appropriate solutions	Displays skills to ideate, collate and present 9-11 slides that reflect the basics of design process with appropriate and innovative solutions	Displays creative skills to ideate, collate and present 12 slides that reflect the basics of design process with very innovative solutions

Design Thinking for Grades 6/7/8

Student Feedback Form:

NAME	CLASS	MODULE	TASK	ACTIVITY	DATE

Give a rating for each of the statements below:
- by placing a tick mark in the corresponding box.

	INADEQUATE	FAIR	GOOD	VERY GOOD	EXCEPTIONAL
Level of effort you put into activity					
Your level of knowledge at the start of the activity					
Your level of knowledge at the end of the activity					
Understanding of exposure slides/video					

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
I enjoyed doing the activity					
I understood the design principles while doing the task					
I liked trying out different creative variations					
I can apply design thinking process to problem solving					
I enjoyed working in collaboration with my group					

Additional Comments:

What I liked the most: What can be done better:	
What can be Added/Changed:	

Teacher's Feedback Form:

NAME	CLASS	MODULE	TASK	ACTIVITY	DATE

Comments:

- place a tick mark in the corresponding box.

	COMMENTS				
It was easy to deliver the exposure modules: You comments:	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
It was easy/satisfying/enjoyable to conduct the task activities: Your comments:	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
No issues were faced with regard to assessment of the task: Your comments:	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
Common questions posed by the students:					
Suggestions for improving the task or suggestion of another task:					
Other suggestions, if any:					

Credits

Acknowledgments and Credits:

CBCE Curriculum Development Committee:

Prof. Ravi Poovaiah, IIT Bombay, Chairman
Dr. Abhay Jere, Chief Innovation Office, Ministry of Education innovation Cell,
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CBSE:

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Ms. Prajakta Kulkarni, Nodes, Pune (Tasks, Exposure Content, Teachers Manual))
Sri Harish Sanuja, Director, Jaipuria Schools, Ghaziabad (Assessment and Validation)
Ms. Rupa Chakraborthy, Director, Suncity World School, Gurgaon (Teachers Manual)
Prof. Ravi Poovaiah, IIT Bombay (Introduction, Tasks, Task details, Exposure Content, Assessment, Validation and Teachers Manual)

Credits:

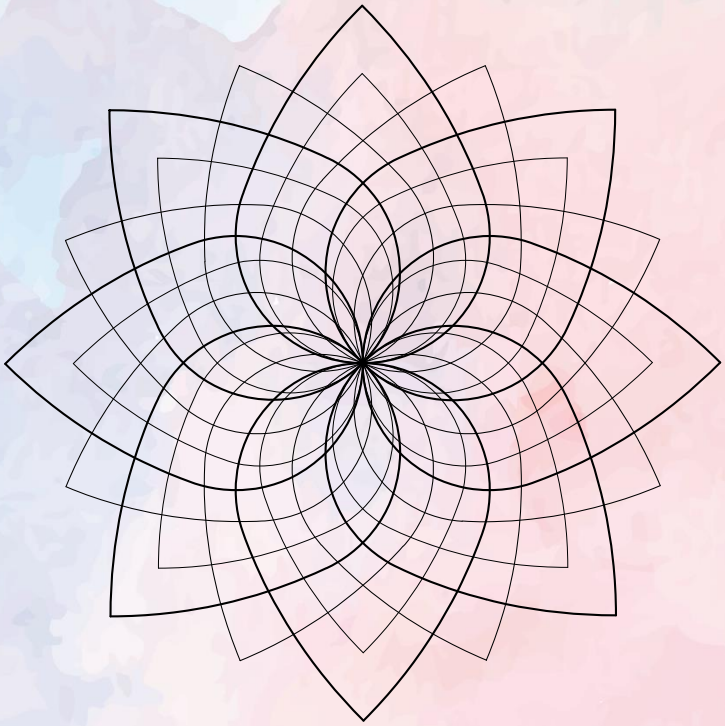
Dr. Ajanta Sen for conceiving the idea of the ‘world in your Palms’ as an exercise for children (reference Task 1b)

Design Thinking and Innovation for Grade 6 / 7 / 8

Workbook/Taskbook

2022

Hope you enjoyed the tasks!



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