



Learning Science through play

Project III

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Indian Institute of Technology, Bombay

Approval Sheet

The Visual Communication Project III titled
“LEARNING SCIENCE THROUGH PLAY”
by J N Somya (08625804) is approved towards
partial fulfilment of the requirements for post
graduate degree of Master of Design in Visual
Communication.

Project Guide:

Chairperson:

Internal Examiner:

External Examiner:

Industrial Design Centre
Indian Institute of Technology, Bombay
January - April 2010

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature:

Name of the student: J N Somya

Roll No.: 08625804

Date:

Industrial Design Centre
Indian Institute of Technology, Bombay
January - April 2010

Disclaimer

I believe it is impossible to be completely original. When I speak, write, or think; can I really ever say with honesty and integrity : these are ‘my’ ideas in ‘my own’ words’ ?

‘My own’ words? The words existed long before I was born. I learnt them, their meaning and how to use them from others.

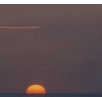
‘My’ ideas ? Ideas come to my mind from having talked to many people, read many books, visited many places, and experienced many things. Thoughts which come to my mind now, come from having lived so long.

Ideas trigger other ideas. That is their property. They get fabricated, reassembled, revised, modified, and better; because there exist all the other ideas. They enrich themselves by intermingling, combining, and interacting with each other. This takes the world of ideas and the mankind forward.

What purpose is served by calling them ‘my’ and ‘mine’. By declaring ownership?

This disclaimer is inserted here to completely disassociate myself from the mandatory declaration by the student on the previous page.

Kirti Trivedi
Guide



Acknowledgements

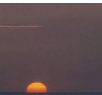
I wish to express my sincere thanks to my guide Prof. Kirti Trivedi for his guidance, support and mentorship throughout the project.

Special thanks to the Industrial Design Centre (IDC) and the library.

Thanks to Khushi, Riya and Srishti who actively performed the activities.

A heartfelt thanks to friends Sakshi, Pragati to listen to my cries and Chitra, Radhika and Shruti for their help.

And lastly to my family and Manan for always being there.





Synopsis

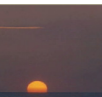
Learning is associated with education which stresses on learning through classrooms, teachers, text books and exams. But, we tend to ignore the fact that we all including children learn through what we experience.

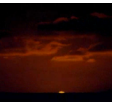
This project aims at self directed, purposeful and meaningful experiences against passive, forceful and fearful education. Experiences mean things done with body, muscles, hands, tools as well as the mind; the things which involve actions which are physical and involve senses. Talking, reading, listening, writing, questioning, observing, thinking, making, breaking and even dreaming are part of the experiences.

‘Play’ is the most active component of things when we engage, enjoy, have fun, question, analyze, argue, prove and do things.

Science is to know how things work. Children are naturally curious to know how things work around them. Sun is the most essential component of our existence being responsible for most of the phenomena in our environment. It is important to know Science behind Sun.

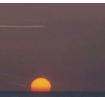
The project is an attempt towards learning to understand ‘Sun’ through a book where activities are planned and illustrated to encourage children to learn Science with readily available materials in a playful way.

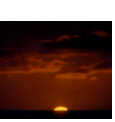


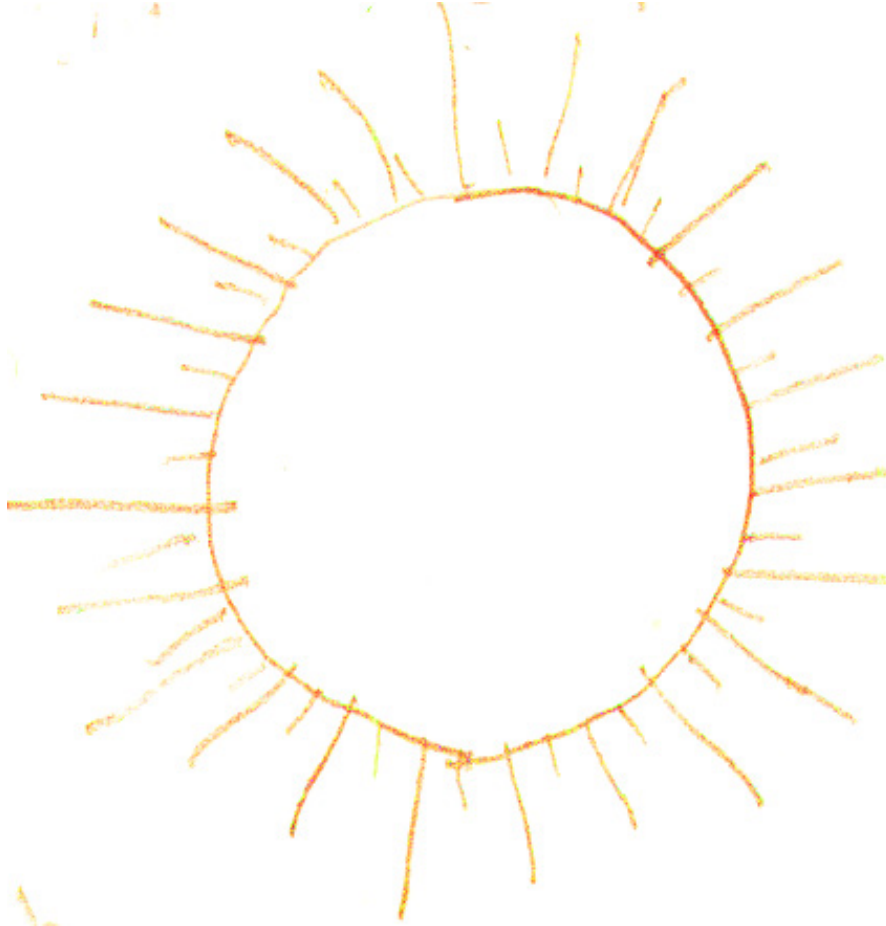


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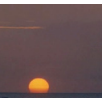
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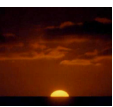






Chapter 1: Need Identification

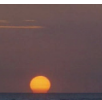


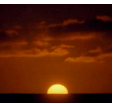


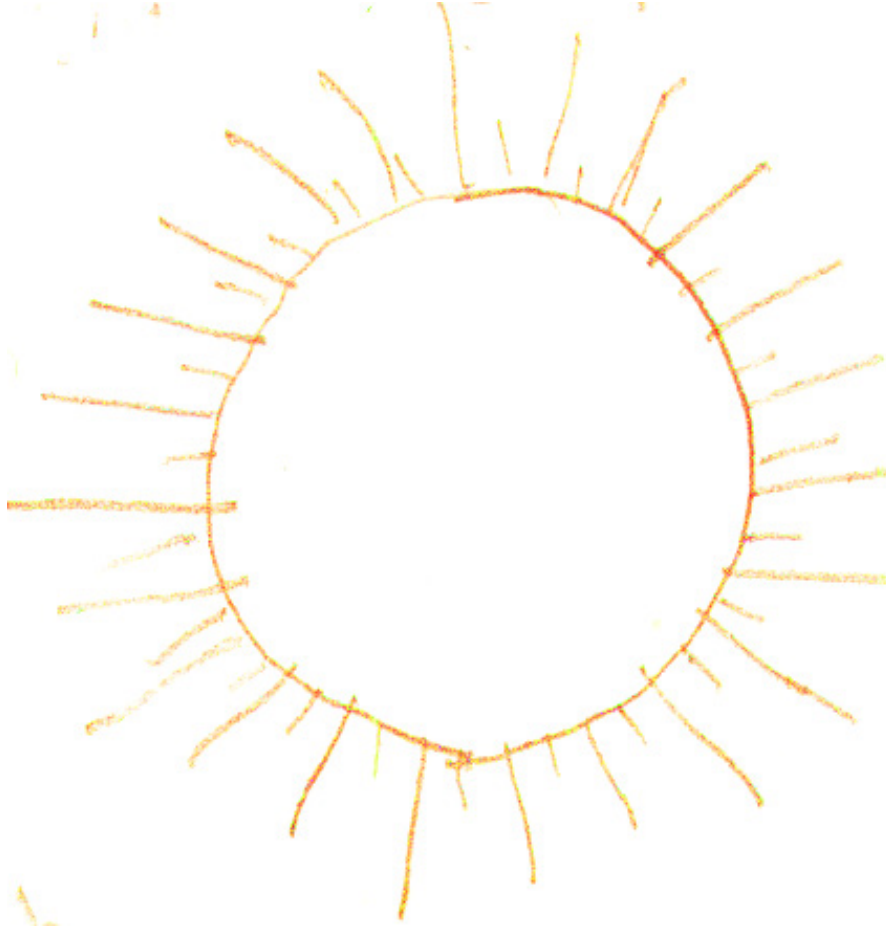
Need Identification

Children should be trusted to learn for themselves with natural curiosity. Each answer they receive leads them to their newer question. This is important for any learning experience where we question, think, and share knowledge. A facilitator should offer resources to learn with a focus on process at the pace and interest of the child rather than a prescribed syllabus or content to be memorized and assessed.

Science provides children with direct experience with materials, events and ideas that is essential towards learning. Most of the phenomena in primary Science can be explained by easily available materials that children can find in their environment. There is a need to create resource in a particularly new area of Science engaging children in fun, enjoyable and safe way.

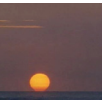






Chapter 2: Understanding

Learning
Science
Play



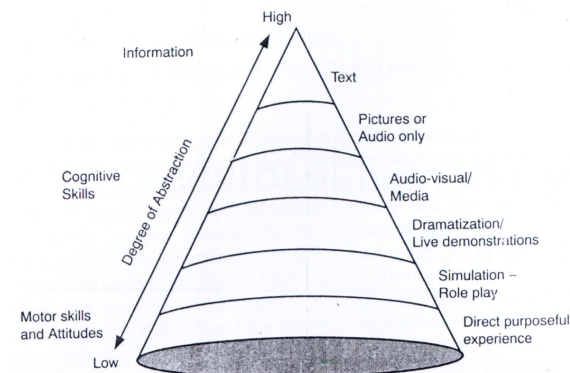
Learning

What are the assumptions that we make about learning when we try to help somebody learn or teach them by different ways?

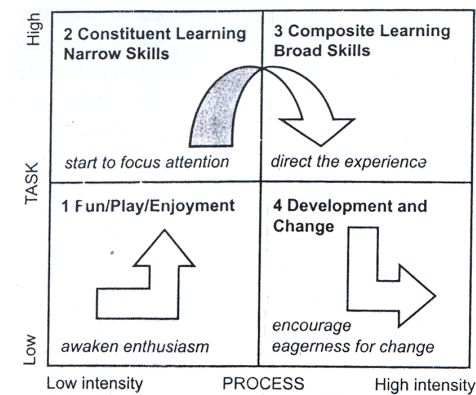
One needs to think about the several layers of beliefs and action that are relevant to learning things and how is it that we go about designing?

Various people have researched and written about ways of learning. There is an almost endless list of individual learning theories. The approach we use for our learning and for others are based on our conscious or subconscious philosophies from our experiences about how people learn and their ability to learn. While it is important to be aware of the value of learning theories that can provide positive inputs into the learning process but they should not restrict our thinking and limit our capability to help people learn.

So, my research base includes some understanding about the beliefs and rationale behind different theories of learning and what conceptions influence both beliefs and behavior of children.

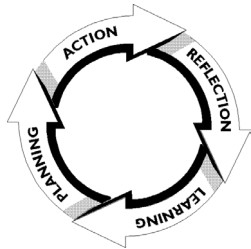


1. Edgar Dale's Cone of Experience



2. The experiential wave

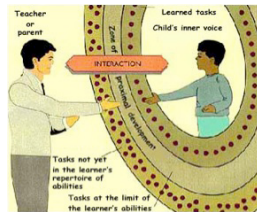
Learning Theories



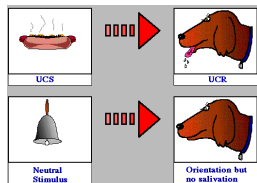
3. Action learning



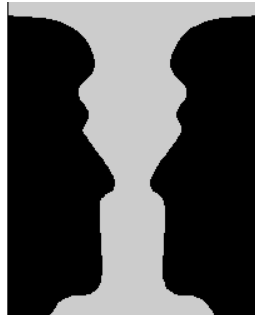
4. Cognitivism



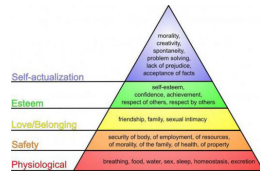
5. Cognitive development



6. Classical and operant conditioning



7. Gestalt



8. Humanistic learning



9. Constructivist learning

Learning Activities

Self-directed learning



10. Reading



11. Writing



12. Researching



13. Reflecting

Peer-directed learning



14. Group projects



15. Peer review



16. Discussion boards



17. Learning partners

Teacher-directed learning



18. Lectures



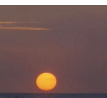
19. Tutorials



20. Laboratories

People

Skinner
Piaget
Vygotsky
Bruner
Keller
Papert
Sri Aurobindo
Maria Montessori
Rabindranath Tagore
J. Krishnamurthi
Mahatma Gandhi

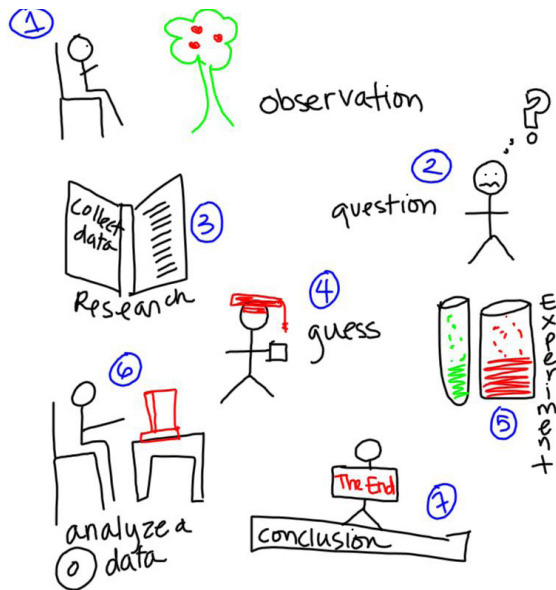


When I tried listing down what I learnt in my childhood, I not only learnt from school, teachers and textbooks but from the different experiences. There were things that I didn't do in order to 'learn' something, these things were the experiences that I had with different interests, meets, people, books and media as and when I grew up in an environment. We learn most by self when we touch, play, watch, ask and do things.

I have tried to compile a list of all the resources of learning that one learns from and can be provided to help children learn.

People	Media	Events	Environment
<i>Self</i>	<i>Books</i>	<i>Picnics</i>	<i>Home</i>
<i>Parents</i>	<i>Magazines</i>	<i>Museum visits</i>	<i>Playgrounds</i>
<i>Siblings</i>	<i>Newspaper</i>	<i>Fairs</i>	<i>Library</i>
<i>Grandparents</i>	<i>Comics</i>	<i>Exhibitions</i>	<i>Community</i>
<i>Relatives</i>	<i>GK books</i>	<i>Festivals</i>	<i>Schools</i>
<i>Friends</i>	<i>Internet</i>	<i>Sports festivals</i>	<i>Laboratories</i>
<i>Classmates</i>	<i>TV/ DVD</i>	<i>Fancy-dress</i>	
<i>Neighbors</i>	<i>Movies</i>	<i>Performance (dance, drama, music) shows</i>	
<i>Teachers</i>	<i>Radio</i>		
<i>Coaches</i>	<i>Cartoons</i>	<i>Workshops</i>	
<i>Trainers</i>	<i>Computers</i>	<i>Debates/ discussions</i>	
	<i>Interactive websites</i>	<i>Craft sessions</i>	
<i>Experts</i>	<i>Songs</i>	<i>Competitions</i>	
<i>Professionals</i>	<i>Poems</i>	<i>Tests/ exams</i>	
<i>Artists</i>	<i>Games</i>		
<i>Doctor</i>	<i>Toys</i>		
<i>Gardeners</i>	<i>Pretend play</i>		
	<i>Video games</i>		
	<i>Computer games</i>		

* Refer Annexure 1



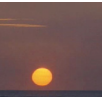
21. Scientific method

Science

Science is to know the way things work. It is important to know why and how things work so that they can be generalized to use, create newer principles and useful things.

Most scientific investigations use a scientific methodology to know things. Science has been categorized into natural sciences, applied sciences, formal sciences and social sciences.

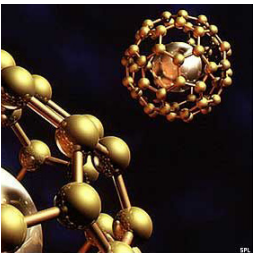
Children experience most of the things of the natural world in their environment. But, it is important to encourage them to observe, question to know the reasons and articulate for science learning.



Scientific fields



22. Natural science



23. Applied science

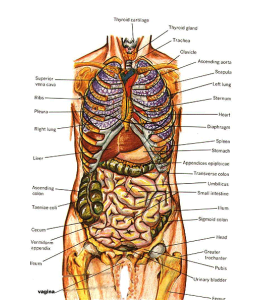


24. Formal science

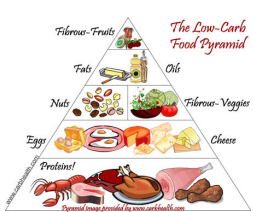


25. Social science

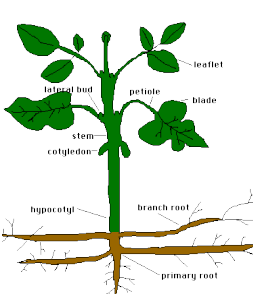
Living World



26. Natural science



27. Food



28. Plants



29. Animals

Environment



30. Earth



31. Universe

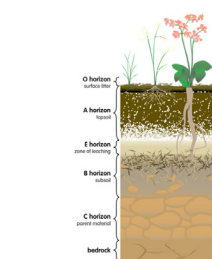


32. Sky



33. Weather

Matter



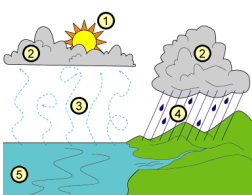
34. Soil



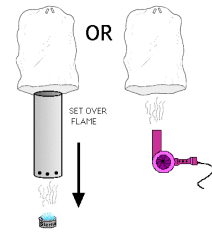
35. Shelter



36. Things



37. Water

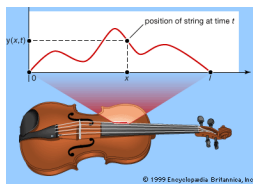


38. Air

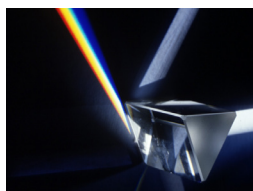
Physical processes



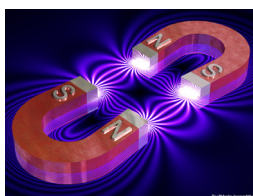
39. Movement



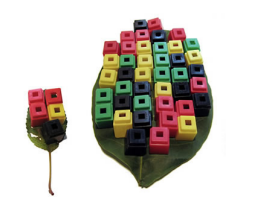
40. Sound



41. Light



42. Magnetism



43. Measurement

Scientists

- Aristotle

Archimedes

Galileo

Newton

Darwin

Einstein

Hawking

Homi Bhabha



44.



45.

Play

Play is:
 Voluntary activity
 Pleasurable and enjoyable
 Engaging
 Engrossing

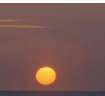
We associate children with play. Children engage in act of play with the intention of having fun and enjoyment. They even have fun while asking questions, making observations and attempting at answers.

Play is a central ingredient in learning, allowing children to imitate behaviors, practice skills, process emotional events and learn about their world.

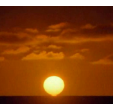
Learning and play are not incompatible; learning takes place best when children are engaged and enjoying themselves.

Both free play and guided play are essential for the development of academic skills.

In playful learning, aspects of collaborative learning by exploring and wondering together should be emphasized.



25



Media



46. Dance



51. Puppet shows



47. Music - songs, poems,
rhymes, prayers



52. Magic shows



48. Drama



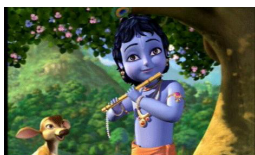
53. Circus



49. Films



54. Story-telling



50. Animation films

Toys



55. Objects



56. Blocks



57. Instruments



58. Equipments



59. Tools



60. Collectibles



61. Working toys



62. Activities



63. Traditional toys

Games



64. Sports



65. Computer/video games



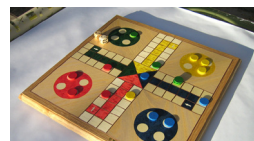
66. Memory games



67. Concentration games



68. Timed games



69. Equipments



70. Puzzles/ Bingo



71. Strategy games



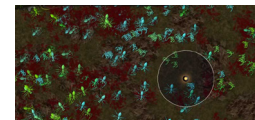
72. Role play games



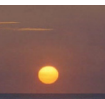
73. Adventure games

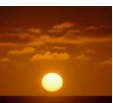


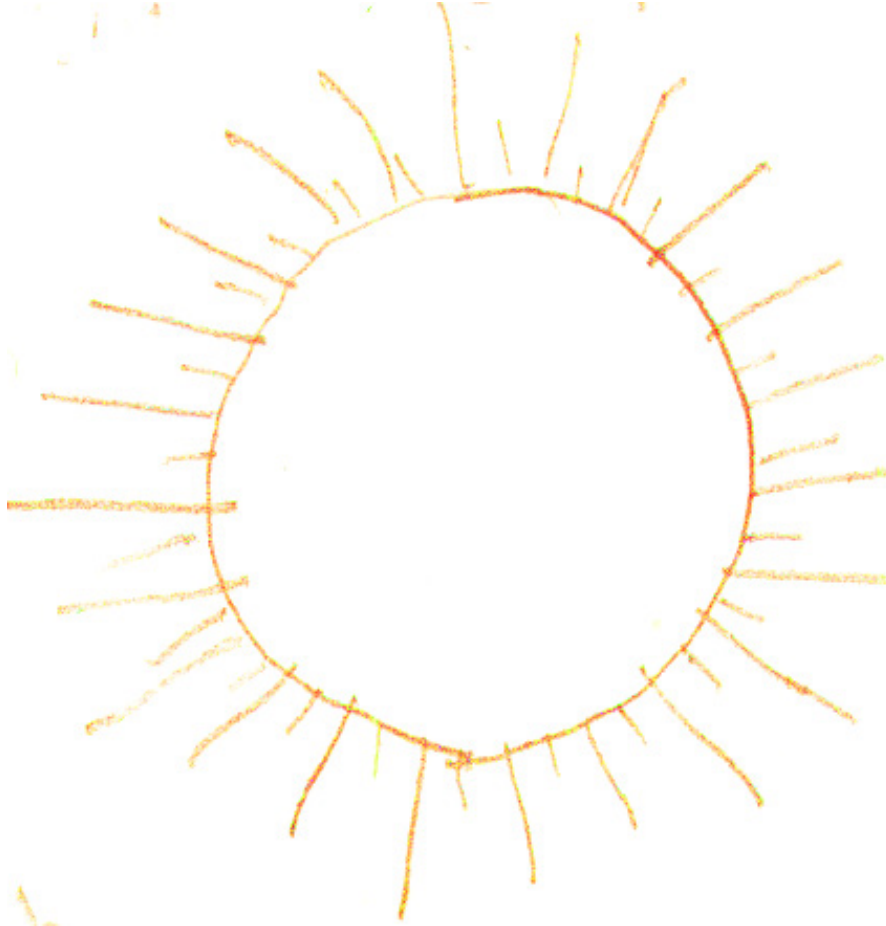
74. Detective games



75. Reflex games





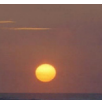


Chapter 3:

Formulating the design brief

Objective

Identifying the theme





Objective

To demonstrate the effectiveness of a significantly new way of learning Science through play.

The environment is the key factor in influencing an experience. Learning is traditionally related to the schools, the classrooms, the teacher, the textbooks and the exams. But, there is no reason why we should learn things belonging to the environment sitting in classroom from a teacher reading from the textbook. Direct involvement outdoors with the primal elements of earth, air, fire and water can help learners explore within themselves, discover new things and create personal knowledge in domain of Science.

Whenever we do something, it either makes us feel more informed or ignorant. This feeling of being learned or unaware in turn kindles the curiosity to do more things. But, we are less likely to do things that do not seem interesting enough.

The activities have to help children understand things for the first time even though they may have gone undergone the experience before. The activities will revisit past experiences, knowledge or observations and allow learners to see them in new light.

Identifying the theme

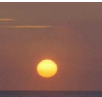
To demonstrate the effectiveness of a significantly new way of learning Science through play, it was thought to select a new emerging area of Science rather than an existing one.

A list of emerging areas of Science was made. Most of these areas of Science do not exist in present Science curriculum for children because of their relatively new being.

Sun is free and available everywhere. Solar energy is an alternative form of energy production that does not emit any polluting material into the environment and uses something that is naturally available as its source without being dependent on other sources.

We are going to exhaust our fossil fuels in near future and it is important to know and shift to alternative forms of energy. It is essential to know about Sun and its energy to think, learn and innovate more applications of solar energy.

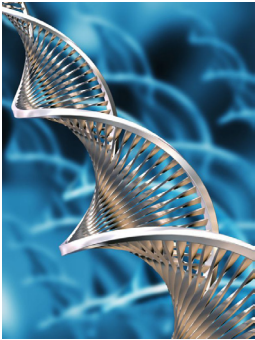
Therefore, Sun and its energy was identified as the focus area in learning.



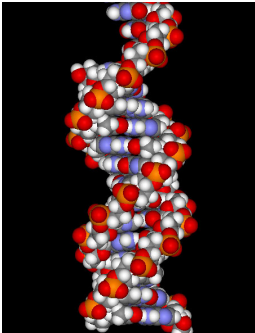
Emerging areas of science



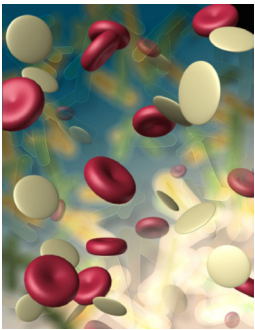
32



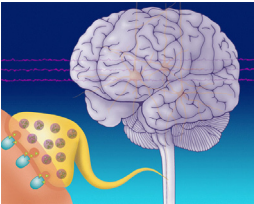
76. Biotechnology



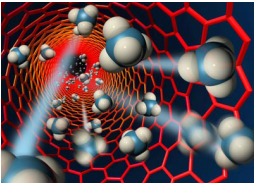
77. Genetic Engineering



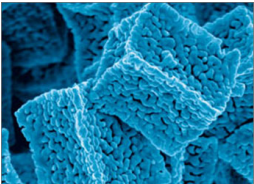
78. Immunology



79. Neuroscience



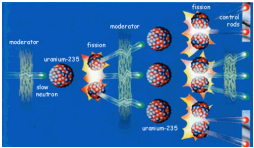
80. Nanotechnology



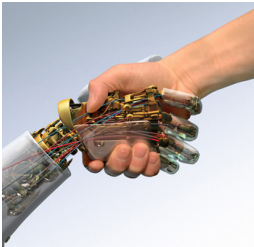
81. Material Science



82. Radioactive materials



83. Controlled nuclear reactions



84. Artificial Intelligence & Robotics



85. Information Technology



86. Sustainability



87. Solar energy



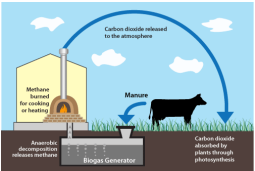
88. Wind energy



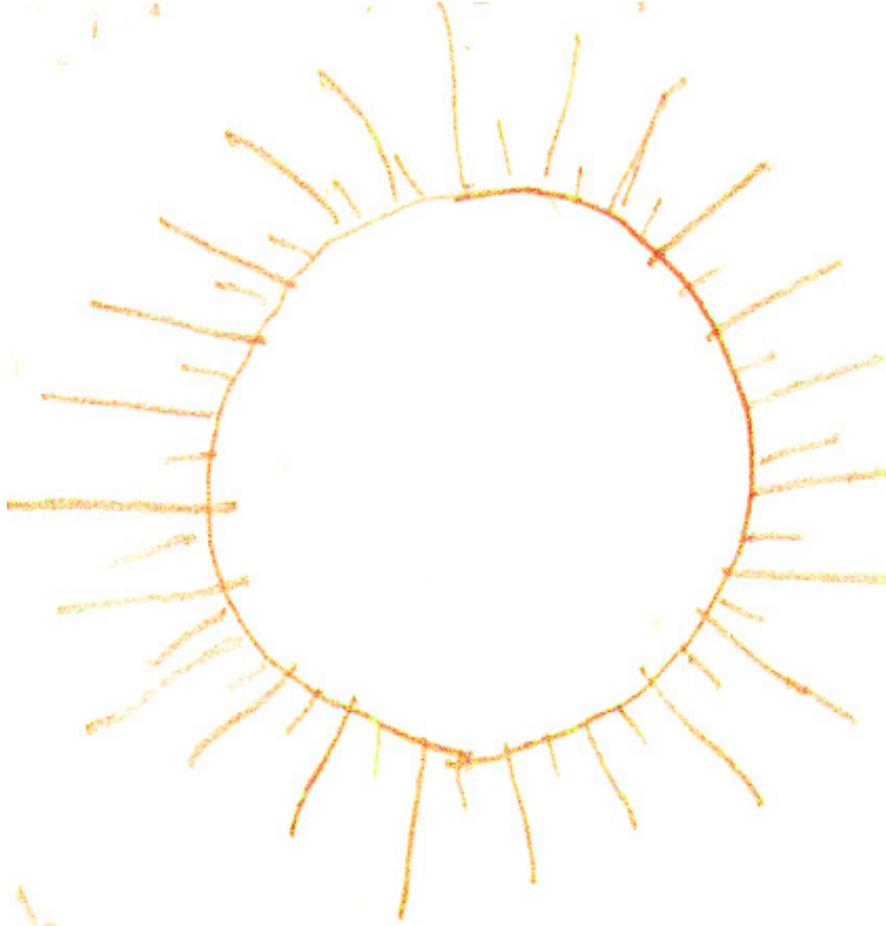
89. Hydropower



90. Geothermal power



91. Biogas



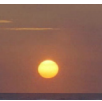
Chapter 4:

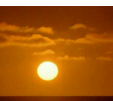
Sun as the focus of study

Aspects of Sun

Design challenges

Design goals





34

Aspects of Sun

Science has been branched into various fields and 'Sun' is such an area which gives answer to most of the physical phenomenas in nature.

The domain of 'Sun' has been defined and broadly categorized under 'creator', 'heat source', 'light source' and 'energy source'.

CREATOR

Life
Growth
Seasons
Day & Night

HEAT SOURCE

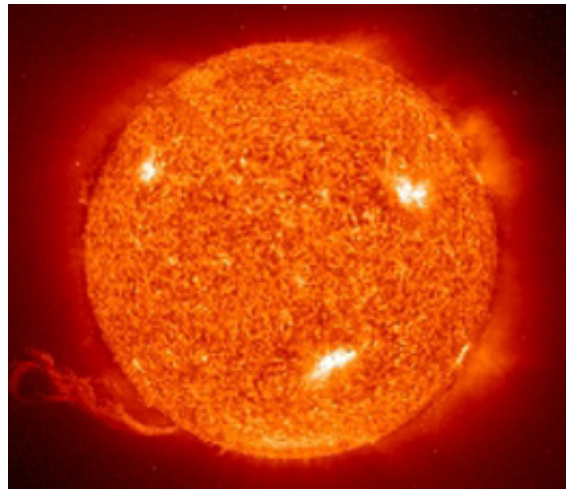
Melts ice
Dries materials
Burns things

LIGHT SOURCE

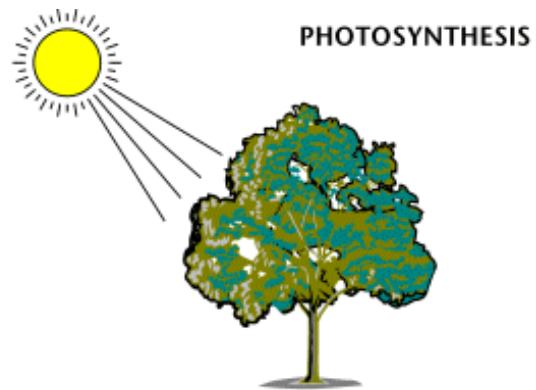
Allows to see
Reflects
Gives color
Fades & darkens
Forms shadows

ENERGY SOURCE

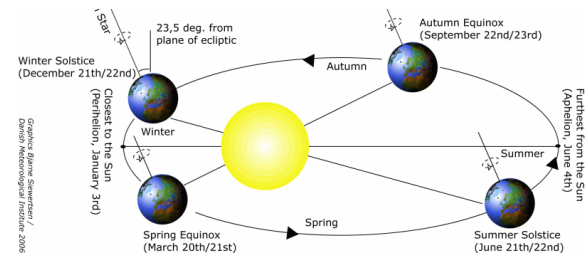
Heat Energy Source
Light energy Source
Electrical Energy Source



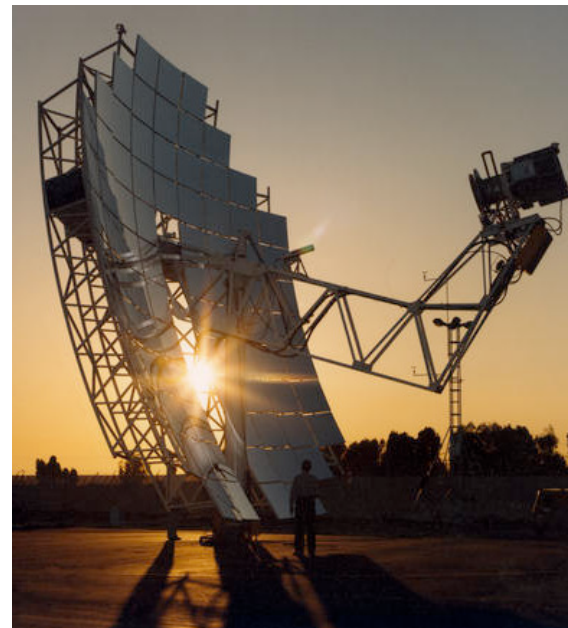
92



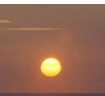
93



94



95



35



Design challenges

In order to help children to get the most from an event of activity, it is necessary to unleash curiosity so that they can think and plan to find something that was previously hidden.

The attributes of Sun can be explained through planned activities in our environment. Children should understand the importance of sun and the fact that it is due to Sun that answers various processes in our environment.

Playful

The activities have to be easy to play and engaging enough to give a clear concept of understanding Sun.

Experimentation

The things that a child can do with an object besides playing is break it. And, the best thing that he can do is to make it. The project output is aimed at stuff that children can use easily to understand the characteristics of Sun.

Materials

The activities should provide an opportunity to interact with various easily available materials and inspire children to recycle, reuse and innovate creative things.

Share and learn

The activities should be able to be performed safely by children themselves or under guidance of older children or adults in some cases. This way they tend to share and learn.

Design goals

Humans are sight mammals. Images plus words communicate twice as much as words alone. Images can translate across cultures, age groups and levels.

An 'activity book' will create a resource about Sun which details all the concepts and phenomena involving Sun in simple and easy-to-understand ways. The book will illustrate the activities which can easily be built by children to understand the importance of Sun and its energy using materials which children can easily find in their environment and observe the different developments. This book will explain the possibilities of doing creative Science instead of providing with ready-made kits.

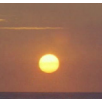
It will follow a route of involvement, doing, observation, analyze and discussion.

The activities have to be planned according to:

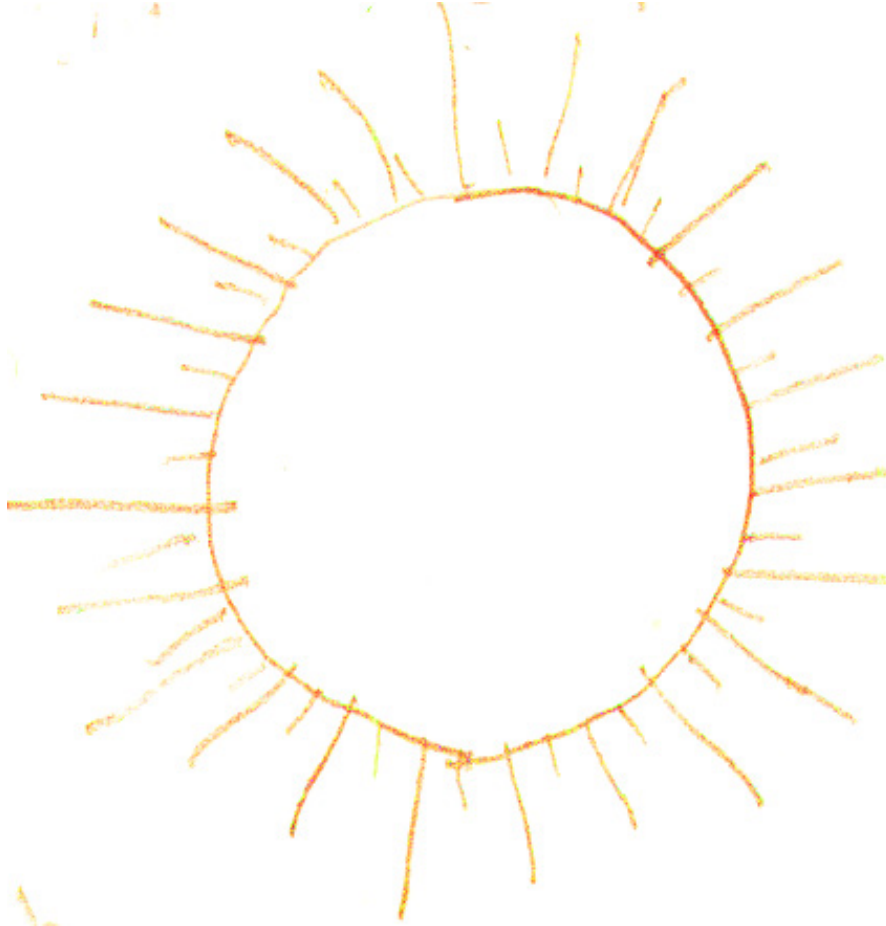
Sense of play through a process
Stimulate the senses and mind through construction
Statement or an objective to understand
Safe and easy to perform by children

Create interest leading to a discussion
Create a collaborative environment rather than individualistic approach

Guided objects or imagery to play or perform
Use of elements easily available in surroundings as much as possible







Chapter 5:

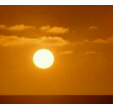
Activity Book

Activities

Concepts

Final concept





Activities

Keeping in mind the design challenges and goals, different ideas for activities to learn Sun were generated under the four heads of 'Create and Sustain', 'Heat source', 'Light source' and 'Energy source'.

Sun creates and sustains:

Life

1. Cover one leaf with black paper in a plant and observe after few days.
2. Keep one plant indoors and one outdoors.
3. By giving rain. Draw water from plants in sunlight.

Growth

1. Plant a seed in a pot. Keep it indoors and outdoors.

Seasons

1. Create a mock up model of sun and earth.

Day and night

1. Create a mock up model of sun and earth.
2. Make a clock from sun-dial.

Sun provides heat:

Melts ice

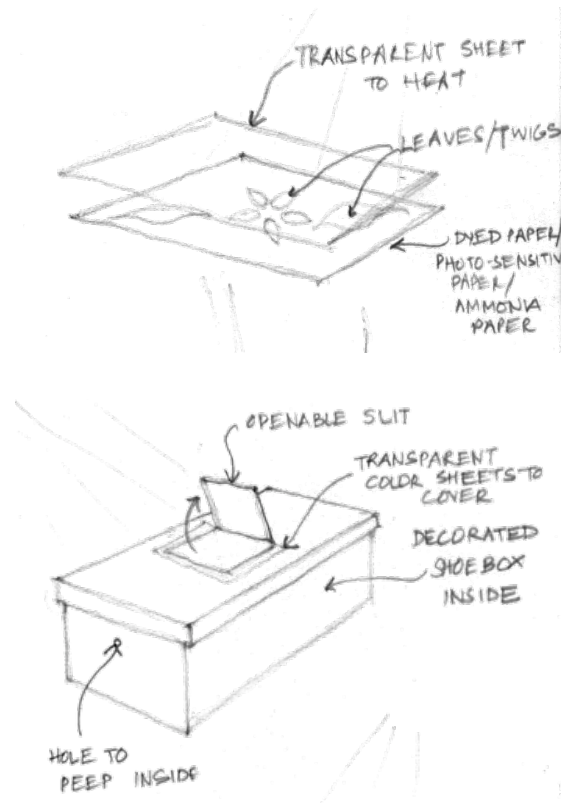
1. Keep ice cubes indoors and in sunlight.
2. Test the ice cubes with different colored papers.

Dries materials

1. Evaporate water in a container over few days.
2. Evaporate water from cloth after keeping in Sun.

Burns things

1. Burn with help of a magnifying glass.



Sun provides light:

Allows to see

1. Make a box and peep inside with no opening.
2. Cover the openings with opaque materials.

Reflects

1. Reflect mirrors on walls.
2. Create a game with colored mirrors.

Gives color

1. Dip a mirror in water in sunlight.
2. Let the sunlight enter through a prism.
3. Reflect sunlight with colored papers.

Fades and darkens

1. Sun prints by keeping papers in Sun for few days.
2. Sun prints of cloth by keeping in Sun.
3. Color of leaf changes if covered with black paper.

Forms shadows

1. Trace the shadows of different objects.
2. Make a sun dial.
3. Play a game composing objects in sunlight by one team member and other team member guesses the composition.

Sun provides energy:

Heat Energy Source: Solar cooker

1. Focussing the sunlight through mirror and black container.

Wind energy source: Solar fan

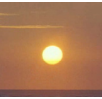
1. Solar pinwheel of paper on tin cans kept in sunlight.
2. Attach a fan with motor and solar cell.

Light energy source: Solar lamp

1. Connect the lamp to solar cell.

Electrical energy source: Solar toy

1. Connect the wheels through a motor and solar cell.



Concepts

Design concepts from the design ideas were finalized and conceptualized into a sequential layout and planning of the book.


Layout 1

The need for simpler and accurate illustration was realized. Any watch or clock is needed in the activity but an unnecessary illustrated alarm clock can create difficulty for the children to find it.


‘Observation’ is to encourage a children to answer the questions after activity themselves. A statement as a fact will discourage children to perform the activity altogether.

SUN MELTS


You will need



About 8 ice cubes




Plate




Clock

Activity


1 Keep 4 ice cubes in a plate.
(Do not take ice cubes out of refrigerator before starting the activity)




2 Keep the plate in direct sunlight.
Record the time it takes to melt the ice cubes completely.



3 Keep the other 4 ice cubes in the plate.



2 Keep the plate indoors away from sunlight.
Record the time it takes to melt the ice cubes completely.



Observation

The time taken by ice cubes to melt is faster in sunlight than without sunlight.

Discuss

What makes the snow-peaked mountains melt? Why don't mountains melt in winters?

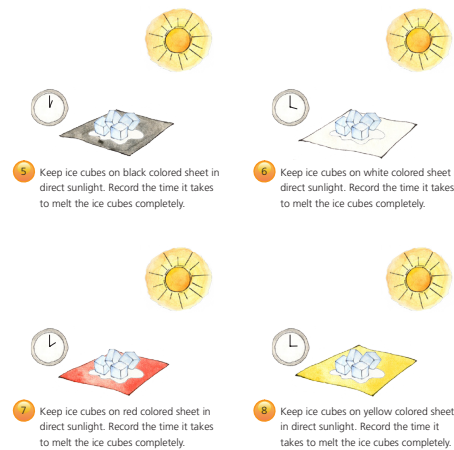
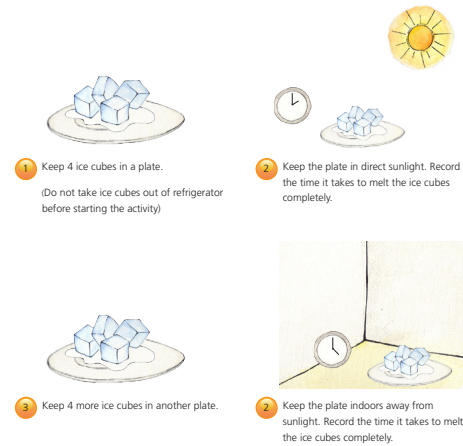
Layout 1

Sun melts ice

You will need



Activity



Observation

The time taken by ice cubes to melt is faster or slower in sunlight?
Which colored sheet takes the least time to melt the ice cubes in sunlight?
Which colored sheet takes the longest time to melt the ice cubes in sunlight?

Discuss

What makes the snow-peaked mountains melt?
What colored clothes should we wear in summers?
Why don't mountains melt in winters?

Layout 2

The questions communicated under 'Observation' were to be framed in a better visual understanding of children.

A brief introduction about the phenomena behind the activity could be added.


A color palette of red, orange, yellow and green was decided for activities under 'creator', 'heat', 'light' and 'energy' respectively.



The need for horizontal grid along the spread was realized after layout of the activity across the spread. The horizontal step-by-step illustrations would give a better understanding of activities to the children.

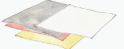



‘Observe’ and ‘Discuss’ were separated out over the spread for better communication.

Sun melts ice







TITLE

You will need



MATERIALS Plate Clock or watch Equal sized black, white & other colored sheets



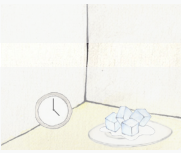

Activity



1 Keep 4 ice cubes in a plate.
(Do not take ice cubes out of refrigerator before starting the activity)

2 Keep the plate in direct sunlight. Record the time it takes to melt the ice cubes completely.

ACTIVITY


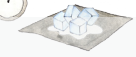



3 Keep 4 more ice cubes in another plate.




2 Keep the plate indoors away from sunlight. Record the time it takes to melt the ice cubes completely.

OBSERVE




BRIEF INTRODUCTION






5 Keep ice cubes on black colored sheet in direct sunlight. Record the time it takes to melt the ice cubes completely.



6 Keep ice cubes on white colored sheet in direct sunlight. Record the time it takes to melt the ice cubes completely.



7 Keep ice cubes on red colored sheet in direct sunlight. Record the time it takes to melt the ice cubes completely.



8 Keep ice cubes on yellow colored sheet in direct sunlight. Record the time it takes to melt the ice cubes completely.

DISCUSS

Observation

The time taken by ice cubes to melt is faster or slower in sunlight?
Which colored sheet takes the least time to melt the ice cubes in sunlight?
Which colored sheet takes the longest time to melt the ice cubes in sunlight?

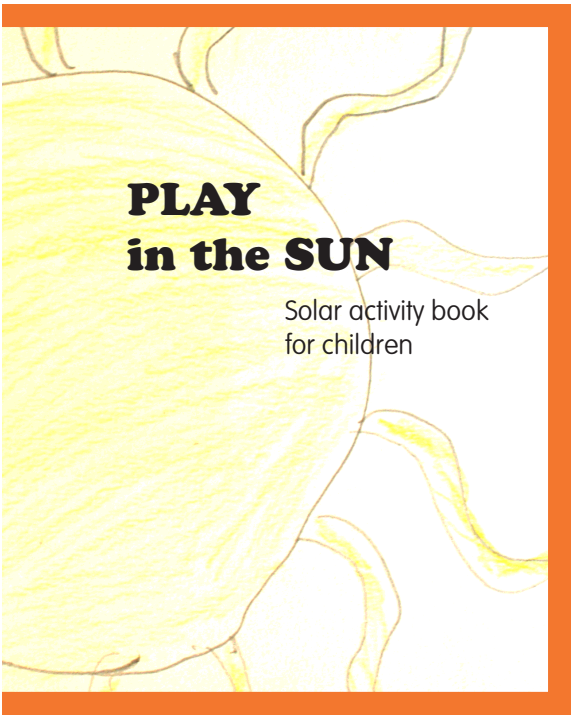
Discuss

What makes the snow-peaked mountains melt?
What colored clothes should we wear in summers?
Why don't mountains melt in winters?

Planning towards final layout

Final Concept

The planning and layout-ing of the book ‘Play with the Sun - Solar activity book for children’ is done according to the new grid and design features.



Concept cover page




Final concept spread


The illustration style was changed to water colors from digital illustrations to make the materials and activity more realistic.

Sun melts ice


You will need




Ice cubes



Plate




Equal sized black, white & other colored sheets




Any clock or watch

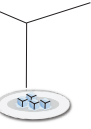
Activity



1 Keep 4 ice cubes in a plate.



2 Keep the plate in direct sunlight. Record the time it takes to melt the ice cubes completely.



3 Keep 4 ice cubes in the plate indoors away from sunlight. Record the time it takes to melt the ice cubes completely.

Observe

Where do the ice cubes melt faster? ☐ Indoors ☐ Sunlight

Which color takes the least time to melt the ice cubes in sunlight ? ☐ Black ☐ White ☐ Yellow ☐ Red ☐ Other

Ice is a solid state of water. The molecules in solid state are fixed in a strong framework. Although the molecules can vibrate, they cannot move around.

As the ice warms up, the heat makes the molecules gain enough energy to break out of their framework and move around freely. At this point, the ice begins to turn to water. In other words, it melts.

Discuss

Why did one ice melt faster than the other?

Why do the ice-creams melt?

What makes the snow on the mountains melt?


What colored clothes should we wear in summers?

Why doesn't the snow on mountains melt in winters?


Final concept spread

Sun melts ice


You will need




Ice cubes



Plate




Equal sized black, white & other colored sheets

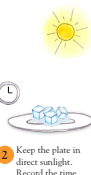


Any clock or watch


Activity



1 Keep four ice cubes in a plate.



2 Keep the plate in direct sunlight. Record the time it takes to melt the ice cubes completely.



3 Keep four ice cubes in a plate indoors away from sunlight. Record the time it takes to melt the ice cubes completely.

Observe

Where do the ice cubes melt faster? ☐ Indoors ☐ Sunlight

Which color takes the least time to melt the ice cubes in sunlight ? ☐ Black ☐ White ☐ Yellow ☐ Red ☐ Other

Ice is a solid state of water. The molecules in solid state are fixed in a strong framework. Although the molecules can vibrate, they cannot move around.

As the ice warms up, the heat makes the molecules gain enough energy to break out of their framework and move around freely. At this point, the ice begins to turn to water i.e. it melts.

Discuss

Why did one ice melt faster than the other?







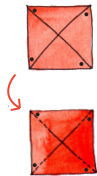


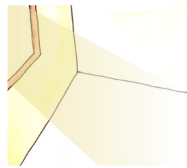

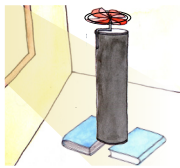
Why do the ice-creams melt faster in winters?

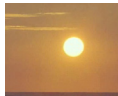
What makes the snow on the mountains melt?

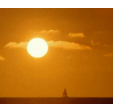
What colored clothes should we wear in summers?

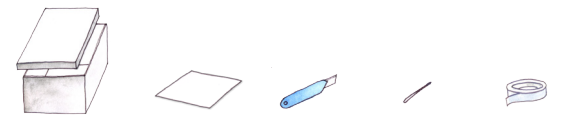
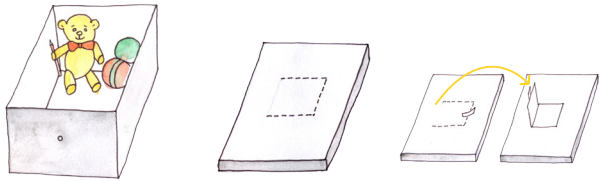
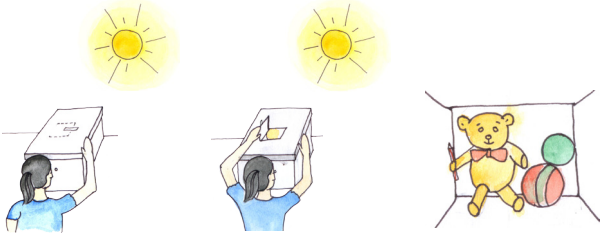
Why doesn't the snow on mountains melt in winters?

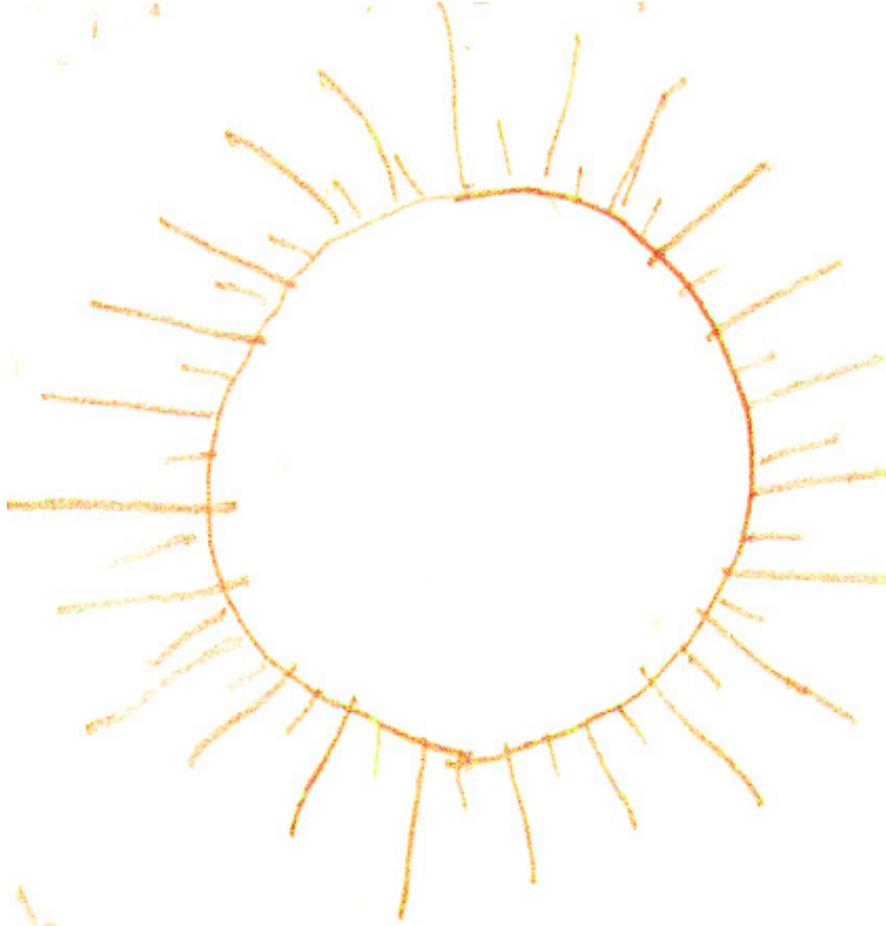
Final spread from the book

		Sun creates wind	
<p>You will need</p> <div>       </div> <p>Black paint and brush Metallic wire Sheet of paper Long metallic tube Two thick books or bricks Pair of scissors</p>		<p>Wind is simply air in motion. It is caused by the uneven heating of the Earth's surface by the sun. The Earth's surface is made of very different types of land and water and it absorbs the sun's heat at different rates. When the air gets warmer, its particles spread out.</p> <p>This makes the air light, so it rises. As air cools, it becomes heavier and it sinks. As warm air rises, air from cooler areas rushes in to take the place of the heated air, creating wind.</p>	
<p>Activity</p> <div>    </div> <p>1 Fold a square paper along diagonals and mark one dot each in right corner of the four triangles formed. Cut halfway along the diagonals.</p> <p>2 Glue four dotted ends at the centre of the paper. Make a single dent with a wire at the centre of the pinwheel.</p> <p>3 Paint the outside of the long tube black. Bend the metallic wire in a 'Z' shape.</p>		<div>    </div> <p>4 Find a place indoors where direct sunlight falls from the window.</p> <p>5 Place the pin wheel horizontally on the top of the tube by fixing with bent wire.</p> <p>6 Stand the long tube on two books in a sunny place. Observe after few minutes.</p>	
<p>Observe</p> <p>What happens to the pinwheel under direct sunlight? <input type="checkbox"/> Starts rotating <input type="checkbox"/> Stops rotating</p> <p>What gets heated by sun? <input type="checkbox"/> Cans <input type="checkbox"/> Pinwheel</p>		<p>Discuss</p> <p>What causes the pinwheel rotate? Does the wind blow from the same direction each day?</p> <p>What happens in the case of hot air balloon? Are there times when wind doesn't seem to blow at all?</p>	
10		11	



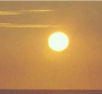


	<h2>Sun allows us to see</h2>
<p>You will need</p> <div data-bbox="331 539 891 707">  <p>Any card board box with top lid Any paper Cutter Needle Cello tape</p> </div>	<p>The sense of sight is one of the most important senses. Through eyes, we see everything around us.</p> <p>We also need light to see. We cannot see if there is no light and it is completely dark. Light makes things visible. However, things which glow themselves, can be seen without light falling on them.</p>
<p>Activity</p> <div data-bbox="302 821 898 1002">  </div> <ol style="list-style-type: none"> Put available materials like toys and stationery in the box. Prick a hole on the front wall of the box with the help of a needle. Draw a rectangle big enough to fit your hand in the middle of the lid. Slit three sides of the rectangle with the help of a cutter. Fix a piece of paper with the help of tape to lift the flap. 	<div data-bbox="1025 774 1624 1007">  </div> <ol style="list-style-type: none"> Take the box in a sunny place outside. Peep inside the box with one eye through the hole at the front with flap closed. Take the box in a sunny place outside. Peep inside the box with one eye through the hole with flap open. Observe what you see inside the box.
<p>Observe</p> <p>When do you see objects inside the box? <input type="checkbox"/> With open flap <input type="checkbox"/> With closed flap</p> <p>When does the sunlight reach inside the box? <input type="checkbox"/> With open flap <input type="checkbox"/> With closed flap</p>	<p>Discuss</p> <p>What makes things visible? How do we see things?</p> <p>What kind of materials will block sunlight?</p> <p>How do we work without electricity in the day?</p> <p>What are luminous objects? Is sun luminous?</p> <p>What happens when we go inside the cinema theatres?</p>



Chapter 6:

Conclusion



Conclusion

The final output of the project is a book titled 'Play with the Sun' which has 13 planned activities categorized under:

'Creator'

Sun gives life

Sun helps in growth

Sun creates day & night

Sun creates rain

Sun creates wind

'Heat'

Sun melts ice

Sun dries materials

Sun burns things

'Light'

Sun allows us to see

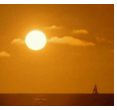
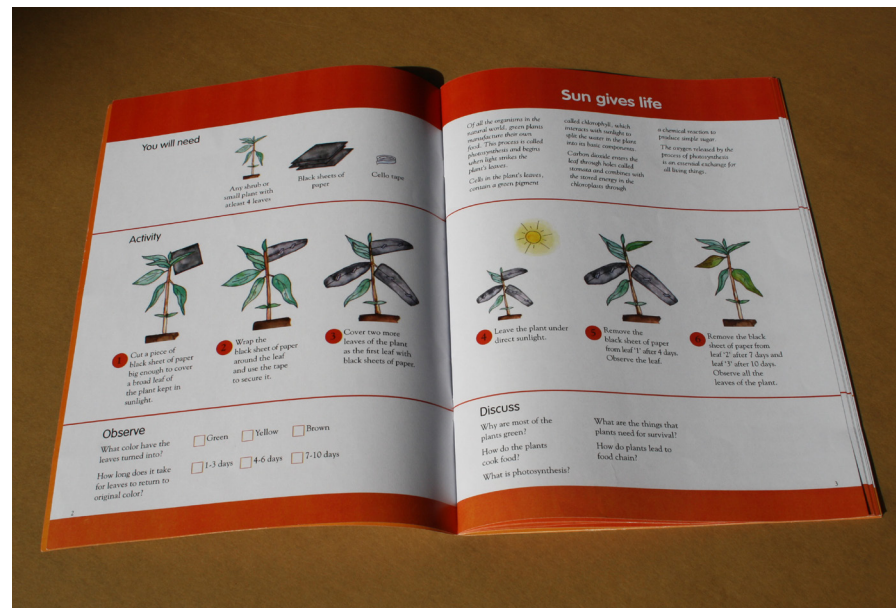
Sun reflects

Colors of sunlight

Sun fades

Sun tells time

The activities are to be done using simple and readily available materials. The activities can be safely performed by children themselves or under guidance of older children or adults in some experiments.





Some of the activities were done with three children of age 8-12 years. The book was given to the children, who then found the materials in their houses for the activities they wanted to perform. Following are the observations from the activities:

Children when worked in a group, they suggested, argued and thought together.

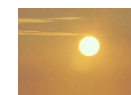
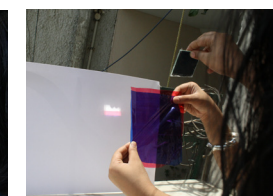
Child of age 8 years was able to learn as well as get involved in the activity with elder children.

If some material wouldn't work, children thought of newer/ substitute materials to perform the activity.

They were eager to see the results of the activities performed.

The results of the activities surprised children and they came up with more questions.

They particularly enjoyed the activities from the category 'Light'.



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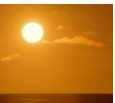
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Images Resources

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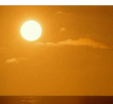


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Annexure 1

Water plants from MOM

See time from DAD

Balance stones from SISTER Bushu

Folk dance of Punjab-Bhangra from NEIGHBOUR Parul

Play badminton from FRIEND Ankur

Cook maggi from INSTRUCTIONS on the packet

Play game Brainvita from FRIEND Uma

Brushing teeth properly from DOCTOR

Origami from TEACHER in school

Giggling from COUSIN Neetu

Draw butterflies from NEIGHBOUR Deepali

Drive toy car from REMOTE CONTROL

Breed of dog Labrador and Pomerian from FRIEND Neha

To count number of steps on a floor from COUSIN Sachin

Switch different TV channels by REMOTE CONTROL

Bricks and concrete by going to SITE with DAD

Current affairs from MANORAMA YEARBOOK

Favorite artists from movies, songs in NEWSPAPER

Use lock and key from DAD

Keep account of my piggy bank money from MOM

Taekwando from COACH

Dancing from MICHAEL JACKSON on TV

Singing from TAPES in TAPE RECORDER

Chunking of fruits from FRUIT SELLER

Comb my hair in a ponytail from MOM

Gaming from SEGA games in VIDEO PARLOR

Republic Day celebrations by watching PARADE on TV

Shake hands, greet and say Namaste from DAD

Dial numbers by seeing MOM using PHONE

Playing cards from COUSIN Sachin

Plants from PLANTING DRIVE organized in COLONY

Clean and organize my cupboard from MOM

General knowledge by attending QUIZES in school

Current affairs by watching Bournvita QUIZ Contest on TV

Culture by attending and celebrating FESTIVALS

Temples of India from SUMMER PROJECT

Collecting information about cities by seeing BROCHURES

Computers from UNCLE at DAD's OFFICE

Match clothes in different colors from MOM

New authors and books from LIBRARY

Dolls of India by visiting DOLLS MUSEUM

Rajghat – Gandhi Memorial by going on a SCHOOL VISIT

Amusement park by going on a PICNIC

Monuments of city by going for HERITAGE WALK

Read temperature on a thermometer from MOM

Read weather and temperature from NEWSPAPER

Playing crossword from Children NEWSPAPER

Fix bulbs from ELECTRICIAN

Find tyre puncture from MECHANIC

Masonry from MASON

Routes of the city by TRAVELING Speaking English by watching MOVIES

History and Maths from TEXTBOOKS

Discipline from SCHOOL

Business from GAME Monopoly

Imagine stories by playing ROLE PLAY

How to 'search' from GOOGLE

Read comics from FRIEND

Blow gum from BROTHER Vicky

Cricket by watching MATCHES on TV

Jump from a FROG

Anthem in SCHOOL

Kick-start a scooter from UNCLE

Cycling by FALLING again and again

Whistle from WATCHMAN

Carom by WATCHING COUSINS play

Shlokas recitation from GRANDMA

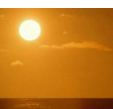
Iron clothes WATCHING MOM

Stories from GRANDMA

Old songs and singers from RADIO

Draw stars from SISTER Bushu

Learn music from UNCLE



Annexure 2: Sun...

SUSTAINS LIFE



59

Heat

Water

Processes

Precipitation

Rainbow

White light

Reflection

angle

materials

Snowmelt

Run off

Collection

Oceans

Rivers

Lakes

Evaporation

Water vapor

Dries

Fades

Condensation

Clouds

Fog

Overheats

Fire

Global warming

Wind

Sources

Ocean tides

Land (Earth)

Processes

Temperature

Absorbtion

Reflection

SUSTAINS LIFE

(contd.)

Heat

Wind

Energy

Wind turbines

Wind mills

Wind pumps

Water

Solar pumps

Food

Solar cooker

insulation

absorbtion

Power

Electricity

Light

Photosynthesis

Plants

Oxygen

Animals

Fossil fuels

coal

petroleum

natural gas

Seasons

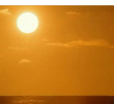
Temperature

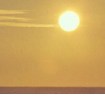
Intensity

angle of incidence

Time duration

rotation of earth





SUSTAINS LIFE

(contd.)

LightDay & NightMovement of earthRotationAxisRevolutionSolar EclipsePenumbraUmbraLunar eclipsePropertiesRadiationRaysDarknessVitamin DSpeedHits at an angleReflectionRefractionScatteringSpectrumwhite lightVIBGYORShadowsAbsorbtionDiffractionGravityForceMassPullDistanceAtmosphere (air)

STAR

Universe

Solar System

Planets

Mercury

Venus

Earth

rotation

revolution

distance

gravity

Mars

Jupiter

Saturn

Uranus

Neptune

Galaxy

Milky way

Stars

Constellations

Asteroids

Comets

Characteristics

Composition

Hydrogen

Helium

Nuclear fission

Other elements

Speed

Distance

Temperature

Magnetic field

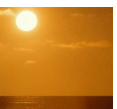
Color

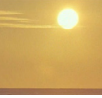
White

Gold

Reddish Orange

Yellow





SOLAR ENERGY

Photo voltaic
energy

Electricity

Solar cell

Solar lamp

Solar calculator

Solar toy

Solar car

Solar Thermal

Power Plant

parabolic trough

solar dish

solar power tower

Renewable source

clean

abundant

everywhere

other sources

Wind Power

Hydro power

Geothermal

Tidal Power

Wave Power

Biomass

Wood

Crops

Garbage

Landfill

Alcohol fuels