**Falling Leaves:
An Interactive Learning Kit**

Geetanjali Srivastava

Guide: Prof. Kirti Trivedi

21 November 2006

Current learning systems: Surface Approach to learning

Students are told information through textbooks

Expected to memorise and repeat during assessments

Grading on the basis of accuracy of recalling information

Learning strategies
- Memorising parts of information instead of completely understanding the subject

- Learning by rote for the purpose of reproducing it

Result
Concept understanding and
thinking takes a backseat

Develop negative outlook towards:
- taking tests and examinations
- attending school, homework
- studying

Students aim to reproduce
information to meet assessment
requirements or for the sole
purpose of passing the assessments

Learning to Understand

New approach towards learning and the **design of learning content**

Integral understanding from the basic level induces learning

Integral understanding developed through a process of
- observation
- experimentation
- hypothesis building
- validation

Students may create meaning, **apply it to ideas of their own** and other contexts

Naming a phenomenon is not understanding, name is merely representative of idea/ object

By **watching and observing,** children can understand an occurrence

Language independent learning/ understanding
Visually depicting a phenomenon in different contexts that initiates a discussion between the teacher and students is by itself a language

Universal Content
Learning material that can be used anywhere and by anyone, through the process of understanding and exploration

Good learning requires
- Understanding a concept well
- Create meaning from what is being learned

Group learning
- stimulates students to develop their own understanding
- ask questions, learn to answer them
- participate in discussions explore beyond the immediate environment

Active Learning

परिप्रश्न - **Counter question**

जिज्ञासा - **Curiosity**
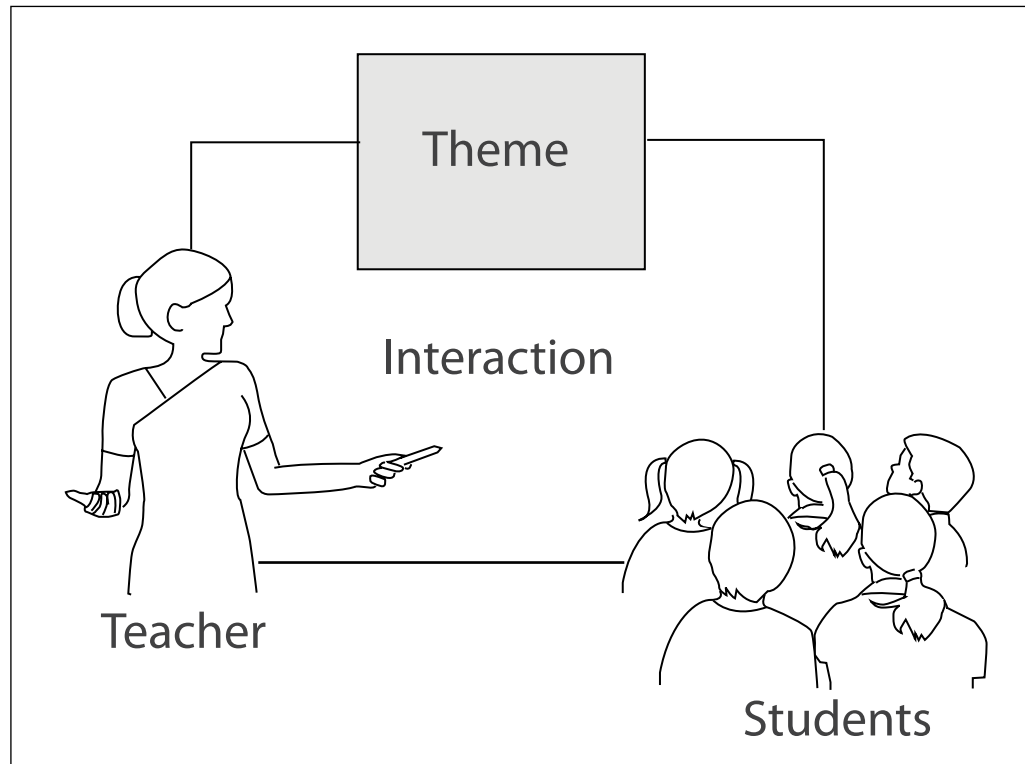
Interactive Group Learning

Constructive activity

Ask questions simultaneously

Interactive sessions where students learn from each other

Learners and their teacher share ideas and participate in discussions which encourages students to learn

1. Shared observations and discussions
2. Multiple perspectives and points of view
3. Problem solving
4. Testing ideas
5. Understanding the core concept

ICT in Education

Possible to create learning environments within classrooms

Application of digital equipment to all aspects of teaching and learning

Group learning
1. Joint observations are carried out and repeated

2. The contents are seen, observed and discussed till the subject is understood

Ease and convenience
1. Logistics has been made simpler, and lesser time is wasted in collecting the content for study

2. Facilitates concentrated discussion of the phenomenon

Interactive Learning Kit: Possibilities

- Learn lessons through an interactive approach

- Teacher becomes part of the group and participate collectively

CD will simulate the natural phenomenon in classrooms, so that students can enjoy the activity indoors, and eventually go outside and explore on their own

- Viewed indoors, all year round and anytime of the day
- Language independent and entirely visual, used all over the world by students
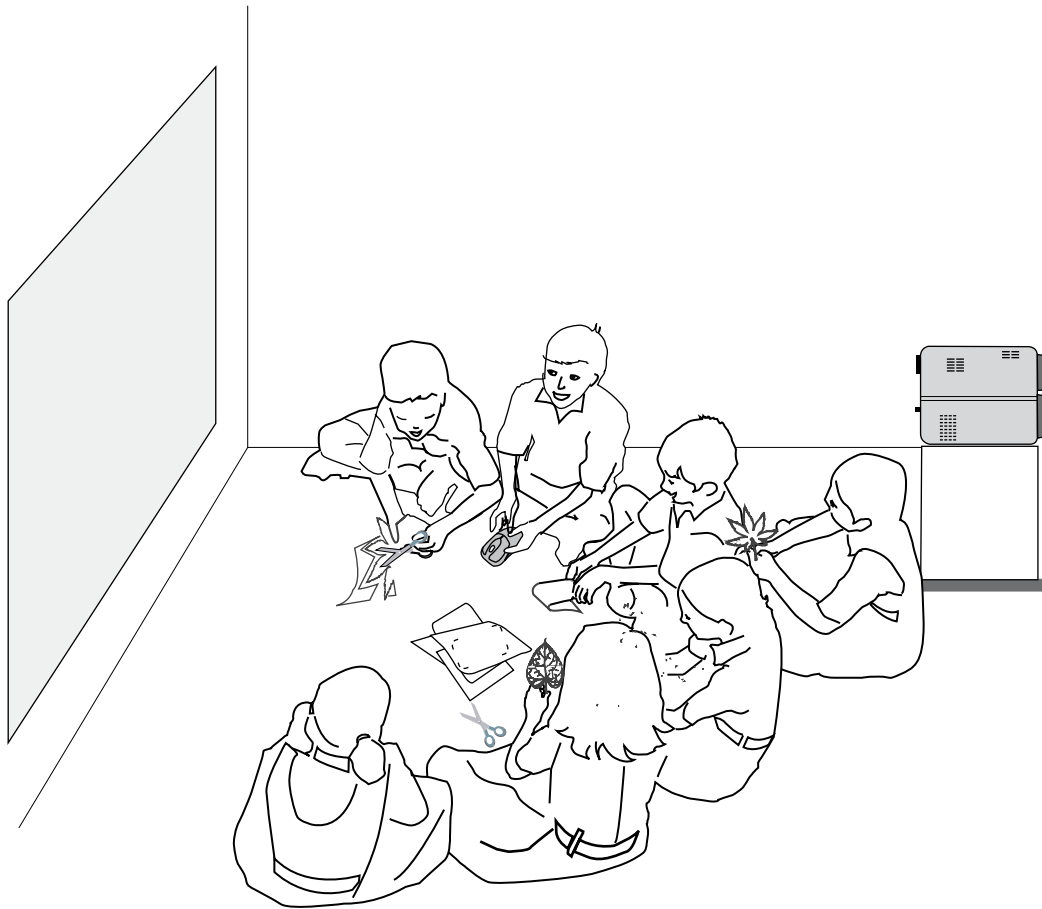
- The Kit is a collection of modules helps students to discover and explore various leaf fall patterns

- It increases in level of complexity

- Students learn how to make their own objects which simulate natural leaf fall movements

Choosing a Theme: Falling Leaves

Display a variety of patterns because of the diverse types, shapes, sizes and colours

Air currents carry some leaves a great distance while others simply float slowly

The phenomenon of falling leaves is universal

Individuals of all ages can observe, experience the activity

Each fall has a unique pattern variations in pace, style and manner, speed and direction

Not repetitive or monotonous

Understanding Leaves

Types of leaves

Apice

Margin

Base

Petiole

Simple

Digitate
(Peltate)
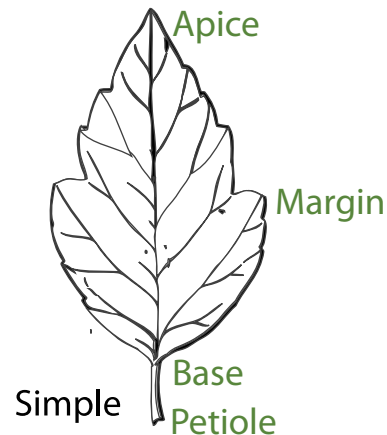
Parameters of a leaf fall

Leaves of different kinds fall in different patterns. No two patterns are the same. Yet, it is possible to trace a general pattern between leaves of an almost similar shape, size and level of dryness.

The parameters responsible for this action are:

Internal conditions
  1. Size of the leaf, surface area
  2. Shape of the leaf
  3. Thickness/ thinness of the leaf
  4. Weight distribution of the leaf
  5. Level of dryness

Shape

Elliptic
Oval shaped
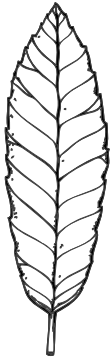
Oblong
Elongated

Ovate
Egg shaped
wide at base

Obovate
Egg shaped
narrow at base
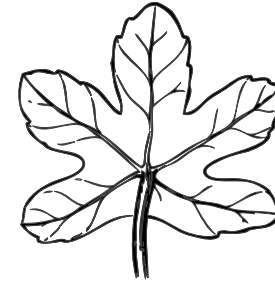
Peltate
Stem attached
centrally
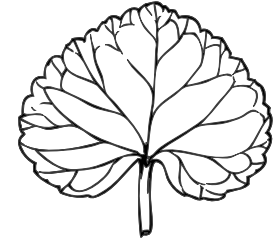
Reniform
Kidney- shaped

Oblanceolate
Egg shaped
wide at base

Lanceolate
Pointed at
both ends

Linear
Parallel margins
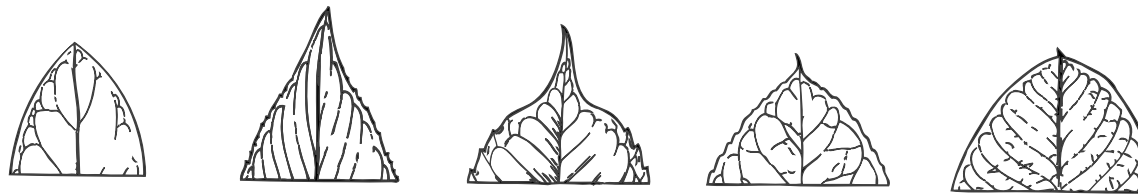
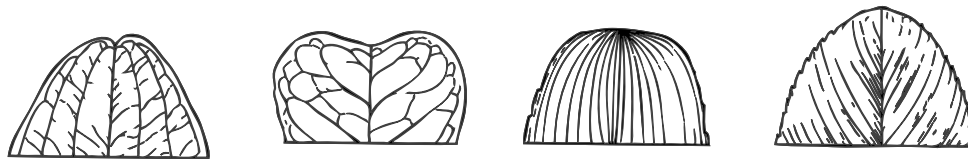**Palmately
Lobed**
Palm shaped

Sagittate
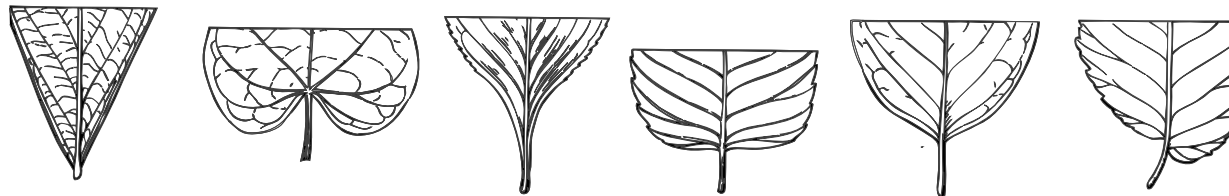Spear shaped
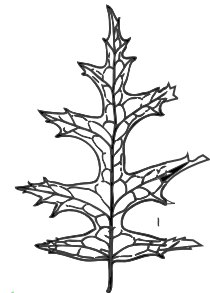
**Pinnately
Lobed**
Deeply indented
margins

Apices

Acute Acuminate Cuspidate Apiculate Mucronate

Emarginate Retuse Truncate Obtuse

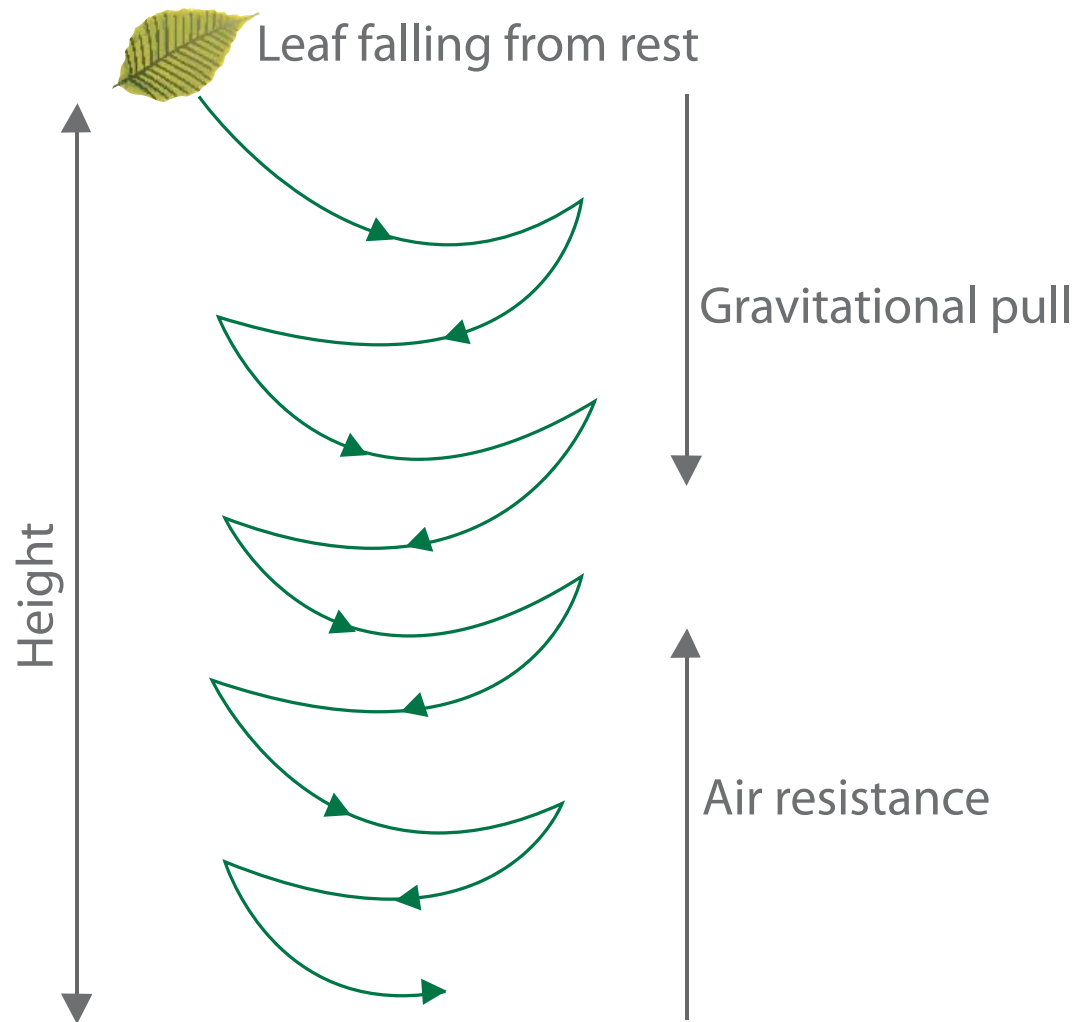**Bases**

Cuneate Cordate Acute Truncate Obtuse Oblique
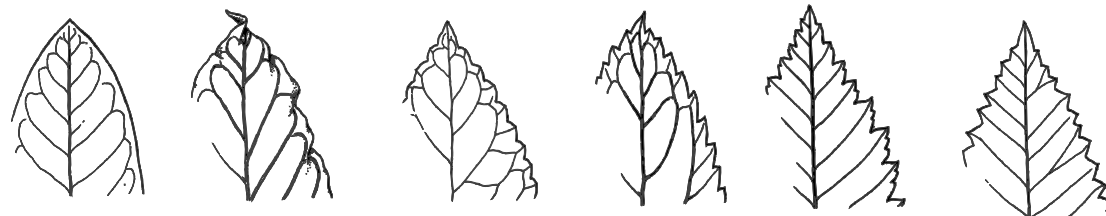
Margins

Entire Undulate Crenate Serrate Doubly Serrate Dentate

Oscillatory motion

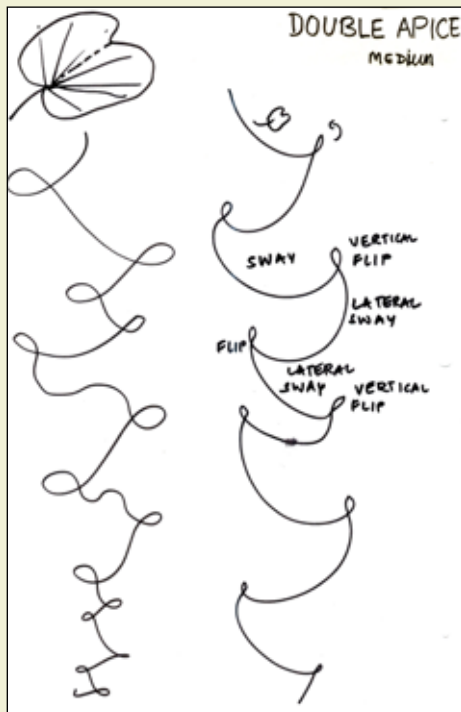Leaf falling from rest

Height

Gravitational pull

Air resistance

External factors
Aerodynamics & Gravitational Forces

1. Downward pull, i.e. gravitational force acting on the falling leaf

2. Upward thrust of the air acting on the surface area of the leaf

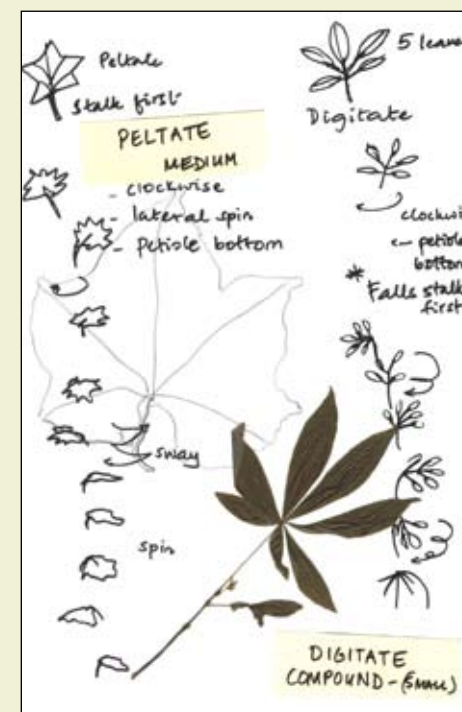3. Local air current

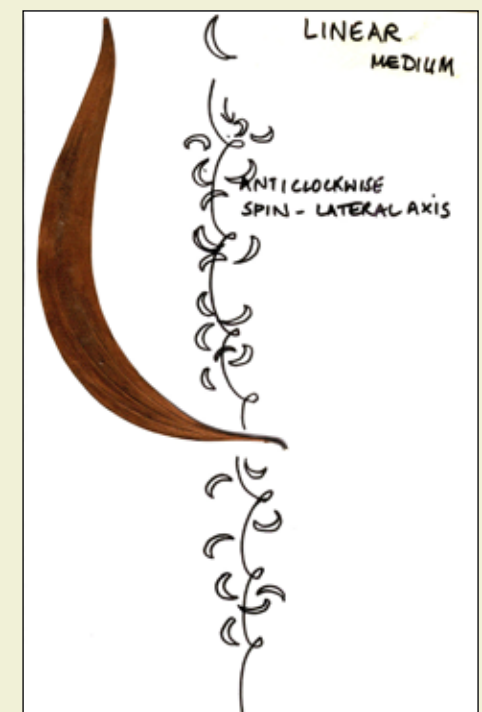4. Height from which the leaf is falling

Double orbicular

sways laterally then flips horizontally at the end of a sway
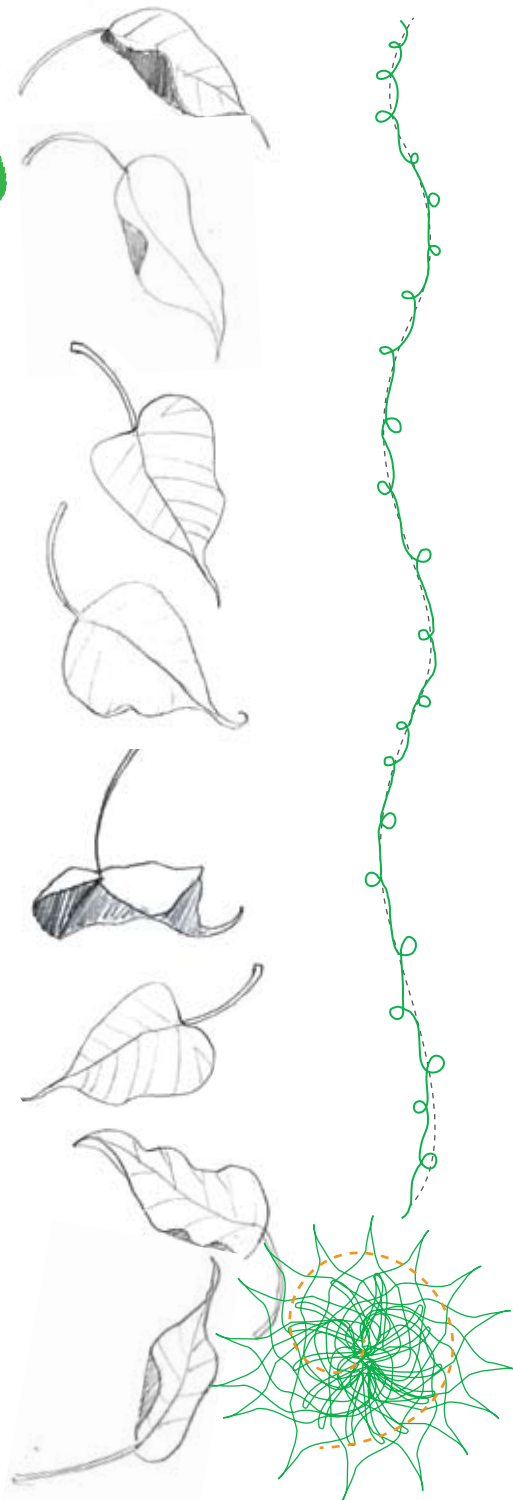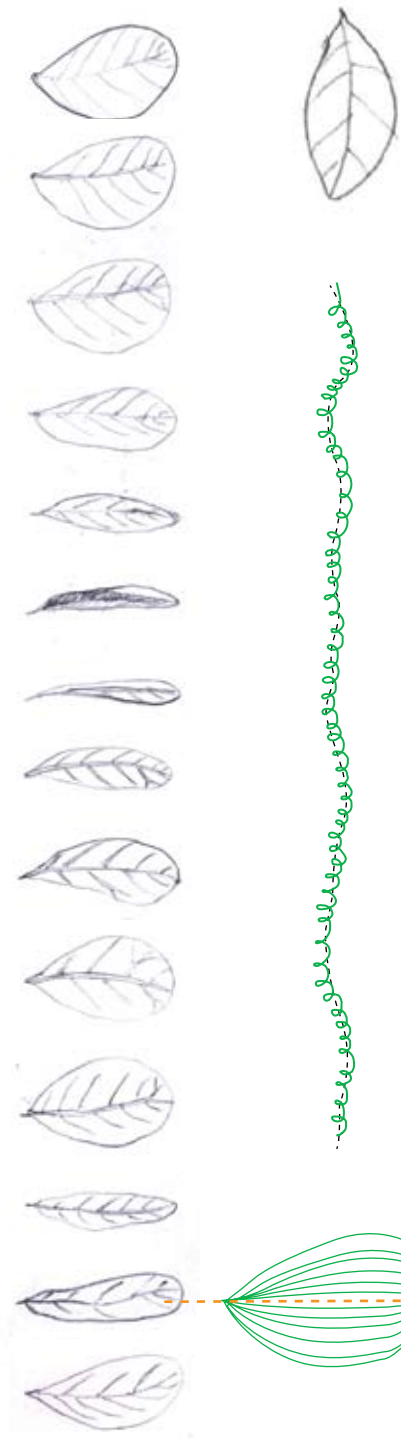

Pinnately lobed

sways and floats laterally, takes a vertical flip at the end of an alternating sway (random) and sways gently onto the ground

Digitate

spins clockwise, (falls stalk first)

Leaf shape: Linear

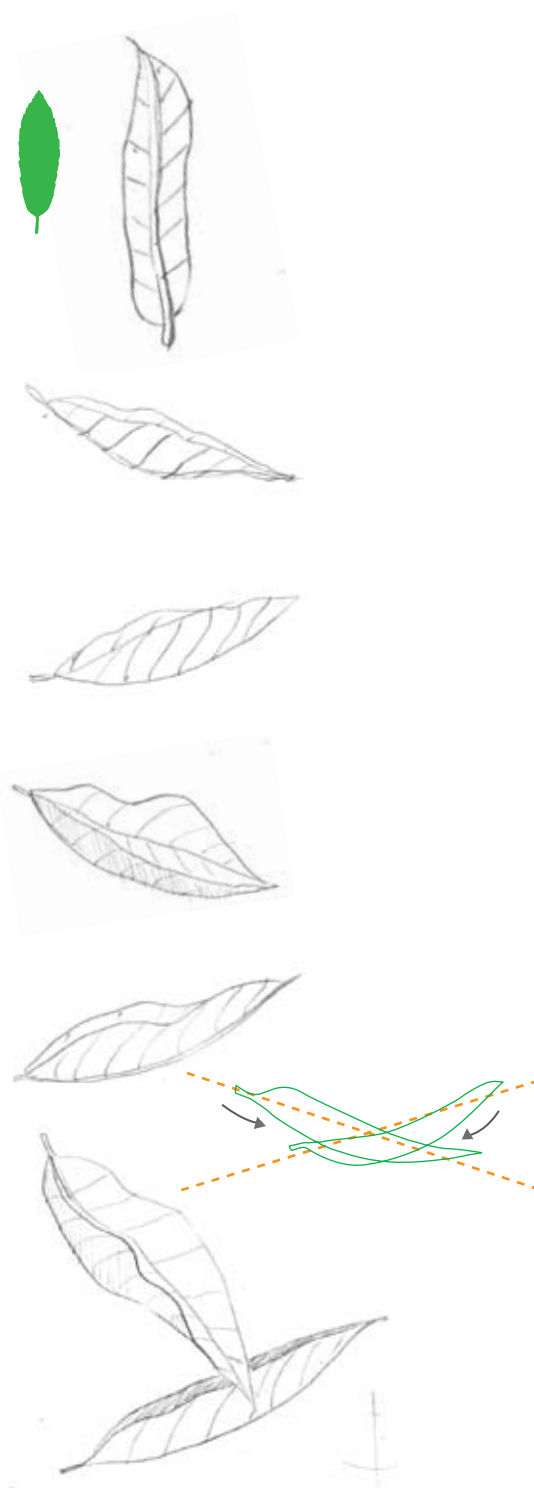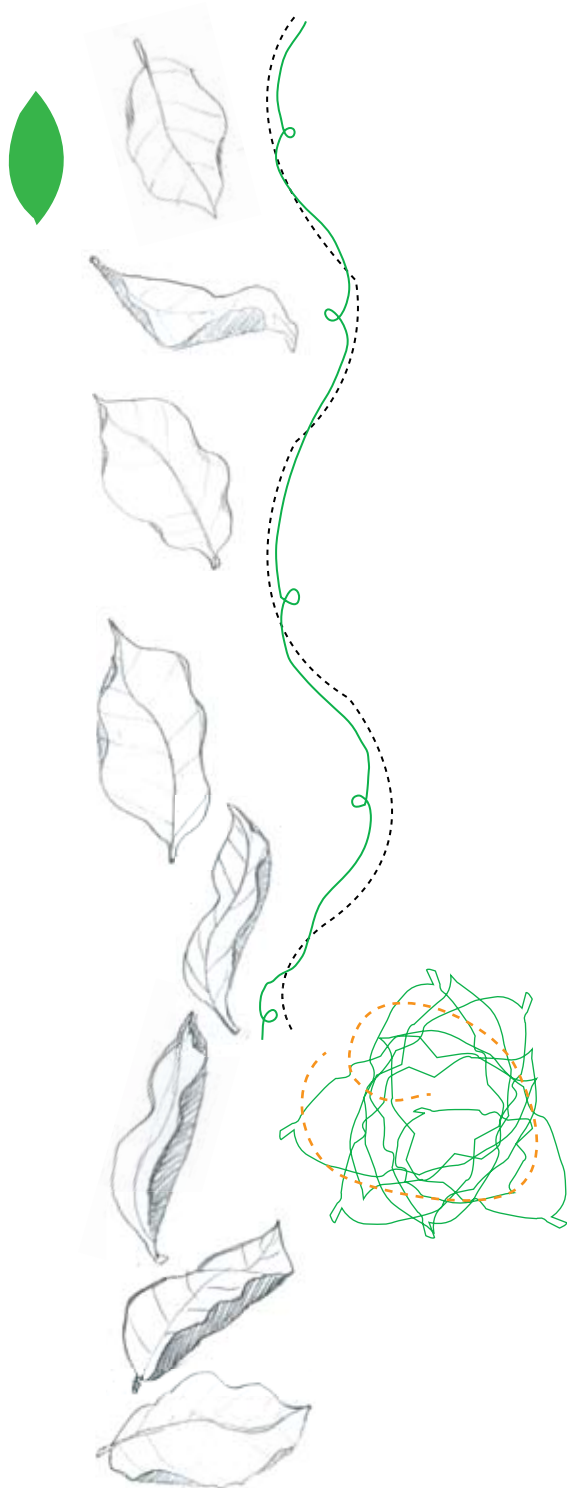This leaf is spins on the lateral axis anti-clockwise

Initial Study

Elliptic (small)
Flips on the horizontal axis along the vein of the leaf

Ovate (medium)
Spiral axis along the stalk of the leaf
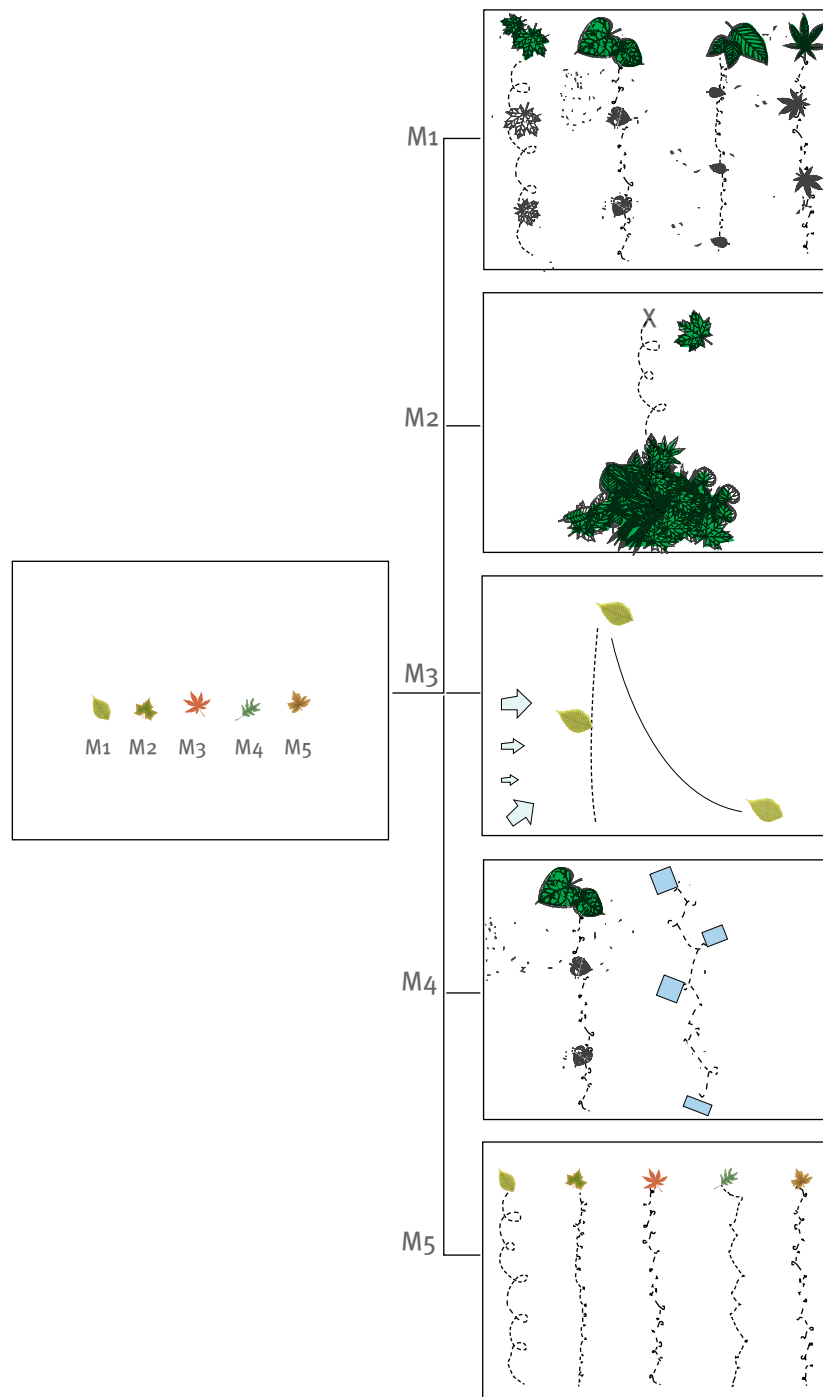
Initial Study

Elliptic (large)
Random axis
Turns and flips as it falls

Oblong (Large)
Planar axis
Oscillating motion

Design Concept

- collection of modules
- sequence that increases in complexity and tasks
- consequently increasing in learning levels

Module 1
Observing

Module 2
Shape parameters

Module 3
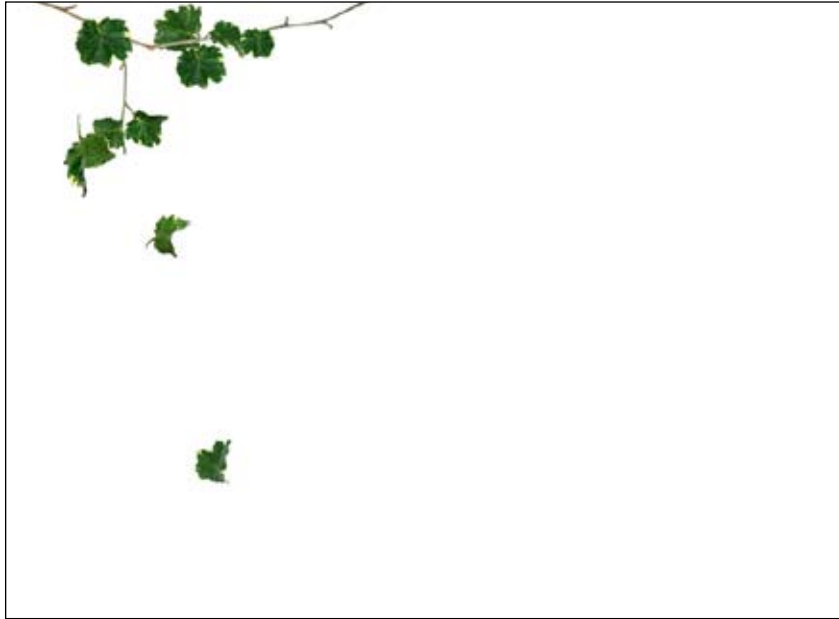External forces: Wind, Gravity and distance from the ground

Module 4
Replicating and designing one's own leaves

Module 5
Enjoying the phenomenon with understanding

Module 1

Module 1: Looking at falls
(Watching)
● An introduction to 16 types

Event
● Each type of leaf is suspended
from a branch
● There are 16 screens that follow,
each with a new leaf, and an
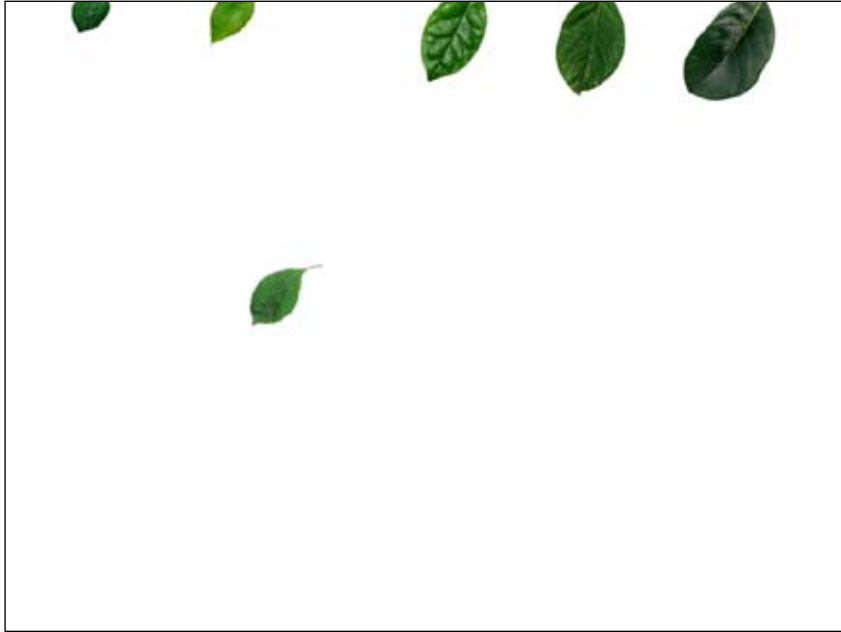interesting fall movement.

Purpose
● To illustrate the various types of
shapes and sizes of leaves

Module Understandings
● Leaves are small and large
suspended in different ways
● Unique type of descending pattern
● Some fall fast and flip, float, sway
while others randomly tumble

Module 2

Module 2: Internal conditions

Event
• illustrates the difference in the size and shape of the leaf.

Size
• elliptic in shape
• increasing order of size
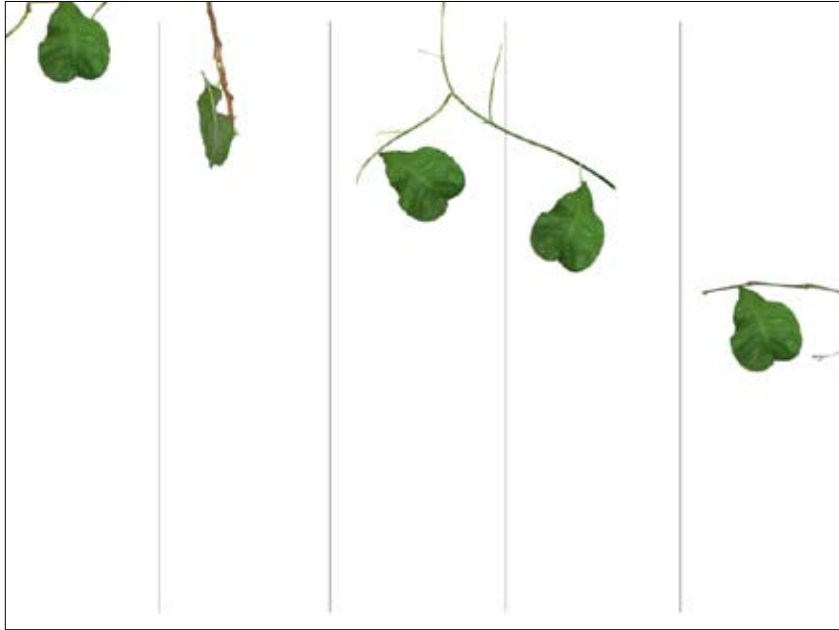
Module 2

Weight
This screen illustrates the leaves possessing thick/ thin/ fleshy bases which affect the overall weight of the leaf, and cause it to fall differently.

• leaves are shown in profile, to demonstrate the weight distribution of the leaves

• Usually the ones with fleshy stems fall towards the ground petiole first.

Thickness/ thinness
thicknesses of the leaves that cause them to fall differently.

Module 3

Module 3: External Factors

Height
Event
The higher the location of the leaf from the ground, the more time it takes to fall than the same leaf located closer to the ground

Module understandings

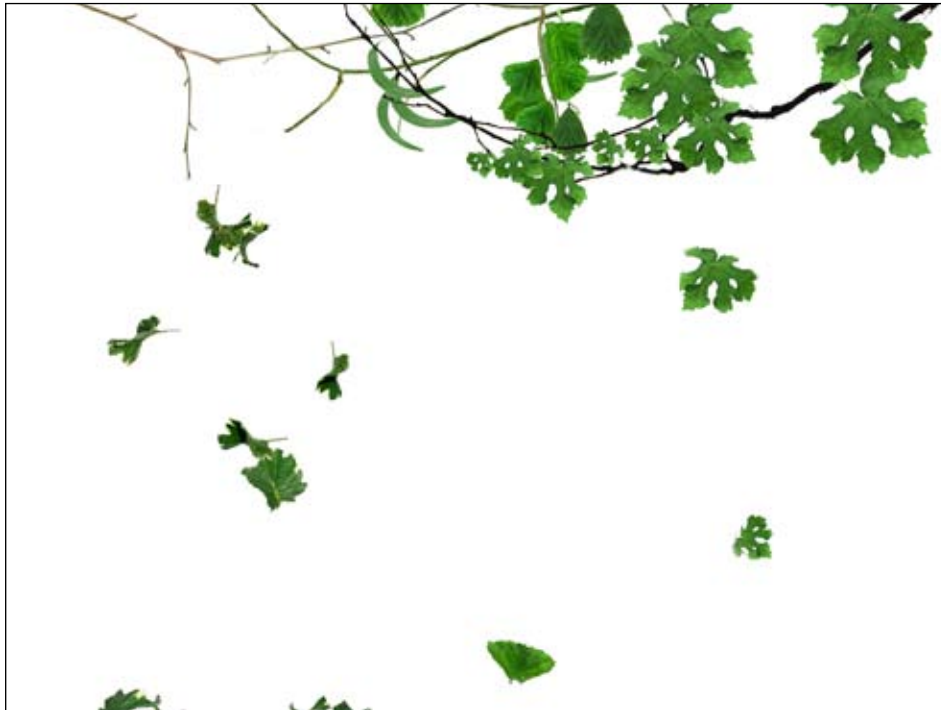demonstrates that distance and relative positions of leaves cause them to fall with different timings

Module 4

Module 4: Making falling objects (Participatory)

• Simple exercises such as folding and tearing

Purpose: Through this module students will be taught to make objects that replicate the fall patterns of the leaves that they have seen

Module 5: Fun exercise

Event
Array of different types of leaves all dancing about on the screen

Purpose
To get children excited about watching the leaves in real life, this screen tickles and amuses the child.
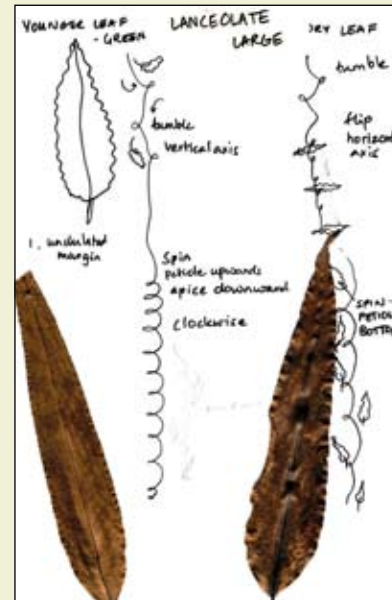
Module Understanding
Watching events in nature can be fun and exciting. While the leaves fall in an array of patterns, it is an enjoyable experience to see it happen in real life.

ii) Study sketches
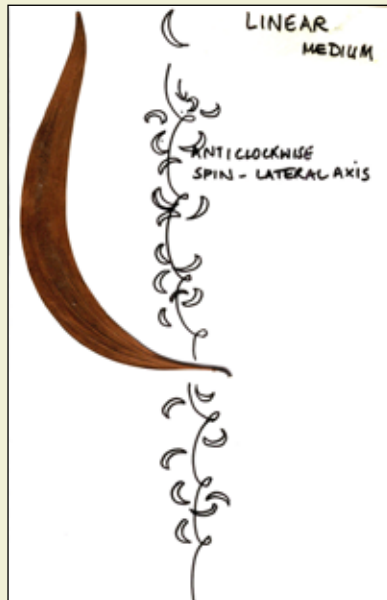
Leaf shape: Linear

This leaf is spins on the lateral axis in an anti-clockwise direction. It falls with numerous turns horizontally.


Leaf shape: Lanceolate, undulating margins

1. The leaf initially tumbles on its vertical axis, then spins with the petiole upwards and apice downwards, in a clockwise movement, when the tip bends and becomes the blunt edge.
2. The leaf flips along laterally and spins with the petiole downwards.
3. The leaf sways and flips along the horizontal axis.
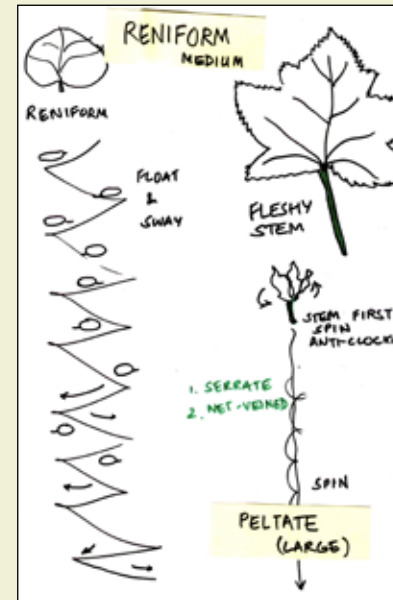
Leaf shape: Reniform
This leaf floats and sways slong the horizontal plane.

Leaf shape: Peltate
Serrated margins and fleshy stem
The leaf spins stem first in an anti-clockwise direction.
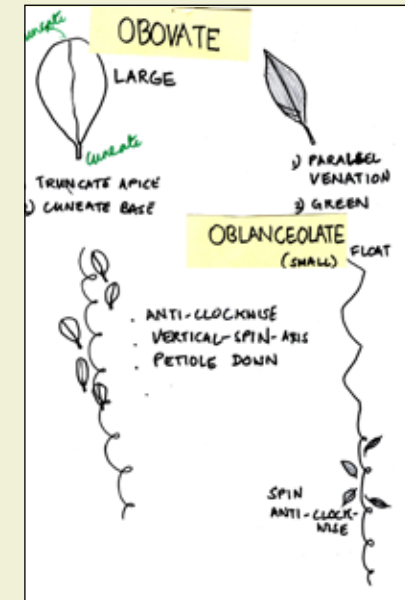
Leaf shape: Obovate
Truncate apice
Cuneate base

The leaf demonstrates random tumbling along its vertical axis with the petiole downwards.