



A Curriculum  
Framework for  
Preschool Education  
in Singapore

**EDUCATORS’  
GUIDE FOR  
DISCOVERY OF  
THE WORLD**

Copyright © 2023, Ministry of Education  
Republic of Singapore  
Earlier editions published by Ministry of Education,  
Singapore in 2003 and 2013.

All rights reserved. This publication shall not  
be reproduced, stored in a retrieval system,  
or transmitted in any form or by any means,  
electronic, mechanical, photocopying, recording, or  
otherwise, without the prior written permission of  
the copyright owner.

All information contained herein is correct at the  
time of printing.

ISBN: 978-981-18-7423-9

# CONTENTS

---

|                                                                                                  |     |
|--------------------------------------------------------------------------------------------------|-----|
| <b>ACKNOWLEDGEMENTS</b>                                                                          | 4   |
| <b>OVERVIEW OF EDUCATORS' GUIDES</b>                                                             | 5   |
| <b>CHAPTER 1:</b>                                                                                | 7   |
| <b>Discovery of the World in the Early Years</b>                                                 |     |
| • Developing a Sense of Wonder and Curiosity                                                     | 9   |
| • Developing Essential Process Skills                                                            | 13  |
| • Developing Positive Attitudes Towards the Environment                                          | 23  |
| <b>CHAPTER 2:</b>                                                                                | 25  |
| <b>Learning Goals for Discovery of the World</b>                                                 |     |
| • Learning Goal 1: Show Curiosity and an Interest in the World They Live In                      | 27  |
| • Learning Goal 2: Use Essential Process Skills to Make Sense of the World Around Them           | 30  |
| • Learning Goal 3: Develop a Sense of Responsibility, Care and Respect for the World Around Them | 35  |
| <b>CHAPTER 3:</b>                                                                                | 44  |
| <b>Strategies for Discovery of the World</b>                                                     |     |
| • Igniting Children's Sense of Wonder and Curiosity and Encouraging Exploration and Discovery    | 46  |
| • Providing Opportunities for Children to Gather Information in Different Ways                   | 49  |
| • Helping Children to Organise, Consolidate and Communicate Their Learning                       | 61  |
| • Helping Children to Develop and Demonstrate Positive Attitudes Towards the World Around Them   | 64  |
| <b>CHAPTER 4:</b>                                                                                | 67  |
| <b>Organising the Learning Environment</b>                                                       |     |
| • Indoor Spaces                                                                                  | 69  |
| • Outdoor Spaces                                                                                 | 79  |
| <b>CHAPTER 5:</b>                                                                                | 85  |
| <b>Monitoring and Assessing Learning and Development</b>                                         |     |
| • Observing, Documenting and Assessing Children's Learning and Development                       | 87  |
| • Examples of Observation, Documentation and Assessment of Children's Learning and Development   | 89  |
| <b>BIBLIOGRAPHY</b>                                                                              | 100 |

# ACKNOWLEDGEMENTS



The Ministry of Education wishes to thank Professor Nirmala Rao, Serena H. C. Yang Professor in Early Childhood Development and Education and Chair Professor of Child Development and Education, Faculty of Education, The University of Hong Kong who had provided valuable advice in the development of the document.

We would like to acknowledge the members of the Nurturing Early Learners Framework Review Committee and Associate Professor Dora Chen, Early Childhood Education Programme, S R Nathan School of Human Development, Singapore University of Social Sciences for their advice, feedback and recommendations for the document.

We would also like to express our appreciation to the following preschool centres for sharing their activity ideas and/or photographs:

- 7oaks Preschool - Bukit Batok
- E-Bridge Pre-School @ Bukit Panjang Plaza
- Genius Hive Preschool
- Hampton Preschool Tanjong Pagar
- Hebron Christian Preschool
- Learning Vision @ Tech Point
- Little Atlas Preschool
- M.Y World @ Tampines Central
- M.Y World @ Yishun Fern Grove
- MOE Kindergartens
- My First Skool at 6 Segar Road
- PCF Sparkletots @ Pasir Ris West Blk 517
- Presbyterian Preschool Services
- The Schoolhouse by Busy Bees, Sembawang Country Club

# OVERVIEW OF EDUCATORS' GUIDES

*Nurturing Early Learners – A Curriculum Framework for Preschool Education in Singapore* or NEL Framework was updated by the Ministry of Education (MOE) in 2022. It provides broad principles to guide preschool centres in planning and implementing a quality curriculum for children aged four to six (i.e., Nursery 2, Kindergarten 1 and Kindergarten 2).

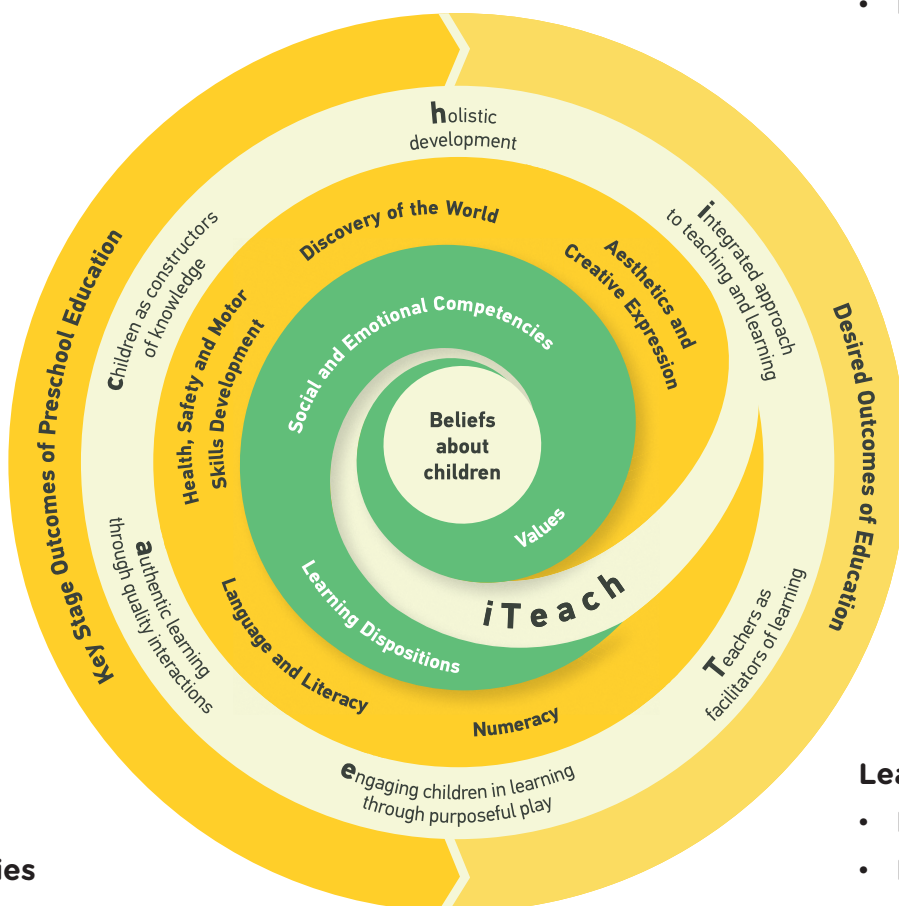
**Figure 1: Key Concepts of NEL Framework**

## Beliefs about Children

- Children are joyful, curious, active and competent learners.
- Children play, learn and grow with others in a diverse and multi-cultural community.

## Values

- Respect
- Responsibility
- Care
- Honesty



## Social and Emotional Competencies

- Self-awareness
- Self-management
- Social awareness
- Relationship management
- Responsible decision-making

## Learning Dispositions

- Perseverance
- Reflectiveness
- Appreciation
- Inventiveness
- Sense of wonder and curiosity
- Engagement

At the centre of the NEL Framework is our beliefs about children. It emphasises the importance of holistic development and nurturing the joy of learning in our children. The NEL Framework places an increased importance on the key aspects of children's learning and development, which include inculcating values, developing social and emotional competencies and fostering learning dispositions. These cut across all learning areas and should be intentionally and consistently incorporated across children's learning experiences as they serve as the foundation for character building, lifelong learning and learning to live harmoniously with others. The NEL Framework also states the key knowledge, skills and dispositions of five learning areas to support children's holistic development.

Teachers play a critical role in stimulating and deepening children's learning based on their understanding of how children develop and learn. The six *iTeach* principles serve to guide preschool teachers in planning, designing and facilitating joyful and meaningful learning experiences which will lay a strong foundation to help children achieve the Key Stage Outcomes of Preschool Education and the Desired Outcomes of Education in Singapore.

## PURPOSE OF THE EDUCATORS' GUIDES

The NEL Educators' Guides seek to help teachers translate the NEL Framework into quality teaching and learning experiences for children. The nine volumes of Educators' Guides provide teaching and learning strategies; examples of learning activities; ways of organising the learning environment; and considerations for observation and assessment of children's learning and development. Each Educators' Guide takes close reference to the principles and learning goals of the NEL Framework. The examples in each Educators' Guide illustrate one or several of the following:



Values



Social and Emotional Competencies



Learning Dispositions



Executive Functioning Skills

1. Nurturing values, social and emotional competencies, learning dispositions and executive functioning skills across learning experiences
2. Promoting learning in, about and through the outdoors
3. Using technology meaningfully and appropriately

The Educators' Guide for *Discovery of the World* provides ideas for teachers to create and facilitate appropriate and meaningful experiences for children through examples and suggestions. Teachers may adapt and modify these examples and suggestions to cater to the interests, needs and abilities of their children.

# Chapter 1

**DISCOVERY OF  
THE WORLD IN THE  
EARLY YEARS**



Children are naturally curious and are filled with a sense of wonder about and fascination with the world around them. The learning area, *Discovery of the World*, helps children make sense of their immediate surrounding, community and the world around them.

Learning experiences created for *Discovery of the World* should leverage and ignite children's sense of wonder and joy of discovery. This can be done by allowing/encouraging children to explore all aspects of their environment, including their home, school, various neighbourhoods, cultures and events, technology and the natural world. These would enable them to discover who they share the world with, as well as why things happen and how things work.

Being curious and active learners, children should be given opportunities to explore the world with their senses, ask questions, investigate and make sense of the world around them. Teachers play a critical role in creating and facilitating learning experiences for children to sustain and stimulate their sense of wonder and curiosity and develop essential process skills to help them build knowledge and understanding of the world around them. **Instead of explicitly teaching scientific concepts, the focus of this learning area should be to help children develop a sense of wonder and curiosity, process skills and responsibility, care and respect for the environment, as well as for people from different backgrounds, cultures and settings.** Teachers can and should empower children, even in the early years, to think about how they can play their part in **building a sustainable future and a cohesive society.**

The learning area, *Discovery of the World* helps to lay the foundation for learning in geography, history and science in the later years of children's education.



Children are joyful, curious, active and competent learners and should be given ample opportunities to explore with their senses, ask questions and investigate to make sense of the world around them.



## DEVELOPING A SENSE OF WONDER AND CURIOSITY

Children are naturally curious about the world they live in and it is necessary to stimulate and sustain this disposition. Children with a sense of wonder and curiosity show an interest in the world around them, are not afraid to ask questions and like to explore and discover new things.



Modelling habits of inquiry, encouraging children to ask questions and creating meaningful learning experiences for children will sustain their curiosity about how things work and why things happen.

To nurture this sense of wonder and curiosity, teachers need to **model the habits of inquiry** through sharing their wonderment, asking questions and finding out answers to children's questions together with them. This can spark new excitement for learning and promote further exploration and discovery.

### Examples of what teachers can do:

- Recognise and show an interest in the things happening around them
- Use language such as “*I see ... and I wonder ...*” to express their sense of wonder and curiosity
- Ask children a variety of open-ended questions, such as “*What are some other ways to ...?*”, “*How else can you ...?*”, “*How would you do it differently?*”
- Value children's questions and responses
- Acknowledge and follow up on children's questions

Children's sense of wonder and curiosity can be stimulated and sustained through their personal experiences, sensory experiences, and intentionally planned experiences for them.

## Children's Personal Experiences

Children bring with them their own knowledge and ideas about the world based on their personal experiences and cultural settings. **Children's personal experiences provide a meaningful context for them to wonder about why things happen and how things work. Teachers can also talk to families to find out more about children's experiences at home and make use of what children experience at home to stimulate their curiosity and help them make meaningful connections between their home and preschool experiences.**



Leverage children's personal experiences to get them to wonder about why things happen and how things work.

**For example, teachers can provide opportunities for children to:**

- Wonder about why there are water droplets formed on the outside of their cup when they drink ice water.
- Wonder about how the postcard they received got into their letter box.
- Ask questions about the different festivals they celebrate.
- Ask questions about the taste and smell of different types of local food they eat.

## Sensory Experiences



Provide ample opportunities for children to use their senses to observe and explore the world around them.

**Children learn through using their senses.** They watch their environment closely, touch and smell what they see, listen to sounds in the environment, and taste food they like. **As they engage in such sensory experiences, they make sense of the world around them** and uncover further questions they have about the world.

**For example, teachers can provide opportunities for children to:**

- Blow soap bubbles and watch how they float and eventually burst.
- Touch and look at leaves or the bark of a tree and make texture-rubbings to discover the patterns.
- See and feel the changes when playing with ice.
- Smell freshly cut grass or the fragrance of flowers.
- Listen to the sounds and smell the food in a hawker centre.
- Listen to the sounds of the trees and rustling leaves during a thunderstorm.
- Taste vegetables and fruits harvested from the garden at the preschool centre.



## Intentionally Planned Experiences for Children



The intentional provision of resources and design of the environment can encourage children to explore, ask more questions and make new discoveries.



Teachers can intentionally design a learning experience or set up the environment to encourage children to explore, ask questions, make new discoveries and develop new excitement for learning.

**For example, teachers can plan and facilitate learning experiences to sustain and build on children's curiosity by:**

- Reading a book or showing a video to get children to wonder about how children get to school in different parts of the world.
- Organising a field trip to the Children's Museum Singapore, National Museum of Singapore or Asian Civilisations Museum for children to learn and ask questions about life in the past in Singapore and its culture and heritage.
- Providing children with blocks of different sizes and shapes to construct structures and explore and discover why certain structures are more stable.
- Getting children to play with magnets and wonder why they attract some objects and not others.

## DEVELOPING ESSENTIAL PROCESS SKILLS

Children develop thinking skills and conceptual understanding as they construct knowledge about people, objects, living things and real-life situations through first-hand experiences.

**As children observe, ask questions, experiment and investigate, they develop important process skills that are necessary for their future learning.**



Children develop process skills when they ask questions, test out their own ideas and make careful observations when exploring.

When children are given opportunities to develop these process skills, they begin to gain confidence in their ability to think critically, reason, problem solve, make predictions, build connections, draw conclusions, and communicate their ideas to others. Essential process skills which children can develop in the early years include:



Observing



Comparing



Classifying



Sequencing



Questioning



Investigating



Inferring



Predicting



Reasoning



Recording



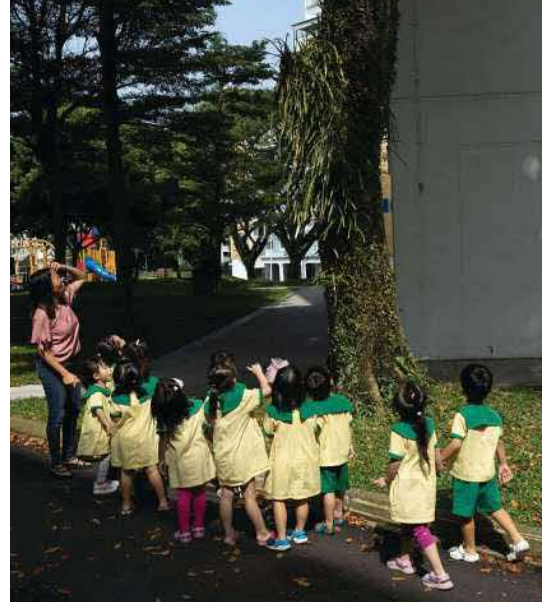
Drawing conclusions



Communicating

## Observing

Observing is the process of **looking closely and noticing things through using the five senses** to gather information and gain a greater understanding of their surroundings.



Outdoor walks provide excellent opportunities for children to engage multiple senses as they explore the different sights, sounds and smells of the neighbourhood.

### Examples of what children can do:

- Use simple tools (e.g., magnifying glass, torch) to examine details of things found during a field trip
- Note the change in colours as they mix paints of different colours
- See what happens to the shadows formed at different times of the day and compare the shadows observed
- Describe what they see, feel and hear as they take a walk around the neighbourhood to find out about people, buildings, facilities, environmental print and other geographical features around them
- Visit a park, garden or zoo to find out the characteristics of plants and animals
- Listen to sounds made by common things found in the house or their preschool centre
- Visit cultural and historic places, such as Little India, Chinatown, Kampong Glam, heritage galleries and museums to find out more about the cultures and practices of different ethnic groups in Singapore
- Visit the hawker centre to try the food from different cultures/ethnic groups





Besides getting children to observe by sight, teachers can encourage children to use their other senses (e.g., smell, touch) to observe as well.

### Examples of questions teachers can ask:

- *What do you notice about ...?*
- *What does ... feel like?*
- *What does ... smell like?*
- *What sound does ... make?*
- *What does ... taste like?*
- *What do you see now?*

### DID YOU KNOW?

Children are natural observers. Beyond “just looking”, encourage them to engage all their senses when they observe. This helps them find information and discover patterns in what they observe around them.

## Comparing and Classifying

When observing the environment, children can **make comparisons of their observations to identify similarities and differences, which will allow them to sort and organise things into groups** based on characteristics, such as size, colour, shape and function.



Children can compare their observations and classify things (e.g., comparing bridges they see in Singapore and grouping them according to function based on the bridge structure).

### Examples of what children can do:

- Compare the texture of surfaces they walk on (e.g., gravel, grass, sand, concrete) during a neighbourhood walk
- Compare and classify furniture according to their function
- Compare fresh and dried leaves and classify them according to colour, size or texture
- Compare modes of public transport in the past and present
- Classify animals into wild animals or pets
- Classify places in the neighbourhood according to the types of services they provide (e.g., hawker centres, coffee shops and fast-food restaurants are places which sell food and beverages; clinics and hospitals are places to treat sick people; parks, fitness corners and playgrounds are places for exercise, physical activities and play)
- Classify clothing for hot or cold weather



**Examples of questions teachers can ask:**

- *How are ... the same?*
- *How are ... different?*
- *How are these items grouped?*
- *How many ways can we sort/organise ...?*

## Sequencing

Being able to recognise patterns and the order of things or events is an important skill to help children make sense of the world around them. As children observe the world around them, they will start to **notice patterns of change in people, objects and the environment over time**. This includes patterns and changes like day and night, growth and life cycles of living things, and past and present events.

**Examples of what children can do:**

- Observe patterns in everyday life (e.g., day, night, day, night, day, night)
- Sequence events based on what would be done in the morning, afternoon and night (e.g., eating breakfast in the morning, eating lunch in the afternoon, eating dinner at night)
- Sequence picture cards to illustrate the growth of a plant or life cycle of an animal
- Sequence picture cards to illustrate the steps for making rice dumpling

**Examples of questions teachers can ask:**

- *What happened first? What happened next?*
- *What do you think comes next/before? Why? What pattern do you see?*
- *How did .... change over time?*

## Questioning

The ability to ask meaningful questions is an important skill for children to develop and learn. Asking questions encourages children to find out and learn about the world around them, as well as help to foster their sense of wonder and curiosity and build critical thinking skills.

**Although many children love to ask questions about things they are interested in or curious about, some children may struggle to think of or formulate their questions.**

### Examples of what teachers can do:

- Allow time for children to generate and think through their questions
- Acknowledge children for asking questions and encourage them to find out answers to their questions
- Use questions to frame discussions and help children understand how asking questions can enable them to get more information about a topic
- Respond to children's questions and model asking follow-up questions
- Get children into groups to brainstorm and generate questions around a topic together

### DID YOU KNOW?



Although children are naturally curious and have many questions about the world around them, it does not mean that they automatically know how to ask questions that are useful for their learning. Teachers should give sufficient time for children to think about and generate questions to help them improve their questioning skills. When children are able to ask meaningful questions and find out the answers, they develop ownership of their learning and enhance their sense of wonder and curiosity.

### Examples of what teachers can say or ask:

- *What are you thinking/wondering about? What questions do you have?*
- *Take some time to think of your questions. Your questions can begin with “what”, “when”, “where”, “who”, “why” or “how”.*
- *I love that you are asking questions. Let's explore to find out more.*
- *What questions can you ask to get more information?*

## Investigating

Children can carry out simple investigations to find out why things happen and how things work. **The process of investigation could involve asking questions, making predictions and testing out their ideas.** Children can **find out answers to their questions in a variety of ways including experimenting, interviewing experts, seeking information from books, magazines, multimedia sources and going on field trips.** They can gather information from different sources and draw conclusions based on what they have found.



Children can find answers to the questions they have by interviewing experts (e.g., finding out about nursing and tools used by nurses). This also allows them to learn to interact with and appreciate others in the community.

### Examples of what children can do:

- Find out what happens when soap and oil are added to water
- Find out what is needed for plants to grow
- Find out which materials (e.g., paper, wood, cloth), when wet, will dry faster in the sun
- Find out what a day is like for different community helpers
- Find out about how people lived in Singapore in the past

### Examples of questions teachers can ask:

- *How can you know if/that ...?*
- *What can you do to find out if ...?*
- *What could it be? How do you know?*

## Inferring and Predicting with Reasoning

**When making inferences, children draw conclusions or explain a phenomenon based both on what they are observing or information presented to them and their prior knowledge or experience.** This involves the ability to reason and make connections in their learning to explain an observation or phenomenon.



After observing that the leaves they picked from the ground were all brown, the children inferred that leaves turn brown and dry up after falling off the plant.

### Examples of what children can do:

- After observing that a pair of shoes light up, infer that there are batteries in the shoe, like in a torchlight
- After seeing that Chinese families tend to dress in red during Chinese New Year and most Chinese New Year decorations are in red, infer that red is a colour symbolising happiness
- After seeing the facial expression of the character in a book, infer that the character enjoys going to school

### Examples of questions teachers can ask:

- *What does seeing ... tell you?*
- *Why do you think ...? What makes you say that?*
- *What made you think that ...?*
- *What would have caused ...? How did you know that ...?*

**When making predictions, children make informed guesses about what would happen by recalling their prior knowledge or experiences.** It requires them to make connections between what they already know and the current topic they are focusing on. Reasoning is also involved to foretell what might happen. **It is important that predictions are revisited after children observe what actually happens so that they can analyse why their predictions had been accurate or inaccurate.**

#### Examples of what children can do:

- Predict the ending of a story based on what happened earlier in the story
- Predict whether it will take a longer time to reach home by bus or taxi
- Predict which objects will float or sink in water
- Predict whether it will rain by observing the clouds
- Predict whether Singapore will need more or fewer buildings in the future

#### Examples of questions teachers can ask:

- *What do you think will happen if ...? What makes you say this?*
- *What do you think will happen next? What makes you say this?*

When children are **given ample opportunities to infer and predict**, over time, they will learn to **draw on prior knowledge or experiences to make connections in their learning** and start to **recognise patterns and cause-and-effect relationships**.



Teachers play an important role in planning and involving children in learning experiences that allow them to make predictions, infer, reason and make sense of the world around them.



## Recording, Drawing Conclusions and Communicating Discoveries

As children make observations, encourage them to make recordings of their observations and information gathered and draw conclusions based on their findings. **When children make records of their findings through mark making, drawing, writing or taking photographs, videos or audio clips, they are more precise about what they see, hear or touch. They become more sensitive to the details in the environment and will be better able to process and make sense of the information gathered to form opinions or conclusions.** Children also need opportunities to communicate or show their discoveries either verbally or visually in drawings and other forms of artworks, simple writing or dramatisation.



Besides making recording of their observations through mark making, drawing or writing, children can also take videos or audio recordings of their observations to revisit what they have seen/heard to pay attention to particular details.

### Examples of what children can do:

- Take photographs during a neighbourhood walk and use them to create a map of their neighbourhood
- Mark off days on a calendar to record the growth of a plant or butterfly and draw pictures of the plant's or butterfly's growth each day
- Take a time-lapse video to document the growth of a plant or animal
- Make a model of a bridge (e.g., using clay, ice cream sticks) after looking at some bridge structures in photographs or books
- Dramatise the life cycle of a butterfly



After allowing sufficient time for children to observe, ask questions to help them notice the details to include in their recordings and to elaborate on in communicating their discoveries.

#### Examples of questions teachers can ask:

- *What did you observe or find out?*
- *How can we represent the ...?*
- *What can we do to show others what we have learnt/discovered?*

## DEVELOPING POSITIVE ATTITUDES TOWARDS THE ENVIRONMENT

In supporting children to learn about the world, developing positive attitudes towards the environment is just as important as the acquisition of knowledge and skills in the learning area. **Teachers need to role-model the behaviours and attitudes that they want children to acquire. Children imitate and demonstrate positive attitudes towards the environment by observing adults' reactions and behaviours.** Through observing adults' responses towards the natural environment and people from different backgrounds, as well as their habits and actions, children become aware and start to appreciate and show care and respect for living and non-living things around them.

Meaningful learning experiences can also be planned to **allow children to practise positive behaviours and attitudes towards the world around them**, e.g., caring for and protecting plants, animals and shared spaces in the community, finding out more about and learning to appreciate different cultures and practices. This will help children learn how to care for themselves, others and the environment which lays the foundation for teaching children about sustainable development.

### Examples of what children can do:

- Participate in the celebration of festivals and activities across different age, cultural and ethnic groups
- Walk along the pavements/walkways when visiting the park and avoid walking/stepping on flower beds
- Be gentle and quiet when viewing animals at the zoo
- Use public property (e.g., playground equipment, lifts, library books) carefully by not damaging or losing it
- Stay at home and see a doctor when they feel unwell
- Turn off the tap and switch off appliances when not in use
- Maximise the use of materials by using them again before throwing them away

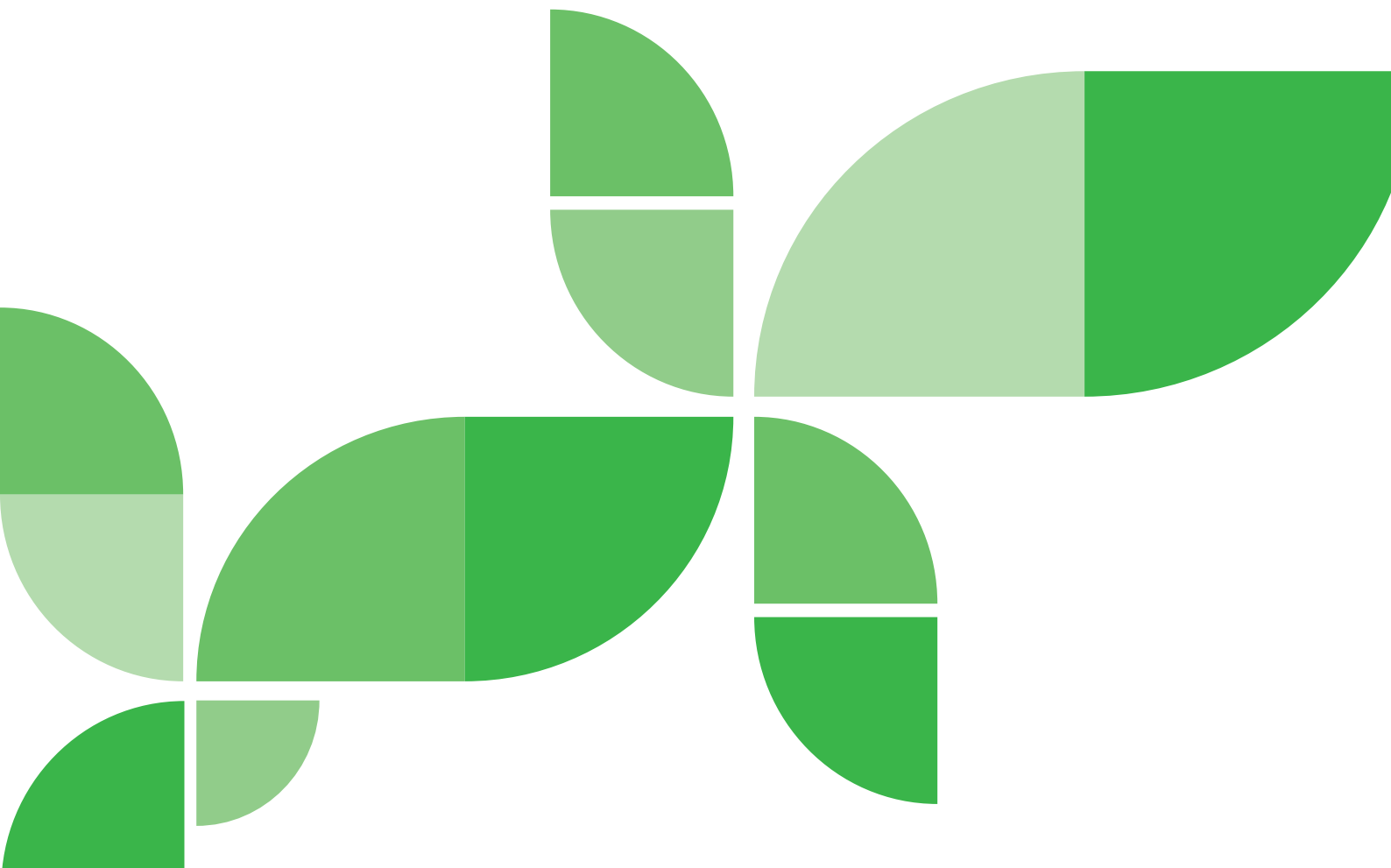


As children participate in the celebration of festivals and different cultural activities, they develop an awareness of and learn to show respect for people from different ethnic groups and cultures.



# Chapter 2

**LEARNING GOALS  
FOR DISCOVERY OF  
THE WORLD**





Exploration and discovery begin with children's natural curiosity. Teachers can also inspire children by intentionally providing a variety of resources, asking questions and modelling a sense of wonder. The learning goals for *Discovery of the World* focus on the need to:

- Stimulate and sustain children's sense of wonder and curiosity.
- Encourage children to discover things in their everyday life.
- Promote critical thinking skills that help children to analyse, reason, build connections, draw conclusions, and communicate their ideas to others.
- Cultivate in children a sense of responsibility, care and respect for the world around them and develop their awareness of the importance of sustainable living.

The examples in this chapter illustrate how teachers can provide opportunities for children to develop the necessary knowledge, skills, and dispositions of the learning goals for *Discovery of the World*.



Stimulate children's natural curiosity by providing them with a variety of resources to explore with and make new discoveries.



## LEARNING GOAL 1

**Show curiosity and an interest in the world they live in**

**Knowledge, Skills and Dispositions (KSD):**  
*Provide opportunities for children to...*

*Children's learning and development could be observed, for example\*, when they...*

1.1 Develop an awareness of their immediate environment (e.g., people, animals, plants, places, events)

- Spontaneously talk about their observations and/or thoughts when they notice something interesting (e.g., a caterpillar crawling on a leaf, posters in the lift)
- Are eager to observe, explore and investigate the environment or things they are interested in (e.g., wanting to find out more about the Malay wedding they observed at the void deck)
- Show interest and curiosity to explore and/or use a range of materials (e.g., view finders, map of Singapore, world map) provided in the classroom

1.2 Ask questions about their immediate environment, why things happen and how things work

- Ask questions about their observations of people (e.g., Why is the person wearing a mask?), events (e.g., Why do we always see fireworks on National Day?) and inventions and technology (e.g., Who invented the television? How did people in the past pass on messages to one another?)
- Ask questions about why things happen (e.g., Why is there a rainbow in the sky after the rain? Why does ice cream melt?) and how things work (e.g., How does the MRT work? How does a light bulb work? How do toy cars move? How did the letters get from the sender to our letterbox?)

*\*The examples are not age-specific or exhaustive. Teachers may provide other appropriate learning experiences/activities based on children's developmental needs and interests.*

## Example: A Walk Along the Singapore River

(This is an adapted learning activity from Genius Hive Preschool.)

### Learning Objective/s

K2 children are given opportunities to:

- Make observations of various sculptures and fixtures in the areas along the Singapore River.
- Ask questions about the sculptures, fixtures and the immediate environment.

### Learning Activity

- Bring the children for a walk along the Singapore River.
- Encourage them to observe the sculptures and fixtures seen during the walk. Have them record their observations by drawing or taking photographs.
- Model a sense of wonder and curiosity by showing interest in the things seen during the walk and use language such as *"I wonder what/where/how/why..."*.
- Promote authentic learning through quality interactions by inviting the children to talk about interesting things they see around them. Use prompts or ask questions to engage the children in shared and sustained conversations to build on one another's ideas, such as:
  - *I wonder why the men are not wearing shirts.*
  - *What do you think they are transporting in the carts?*
  - *Why did they use bullock carts to help them transport the goods in those days? What makes you say this?*
  - *How do people transport goods in Singapore now?*



- What is the man holding in his hands? What do you think it is used for?
- Where have you seen this?



- Encourage the children to ask their own questions.
- Answer the children's questions patiently and take down questions for further investigation back in the classroom to show that each contribution is valued.

*Note: This activity can be modified accordingly, depending on the places near the preschool centre which the children can take a walk at.*

### **Possible extension of the learning experience**

Follow up on this activity to help the children construct new knowledge and extend learning. Help them organise their questions using a graphic organiser and allow them to find out the answers from different sources of information (e.g., books, online resources, interviews with grandparents).

Have them record and communicate what they have found to others (e.g., their parents, other classes) to make their learning and thinking visible.

**Can you think  
of other ways to  
extend the children's  
learning experience?**



## LEARNING GOAL 2

**Use essential process skills to make sense of the world around them**

**Knowledge, Skills and Dispositions (KSD):**  
*Provide opportunities for children to...*

2.1 Develop skills to gather information about the world around them

2.1.1 Observe and investigate their immediate environment using their senses, child-friendly equipment and technology

2.1.2 Identify key features, characteristics and properties of living and non-living things, places and events in their immediate environment

2.1.3 Record observations and information gathered in different ways

2.1.4 Use information from a variety of sources to find out why things happen and how things work

*Children's learning and development could be observed, for example\*, when they...*

- Use their five senses, simple tools and/or technology (e.g., magnifying glass, gardening tools, camera) to explore the world they live in (e.g., observe how different people in the neighbourhood greet each other, touch and feel the texture of different types of rocks, leaves, smell flowers, herbs and/or spices, listen to the sounds animals make, taste food from different ethnic groups)
- Use mark-making, drawings, words, photographs, video and/or audio recordings to record and share their observations and findings
- Carry out short investigations (e.g., experiments to find out what floats or sinks, talk to grandparents to find out more about Singapore in the past)
- Ask classroom visitors or other experts questions to find out more about occupations (e.g., dentist, fireman, scientist, engineer) or specific areas of interest (e.g., photography, cultural dance, gardening, taking care of pets)
- Seek information from books, magazines, multimedia sources, pictures, photographs, maps, artefacts to learn more about different countries, history, technology, people, plants, animals, events, etc.
- Go on field trips to find out more about the neighbourhood and/or different places of interest



## 2.2 Develop skills to organise information gathered

2.2.1 Compare things to recognise similarities and differences between them

2.2.2 Classify things according to their characteristics

- Compare and recognise similarities and differences in things, people, places (e.g., compare modes of public transport in the past and present, compare bottles made of different materials)
- Classify things, people and places according to their characteristics (e.g., sort leaves according to colour, shape and/or size, sort places in the neighbourhood according to the type of services they provide)

## 2.3 Develop skills to interpret information gathered

2.3.1 Recognise patterns of change in people, objects and the environment

2.3.2 Make inferences on the observations of people, objects and the environment with reasoning

2.3.3 Make predictions of what will happen with reasoning

2.3.4 Draw conclusions from information gathered

- Recognise patterns and changes like day and night, growth and life cycles, past and present events
- Sequence events, routines and changes
- Make inferences about their observations based on information presented or gathered and prior knowledge and/or experiences (e.g., infer that plants need water to survive and grow after observing that plants die when not given water for a few days, infer that someone is sad after observing their facial expression)
- Guess or make predictions of outcomes based on prior knowledge and/or experiences (e.g., making informed guesses on which objects will sink or float, which objects will move faster or slower)
- Draw conclusions from information gathered to answer the questions they have

## 2.4 Develop skills to communicate information gathered

2.4.1 Represent observation and information gathered in different ways

2.4.2 Describe and share findings with others

- Represent new information gathered through different means, such as drawing, artwork, 3D models, words, photographs, etc.
- Communicate what they have found to others (e.g. classmates, parents) through platforms (e.g., show and tell, performances)

## Example: An Investigation on Gloves

(This is an adapted learning activity from MOE Kindergarten @ Springdale.)

### Learning Objective/s

K1 children are given opportunities to:

- Compare and talk about the similarities and differences between different types of gloves based on their observations.
- Predict and investigate which gloves can keep their hands dry.
- Make inferences on why certain materials can keep their hands dry while others cannot.

### Learning Activity

- Pass a few pairs of cotton, woollen, rubber and disposable plastic gloves around.
- Have the children observe the parts of the gloves and feel the texture of the materials used to make the gloves.
- Invite the children to talk about their observations by asking questions, such as:
  - *How are the cotton, woollen, rubber and plastic gloves the same?*
  - *How are they different?*
  - *What do you think they are used for? How do you know?*
- Invite the children to predict which pair of gloves can keep their hands dry when they are washing cups. Have them share reasons for their views. This can be based on what they have experienced or observed previously. Encourage the children to listen to one another's reasoning by saying:
  - *Let's listen to what your friends have to say.*
  - *What do you like about your friend's idea?*
- Provide the children with a basin of water and guide them in designing a simple experiment to find out the answers. [Refer to examples of questions teachers can ask on page 19 in Chapter 1].



- Record the steps suggested and encourage the children to follow the steps discussed.
- Have them carry out the experiment in small groups and record the results.
- At the end of the experiment, have the children show and share their findings and confirm if their predictions are aligned with their results.
- Invite the children to infer why certain materials keep their hands dry while others do not. To scaffold this process, have the children observe closely the characteristics of the materials that keep their hands dry and characteristics of materials that do not.

### DID YOU KNOW?



Carrying out experiments in small groups will allow children to learn to take turns and encourage them to listen to and value one another's views and ideas. This helps children to develop social awareness (SEC 3, KSD 3.4) and build positive relationships with their friends (SEC 4, KSD 4.2, 4.3). It also helps to foster the learning disposition, "appreciation" in them as they learn to work as a team and learn from one another.

### DID YOU KNOW?

To infer, children have to explain a phenomenon observed (in this case the materials that keep their hands dry) based on their prior experience or observations. To predict, children have to guess (with reason) what is going to happen based on their prior experiences or observations.

**Possible extension of the learning experience**

- Follow up on this activity so as to help the children apply and reinforce what they have learnt.
- Have them classify a variety of gloves into sets that will keep or not keep their hands dry based on the characteristics of the materials.
- Present a new situation by asking the children to infer which type of gloves would better protect their hands when handling hot/sharp objects or keep their hands warm during cold weather.
- Ask the children to choose the type of gloves suitable for different everyday activities. This helps them to further develop their understanding of the characteristics of glove materials by relating the concepts to their daily life which, in turn, makes learning meaningful for the children.

Can you think  
of other ways to  
extend the children's  
learning experience?





## LEARNING GOAL 3

**Develop a sense of responsibility, care and respect for the world around them**

**Knowledge, Skills and Dispositions (KSD):**  
*Provide opportunities for children to...*

- 3.1 Develop an awareness of the importance of showing care and respect for people from different backgrounds, cultures and settings
- 3.2 Develop an awareness of the need to show responsibility, care and respect for plants, animals and things in the environment
- 3.3 Develop an awareness of how human behaviours and their actions might affect their immediate environment and the world they live in
- 3.4 Show responsibility, care and respect for living and non-living things

*Children's learning and development could be observed, for example\*, when they...*

- Recognise and appreciate similarities and differences between themselves and others (e.g., find out more about and participate in the celebration of festivals and activities across different age, cultural and ethnic groups)
- Recognise issues of concern related to the local and international community and possible implications on themselves and the world around them (e.g., discuss newspaper articles on local and/or world matters, such as flash floods across Singapore after a heavy rain, dengue cases in Singapore, bushfire in Australia, Covid-19 pandemic)
- Recognise how they could have a positive impact on others and the world they live in (e.g., participate in mini-enterprise projects like the sale of hand-made greetings cards to raise funds for the needy/disadvantaged, visit old folks' home, participate in donation drives and beach clean-up activities)
- Show responsibility in taking care of the plants, animals and things in the preschool centre on a consistent basis

- Control impulses like making fun of someone different from themselves, plucking flowers, feeding animals in the pond or feeding the birds in the neighbourhood
- Recognise the importance of saving water, electricity and paper, recycling, and practise these good habits consistently
- Encourage others to have the correct behaviours by doing the right things themselves (e.g., turning off taps after washing their hands, not littering, returning trays after eating in a food court, covering nose and mouth when sneezing or coughing) and by sharing with others the impact of positive or negative behaviours (e.g., the negative effects of food wastage, ocean pollution, climate change) on their immediate surroundings and the world around them

*\*The examples are not age-specific or exhaustive. Teachers may provide other appropriate learning experiences/ activities based on children's developmental needs and interests.*

## Example: Playgrounds for Everyone

(This is an adapted learning activity from MOE Kindergarten @ North View.)

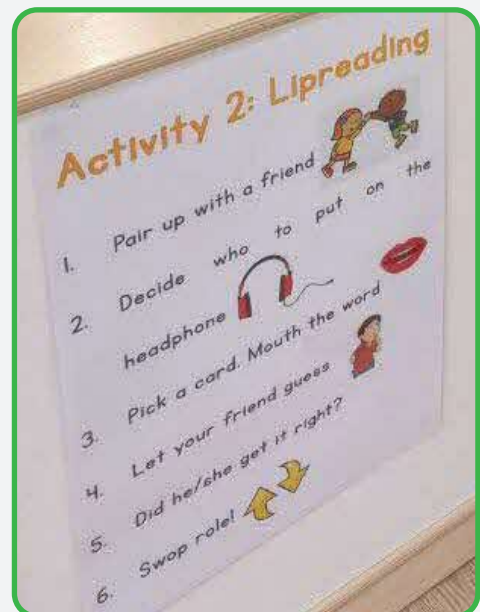
### Learning Objective/s

K2 children are given opportunities to:

- Find out how children with disabilities might have different needs from themselves and how to show care and respect for them.
- Explore different playgrounds and discuss how playground equipment can be made more user-friendly for children with disabilities.
- Work in groups to make models of playground equipment for an inclusive playground.

### Learning Activity

- Read a book or show a video to introduce different disabilities. Lead the children to understand that there are people with different needs around us and everyone has his/her own strengths. Highlight the importance of respecting people with different abilities and learning to work and play with everyone.
- Stimulate the children's interest in finding out more about how a child with a physical disability might perform daily tasks like going to school, brushing his/her teeth, eating snacks and playing at the playground.
- Have the children carry out some experiential activities that can help them better understand what a child with disabilities might have to go through to do seemingly simple daily activities, e.g., writing with their feet instead of their hands, moving something from one place to another with their eyes blindfolded, lip reading.



- Visit both typical and inclusive playgrounds and have the children explore different kinds of play equipment and wonder about whether it would be easy or difficult for children with certain disabilities to play at these playgrounds. Specify several different disabilities and have the children share their thoughts on what might be the needs of these children and to what extent the playgrounds cater to their needs.



- Invite a guest speaker (e.g., someone specialising in assistive technology, physiotherapist) so that the children can ask questions and find out more about the challenges typically faced by children with disabilities and what can be done in the physical environment to help them.

## DID YOU KNOW?



Information and Communication Technology (ICT) tools such as video/digital cameras can be used intentionally and meaningfully to support children's learning. Through appropriate prompts/questions, video recordings or photographs taken of children's learning experiences can motivate them to think back on what they have done, seen, heard or felt and apply their learning in follow-up activities.

This helps to foster the learning disposition, "reflectiveness" in children as they look back on their learning experience and generate alternative ideas to gain new knowledge or improve their learning.



- Have the children revisit what they have learnt and discuss how certain playground equipment could be made more user friendly for children with different disabilities to enjoy using and playing with them.
- Have the children work in groups to design and use materials of their choice to create models of playground equipment for an inclusive playground to cater to children with different needs.
- Invite the children to talk about how the playground equipment they have designed caters to children with disabilities.
- Help the children develop appreciation by encouraging them to listen to and learn from one another's ideas.
- Have them show and talk about their creations with children from another class or with their parents.

### DID YOU KNOW?



Being given the autonomy to design and use materials of their choice, fosters children's engagement and provides opportunities to build their cognitive flexibility and inventiveness as they think of different ways to problem solve.

### DID YOU KNOW?



This learning experience enables children to develop an awareness of diversity in their community (SEC 3, KSD 3.1) and promotes the values, care and respect.





**Possible extension of the learning experience**

Reinforce and deepen the children's learning on the importance of showing care and respect for people with different abilities through books or videos which introduce success stories of people with disabilities (e.g., Singaporean Paralympic athletes). Help the children learn to appreciate and celebrate diversity, as well as understand how people with disabilities have overcome challenges by not giving up. Use the stories to introduce and raise the children's awareness of the learning disposition, "perseverance" and inspire them with a chant:

**Persevere,  
Have no fear.  
Try again,  
Till you gain.**

**Persevere,  
Success is near.  
Try harder,  
Till you get better.**



**Can you think  
of other ways to  
extend the children's  
learning experience?**

## Example: Saving Water in Everyday Life

(This is an adapted learning activity from Hebron Christian Preschool.)

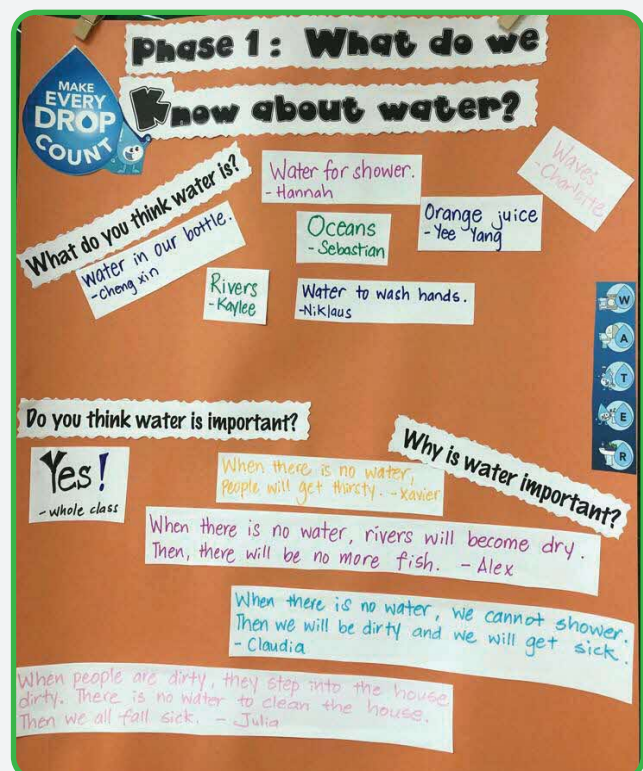
### Learning Objective/s

N2 children are given opportunities to:

- Talk about the importance of water in our lives and why we must save water.
- Discuss actions they can take to save water at home and at school.
- Suggest ways to encourage others to save water.

### Learning Activity

- Introduce the music video, “Turn off the Tap!” by Public Utilities Board (PUB) and encourage the children to sing and dance along to the music video. Invite the children to share why there is a need to turn off the tap as advised in the music video.
- Invite the children to talk about what they know about water and its uses. Use a graphic organiser to record the children’s responses.
- Show the children some pictures of careless use of water at home or at school and invite them to talk about why these practices are wrong.
- Help the children understand the importance of water in their lives. Ask:
  - What do you think it would be like if there is no water for us to use at home or at school?
  - How can we help to save water?
  - What can we do to make sure that there will be enough water for everyone to use at home or at school?
- Record the children’s responses on the graphic organiser.



- Use a picture or information book to facilitate a discussion on the ways to prevent wasting water at home and at school. Based on the children's responses, add to the graphic organiser, further actions to save water.
- Tell the children that they can play a part in encouraging others to practise good water saving habits at home and at school. Have the children draw a picture to remind others to turn off the tap after use which may be displayed near the sink in the toilet or wash area. Incorporate other ideas suggested by the children.



DID YOU KNOW?



Such learning experiences help develop in children an awareness of the consequences of their behaviours and actions on their immediate environment and a sense of responsibility to support sustainable living.

**Possible extension of the learning experience to K1/K2 children**

- Ask K1 or K2 children where they think the water they use comes from and to find out how water gets to the house or school. Help the children learn more about this through videos such as “The Singapore Water Story” by PUB.
- Use stories or pictures to help the children understand that not everyone has access to clean running water in their homes and have them compare how people get water in the past and now.
- Share key events of water shortages and water rationing in Singapore or examples from other countries that do not have clean drinking water. Use these to guide the children to appreciate the ease of accessibility to clean drinking water that they have, simply by turning on the tap.
- Involve the children in a water rationing exercise. Have them predict how much water would be needed and record how much water was actually used. Through this, help them to understand how precious water is.
- Reiterate the need for everyone to play a part in saving water. Invite the children to brainstorm and contribute ideas to encourage others to save water to ensure a sustainable level of water consumption.

**Can you think  
of other ways to  
extend the children's  
learning experience?**



# Chapter 3

**STRATEGIES  
FOR DISCOVERY  
OF THE WORLD**





Teachers play an important role in planning and involving children in learning experiences that help them to seek answers and make sense of the world around them. Through effective questioning, introducing concrete materials and providing a wide range of resources, teachers can spark children's interest and curiosity, and generate their excitement to make new discoveries.

Strategies that encourage children to explore and discover the world include:

### **Igniting children's sense of wonder and curiosity and encouraging exploration and discovery**

- Modelling a sense of wonder and curiosity
- Using prompts and effective questioning

### **Providing opportunities for children to gather information in different ways**

- Introducing simple experiments
- Inviting resource persons
- Conducting field trips
- Using picture books and print media
- Using technology and interactive media

### **Helping children to organise, consolidate and communicate their learning**

- Using diagrams and graphic organisers

### **Helping children to develop and demonstrate positive attitudes towards the world around them**

- Developing care and respect for people in the community
- Developing care and respect for nature
- Developing a sense of social responsibility



Children's learning is made more meaningful when they have opportunities to discover the causes and reasons for things that happen around them.

## IGNITING CHILDREN'S SENSE OF WONDER AND CURIOSITY AND ENCOURAGING EXPLORATION AND DISCOVERY

### Modelling a Sense of Wonder and Curiosity

When a teacher is an interested, curious and respectful observer of the things happening around them, children's awareness, curiosity and appreciation of the their surrounding environment would be modelled after the teacher's behaviour and actions.

Teachers can use language to **verbalise their wonderment**, e.g., *"I see ... and I wonder ..."* Besides modelling a sense of wonder and curiosity, teachers should also **value children's questions** by **acknowledging them** and **showing interest to find the answers together with the children**.



Modelling a sense of wonder and curiosity both verbally and through body language can stimulate or sustain children's interest and get them excited about finding out more.

## Using Prompts and Effective Questioning

The intentional use of questions and prompts is especially important to:

- Invite children's interest and motivate further exploration/discovery.
- Help children draw meaningful connections between their prior knowledge/experiences which, in turn helps them to consolidate learning and draw conclusions from their different learning experiences.
- Help children reflect on their learning experiences and apply/communicate what they have learnt or discovered.

Refer to page 107 in NEL Framework (2022) for examples of questions to promote inquiry and cognitive development.



Questions and prompts can also be put in the learning environment to invite children's interest, help them draw meaningful connections to their prior knowledge/experiences or help them reflect on learning.

In addition, effective questioning/prompting allows teachers to gain insights into children's prior knowledge and thinking to assess their understanding and learning progress in achieving the learning goals.

Here are some tips on effective questioning/prompting:

- **Plan** the use of a series of intentional questions/prompts before the start of an activity by anticipating children's responses and actions. These should build on one another to enrich children's learning experience by arousing their interest to explore and discover.
- **Provide sufficient wait time** for children to think before responding to a question/prompt. Do not appear impatient or undermine children's thinking by providing the answers too soon.
- **Make use of or build on children's responses** to ask questions or provide prompts that invite children to elaborate, extend their thinking and encourage further exploration and discussion.
- **Use both close-ended and open-ended questions** appropriately during large group time or when children are playing at the learning centres. Close-ended questions or questions which require simple responses can serve the purpose of helping children recall information and focus their attention. On the other hand, open-ended questions encourage a variety of responses, challenge or extend children's creative and critical thinking. They can be used to encourage children to solve problems, make predictions and form opinions or draw conclusions about their activity.

**Examples of effective questioning and prompting to expand on children's responses and help them explain and extend thinking:**

- **Clarifying ideas**

*Do you think that the grape will float and the orange will sink? Why do you think so?  
Can you tell me more about it?*

- **Rephrasing ideas**

*Are you thinking that the grape will float because it is smaller but the orange will sink because it is bigger?*

- **Offering your own experience**

*That is an interesting idea. From what I have observed, some small objects will sink and some big objects will float.*

- **Suggesting**

*You might want to try putting other smaller fruits into the water to see if they float or sink.*



- **Reminding**

*Don't forget you said that the grape will float because it is smaller but the orange will sink because it is bigger.*

- **Offering an alternative viewpoint**

*Could it be that not all big objects will sink?*

- **Modelling and extending thinking**

*The orange floated and the grape sank even though the orange is bigger and heavier. I wonder why.*

- **Encouraging curiosity and extending learning and thinking**

*What do you think will happen to the orange if we remove its skin? Why do you think so? What are some other fruits you can use to find out more?*

## PROVIDING OPPORTUNITIES FOR CHILDREN TO GATHER INFORMATION IN DIFFERENT WAYS

### Introducing Simple Experiments

Children have an innate curiosity and interest in exploring their surroundings and using their five senses to find out how things work and why things happen. Experimentation is an excellent way for children to enjoy finding out the answers to questions that interest them.



As children experiment, they develop important process skills, such as observing, comparing, questioning and reasoning.



### Before the experiment

Start off by getting children excited about something they want to find out more about and provide opportunities for them to make predictions of what they might observe. To **help them make informed predictions instead of random guesses**, teachers can prompt them to **draw links to their prior experiences or knowledge**. Record their predictions so they can refer to them again after the experiment.

### During the experiment

During the actual experiment, provide opportunities for children to develop and use process skills as they make **careful observations, comparisons and predictions, test out ideas, ask questions, collect information and draw conclusions** from what they have observed. It will be useful to provide children with materials (e.g., writing materials, camera) to record their findings from the experiment.

While carrying out an experiment, difficult concepts which are beyond the ability of a child to grasp may arise. **The focus should not be on explicitly teaching children the scientific concepts but to develop their process skills** so that they can gather information and make logical conclusions based on their observations. The teacher can **intentionally curate what resources to provide to help children make logical conclusions**. For example, in the float and sink experiment, children often conclude that bigger objects sink and smaller objects float. To prevent this misconception, teachers should provide a variety of different objects including those that would go against this conclusion (e.g., oranges versus grapes) so that children will not reach the wrong conclusion.

### After the experiment

After the experiment, guide children to **compare their findings with the predictions made** before the experiment and provide opportunities for them to give reasons for why these might be the same or different. Encourage them to **use their own ways to share with others what they have found from the experiment**. This will develop their skill of communicating discoveries based on their understanding.

### Examples of experiments for children:

- Find out which objects will be attracted to a magnet
- Find out which toy car can go the furthest or fastest when moving down slopes of different heights
- Find out the effects of wind on heavy and light objects
- Find out the effects of mixing primary colours (i.e., red, yellow, blue)
- Find out which solids and liquids dissolve in water
- Find out the container which holds the most amount of water (i.e., having the greatest volume) by counting the number of cups of water needed to fill each of the containers
- Find out which type of fabric material is best for making raincoats
- Find out which liquid best prevents apple slices from turning brown
- Find out what makes ice melt faster (e.g., in warm or cold water, in shade or sun, in air or water)

### DID YOU KNOW?



Experimentation not only helps children to develop a variety of process skills and foster the PRAISE learning dispositions, it also helps children build and practise executive functioning skills, such as focusing and following through with the step-wise instructions to complete the task at hand.

## Inviting Resource Persons

Resource persons are individuals who can be invited to share first-hand accounts with children based on their areas of expertise, experience and interest.

They include professionals, such as nurses, veterinarians, construction workers, postmen, bus drivers, pilots, cleaners, librarians and chefs, and children's family members, such as their parents, grandparents or siblings. These resource persons or experts can be invited to talk about their jobs, their roles and responsibilities, and the tools they use or their hobbies/interests. Through their first-hand accounts of what a typical day at work or what their hobby entails, children will be able to better relate to what they might have observed or known about these occupations or interest areas.

**Inviting resource persons to the classroom raises children's awareness of and helps them to appreciate the roles played by people working in the community and neighbourhood, and their family members.**

Such involvement of community resources and family members enriches children's learning experiences and encourages the community and families to be involved in the education



Family members of the children make wonderful resource persons as they often have a wealth of knowledge to share and children look forward to having them at the preschool centre.

of children. It will also strengthen the preschool-family-community connections and partnerships. This provides varied opportunities in enhancing children's learning and development.

Prior to the sharing session, the teacher can guide children in brainstorming a series of questions which can be used when interviewing the resource person. The teacher can also **highlight how children can be respectful when interacting with these resource persons** (e.g., greeting the resource person, using the correct volume and tone when speaking to them, taking turns to listen and speak, thanking the resource person at the end of the interview). The affordances of Information and Communications Technology (ICT) can also be tapped to conduct virtual real-time interview with the resource person.

### DID YOU KNOW?



Inviting resource persons to the classroom provides an authentic opportunity for children to develop social awareness and self-regulation skills as they learn to interact respectfully with the resource person (SEC 3, KSD 3.2, 3.4).

**Examples of resource persons and what they could talk about/do:**

- Architect to talk about building designs and construction
- Paramedic/Doctor to demonstrate how he/she use medical instruments to perform medical check-ups for the sick and help the injured
- Dentist to talk about dental care and what happens during a dental visit to help allay the fears children might have when visiting the dentist
- Policeman/Fireman to talk about his/her role in the community and share ways in which children can keep safe
- Delivery man to talk about how he/she transport items, such as food and goods from one place to another
- Teacher/School Principal to talk about what life at a primary school is like
- Nutritionist to talk about healthy food and good eating habits
- Sports enthusiast/Athlete to talk about the importance and ways of staying healthy and physically fit
- Environmental advocate to share the importance of taking steps to care for the world to support sustainable living
- Gardener to talk about his/her interests and experiences in growing different types of plants
- Parents, grandparents or other family members who enjoy cooking and baking to talk about food from different cultures



## Conducting Field Trips

Teachers should identify the teaching and learning objective(s) of field trips and plan activities during the trip to ensure children's active participation. **Field trips increase children's interest in and understanding of their immediate environment and the world around them by allowing them to gather and validate information through more authentic and concrete experiences.** For example, a field trip to a vegetable farm provides children with sensory experiences to gather information and learn how vegetables are harvested and transported to the supermarkets or markets for sale. In addition, they provide opportunities for children to interact, cooperate and communicate with others meaningfully.

### DID YOU KNOW?



Field trips are different from excursions which are usually planned as a recreational activity for children. Field trips not only have specific learning objectives but provide authentic contexts for children to develop and show responsibility, care and respect for living and non-living things, as well as a sense of wonder and curiosity about the world around them.

A field trip does not need to involve visiting a place far away from the preschool centre. For instance, neighbourhood walks that focus on people, culture, buildings, amenities, environmental print and other geographical features can also help children acquire knowledge about their surroundings. **Children can be encouraged to observe the patterns and numbers around them, feel the texture of surfaces they walk on and listen to the sounds around them.**



A field trip can be made to a place near the preschool centre, such as a rooftop garden in the neighbourhood, depending on what the objectives are.

Family members can be involved by talking to the children about the topic or place of interest before and/or after the field trip. Where possible, they can also participate in the field trip.

For a field trip to achieve its objectives, it needs to be planned carefully, like any other activity in the preschool centre. Refer to pages 92 and 93 in NEL Framework (2022) for the field trip general planning considerations. Besides planning for pre-field trip, on-site and post-field trip activities, other aspects of the field trip should also be carefully planned. The key processes involved in conducting field trips are summarised below.

### Prior to the field trip

#### **Conduct pre-trip recce**

Check out the facilities at the selected place and look out for safety issues and think of what the children can do during the field trip to meet the intended learning objective/s.

#### **Make pre-trip arrangements**

Inform parents about the purpose of the field trip and seek their consent for their child's participation. Ensure there is a sufficient number of adults to supervise the children during the field trip by seeking assistance from colleagues and parents. Brief all accompanying adults on their roles and responsibilities to ensure the trip is carried out smoothly.

#### **Conduct pre-trip activities**

Ignite children's curiosity about the field trip and get them to think about what they would like to find out during the field trip. Record their responses on a graphic organiser (e.g., a K-W-L chart). Brief the children on safety and emergency procedures and the behavioural expectations for the field trip.

### During the field trip

#### **Conduct on-site activities**

Bring along materials which might be needed for the planned on-site activities and facilitate children's learning through effective questioning and prompting. Encourage children to record their observations and learning through mark making, drawing, writing or taking photographs. Take photographs to document children's learning experiences for post-field trip discussion and reflection.

#### **Carry out all safety measures**

Bring along essential items, such as a first-aid kit and emergency contact numbers. Supervise children at all times to ensure children's safety.

### After the field trip

#### Conduct post-trip activities

Consolidate learning by helping children to recap their experiences and what they have found out during the field trip. For example, build on the K-W-L chart created prior to the field trip to help the children answer the questions they had at the start.

#### Reflect on learning

Display photographs taken for the field trip to **make children's learning visible** and allow them to recap and reflect on their learning process. Share documentation of children's learning experiences for the field trip with parents, including tips on how they can build on children's learning experiences at home.

#### Evaluate field trip

Identify what went well and the challenges encountered to help planning of future field trips.

If a physical field trip is not possible, the following can be considered:

- A virtual tour (if available) could replace the physical visit by the children. Following which, the teachers can try to replicate some aspect/s of the virtual tour in the classroom or preschool centre so that the children can engage in hands-on activities related to the virtual experience. For example, the classroom can be converted into a nature park including sound and lighting effects to create opportunities for children to explore with their five senses.
- Have a teacher go on-site and conduct a live session for the children from the place of interest. For example, to replace a physical visit to the supermarket with the children, the children can ask questions and direct the teacher who is on-site on what to do and where to go to find out the answers to the questions they have.

Please note that these alternatives should only be considered if a physical field trip is not possible. **Children learn best during a physical field trip when all their senses are engaged.**

## Example: Planning a Field Trip to Marina Barrage

### Learning Objective/s

K2 children are given opportunities to:

- Find out how Singapore obtains our water supply.
- Be aware of the importance of sustainable living in Singapore.
- Learn ways to help keep a clean, green and sustainable environment in Singapore.
- Develop good habits of using only what they need so as to reduce wastage in the world we live in.

### Pre-Field Trip Activities

- Give each child a piece of crushed newspaper or used paper. Ask the children to take turns to throw their crushed paper into a basket until it fills up and overflows. Invite the children to suggest what happens to all the rubbish we produce in Singapore.
- Show the children photographs or a suitable video of where rubbish go to in Singapore. Help them understand that our only landfill, Semakau Landfill will run out of space for Singapore's solid wastes by 2035.
- Introduce the 3Rs – Reduce, Reuse, Recycle – and guide the children to be aware of how practising the 3Rs can help to reduce the amount of rubbish produced in Singapore by:
  - Reducing wastage (e.g., buy only things we really need and will use, cook or order only what we can finish eating, bring and use our own water bottle as a daily habit instead of buying drinks in single-use bottles, use a handkerchief instead of tissue/paper towels).
  - Reusing and recycling things before throwing them away (e.g., donate old clothes, shoes and toys that can still be used, repair electrical appliances for reuse, use a reusable bag for shopping, use recycled materials for art and craft activities).
- Tell the children that they will be visiting the Marina Barrage and the Sustainable Singapore Gallery there to find out more about how everyone can play a part to help keep a clean, green and sustainable environment in Singapore.
- Create a **K-W-L Chart** to record what children **Know** about what they can do to promote the 3Rs, what they **Want** to find out about how Singapore ensures that everyone continues to enjoy a sustainable environment and what they have **Learnt**.
- Sign up for the complimentary guided tour of the Marina Barrage and learning programme for preschool children at the Sustainable Singapore Gallery.



## On-site Activities

- Encourage the children to observe and take note of the things they see, hear and interact with and ask the tour guide/facilitator their questions on the K-W-L Chart or any other questions they might have.

## Post-field Trip Activities

- Encourage the children to share what they have seen, heard or learnt from the visit to Marina Barrage and the Sustainable Singapore Gallery. Repeat or build on the children's responses and record what they have learnt in the K-W-L chart.
- Encourage the children to reflect on their field trip experience by asking them questions, such as *"What do you like best about the trip to Marina Barrage?"* and *"What is something new you learnt there?"*
- Plan an activity for the children to develop their awareness of water conservation or the 3Rs. Get the children to work in pairs or groups to create a poster, postcard, song or skit to share important messages on water conservation or responsible behaviours for a clean, green and sustainable Singapore.



Children can learn ways to help keep a clean, green and sustainable environment in Singapore from their visit to the Marina Barrage.

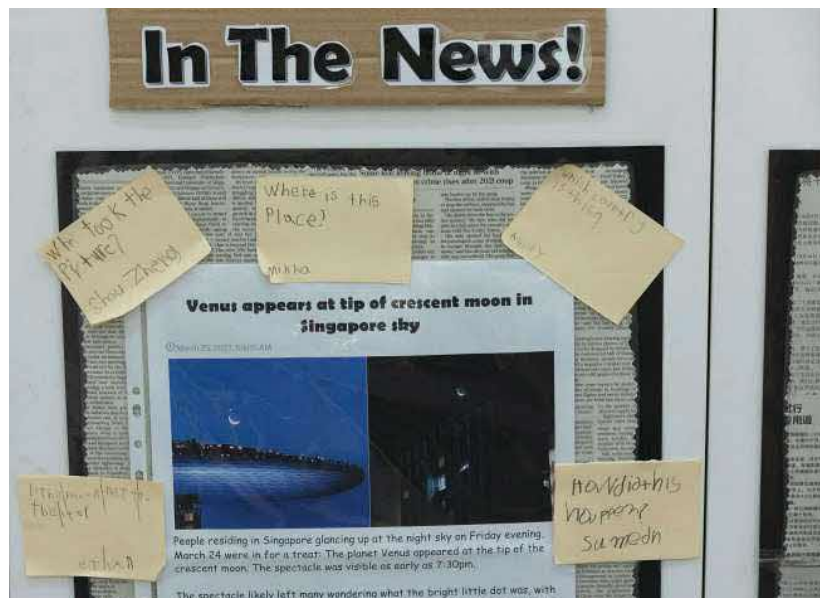


## Using Picture Books and Print Media

There are **many picture books and print media** (e.g., newspaper, magazines, brochures, information books) that **provide information about the world to arouse children's curiosity and offer opportunities for discovery and learning** about plants and animals, people and their cultures, places and events.

Finding out about the world around them through **books and other print media helps children debunk any misconceptions they might have about how and why things happen around them**. It also helps to **develop their awareness and appreciation of diversity** and understanding of relationships between people and between people and the environment, thereby **empowering them to show responsibility, care and respect for themselves, others and the environment**.

Picture books and print media may be used to stimulate children's sense of wonder at the beginning of an activity/project, e.g., through the use of coloured illustrations and pictures in the books. They may also be used for children to search for details mid-way through the activity/project, as well as at the end to provoke further investigations. These books and other print materials can either be displayed at the Reading or Discovery Centre to allow children to browse through and look for information related to a specific theme/topic being discussed.



Suitable picture books and print media could be curated and displayed to stimulate children's interest in a topic or to allow them to find the information they need.

## Using Technology and Interactive Media

Technology and interactive media are tools that can promote effective teaching and learning when they are **selected and evaluated purposefully and integrated meaningfully in developmentally appropriate ways**. Video clips, movies, slides, e-books, applications (apps), and other computer simulations linked to a topic/theme in discussion can be used to excite children and expand their knowledge about people, culture, nature and places in the world, beyond their own community. One example of an appropriate use of ICT to enhance children's learning is showing a time lapse video of a caterpillar changing into a butterfly as it would be hard for children to witness the whole process first-hand.



Appropriate use of technology and interactive media can excite children to learn more about the world around them.

With the affordances of ICT, there are also opportunities for teaching and learning to take place online. However, it is important for teachers to realise that technology and interactive media should be used in moderation. **It should complement and not replace physical teaching and learning experiences**, such as indoor and outdoor play, social interactions with peers and teachers, and hands-on activities with concrete materials.

When utilising technological tools, teachers should check and ensure that the content is developmentally and age appropriate and meets the intended learning objectives. The use of ICT should also be facilitated and guided by teachers, e.g., typing in relevant key words in searching for information from reliable websites. Refer to the *Teaching and Learning Guidelines on the Use of Information and Communication Technology in Preschool Centres* for more details on how ICT can be used appropriately.



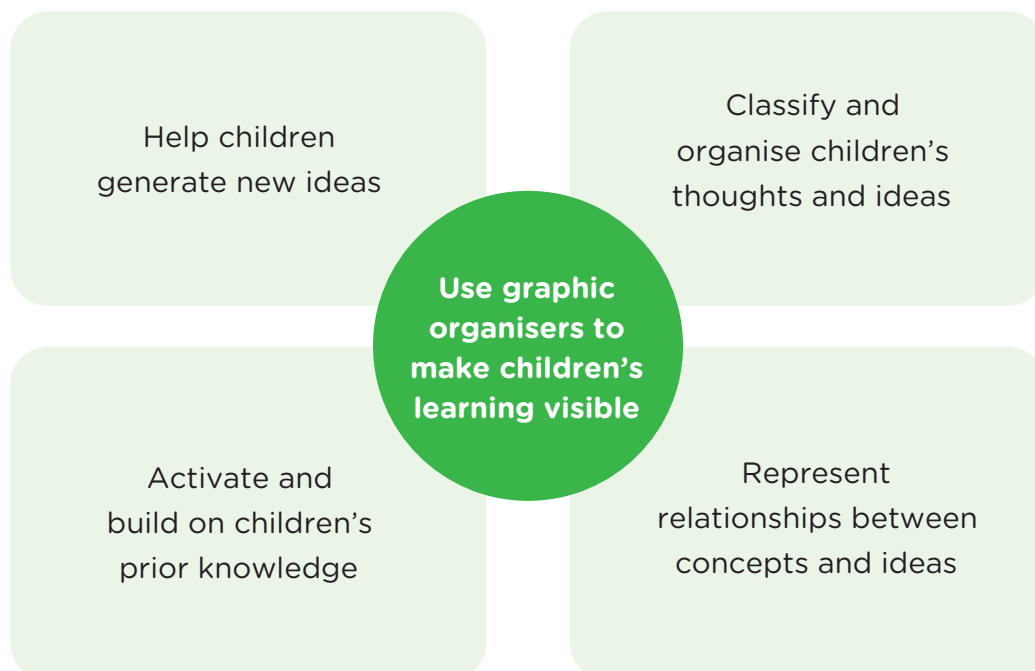
Download the  
ICT Guidelines

## HELPING CHILDREN TO ORGANISE, CONSOLIDATE AND COMMUNICATE THEIR LEARNING

### Using Diagrams and Graphic Organisers

Diagrams and graphic organisers, such as the K-W-L chart, cycle diagram, flow chart, concept map and Venn diagram, are **tools to help children organise their thoughts and ideas in a visual way** to help them better understand concepts, the sequence of events, changes, cause-and-effect, comparisons made, etc. For example, visually representing the life cycle of an animal, plant growth and cooking procedures, allows children to process information visually. In addition, **through labelling these diagrams and using graphic organisers, children are introduced to new vocabulary** (e.g., parts of animals and plants, types of food, names of places and vehicles). **Displaying diagrams and graphic organisers in the classroom and intentionally making reference to them will help children make connections in their learning.** Furthermore, these diagrams and graphic organisers can be **used to elicit further ideas from the children** and to extend and deepen their learning and understanding. Figure 2 shows how the use of graphic organisers helps to make children's learning visible and contributes to children's understanding of concepts and ideas discussed.

**Figure 2: Uses of Graphic Organisers**



## Some examples of graphic organisers include:

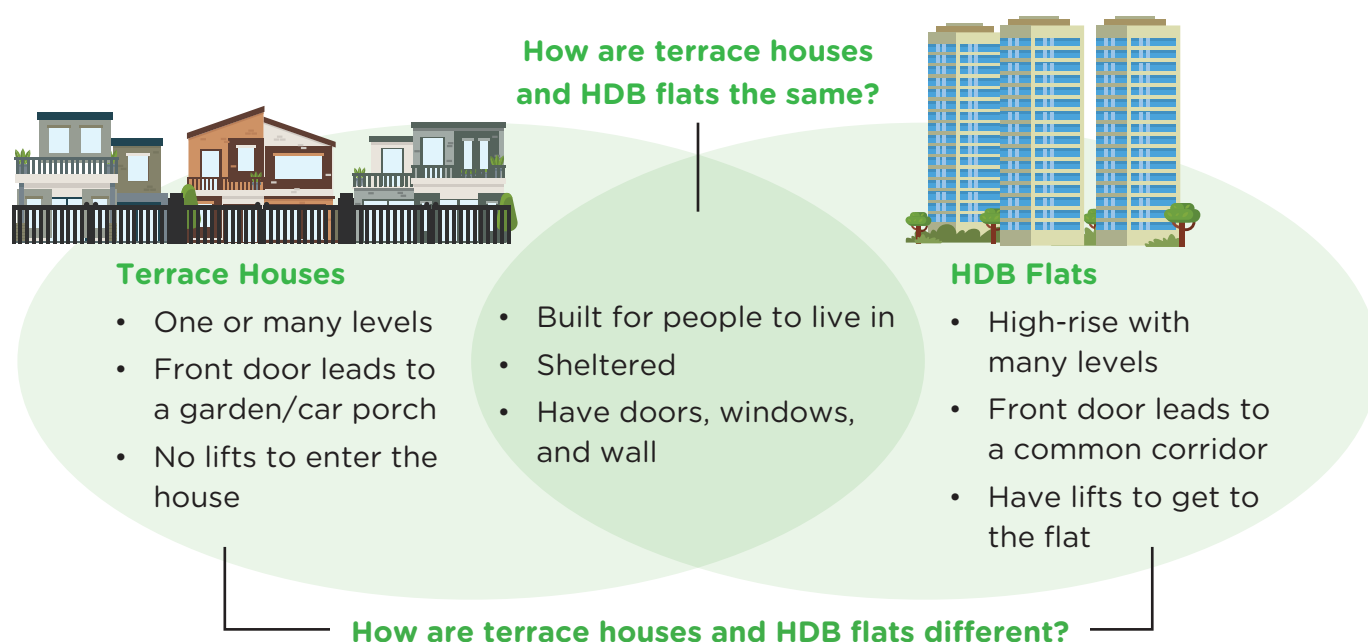
### K-W-L charts to gather prior knowledge and consolidate learning

K-W-L charts are useful in helping children make connections between their prior knowledge and new learning. They can be revisited during the learning process to help children keep track of what they have learnt and include what else they would like to find out. For example:

| What we <u>K</u> now about Singapore                                                                                                                                                                 | What we <u>W</u> ant to Know about Singapore                                                                                                                                                        | What we have <u>L</u> earnt about Singapore                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Singapore is a small country.</li> <li>• There are many people living in Singapore.</li> <li>• Singapore is hot and sunny almost all year round.</li> </ul> | <ul style="list-style-type: none"> <li>• How many people are there living in Singapore?</li> <li>• Who are the people living in Singapore?</li> <li>• Why does it not snow in Singapore?</li> </ul> | <ul style="list-style-type: none"> <li>• Singapore is one of the smallest countries in the world.</li> <li>• There are many people from different countries and cultural backgrounds living in Singapore.</li> <li>• Singapore is an island with a warm tropical climate.</li> </ul> |

### Venn Diagrams to illustrate similarities and differences

After children have talked about the characteristics of objects/places/events they are comparing, Venn diagrams can be used to help them visualise the similarities and differences between what they have compared. For example:





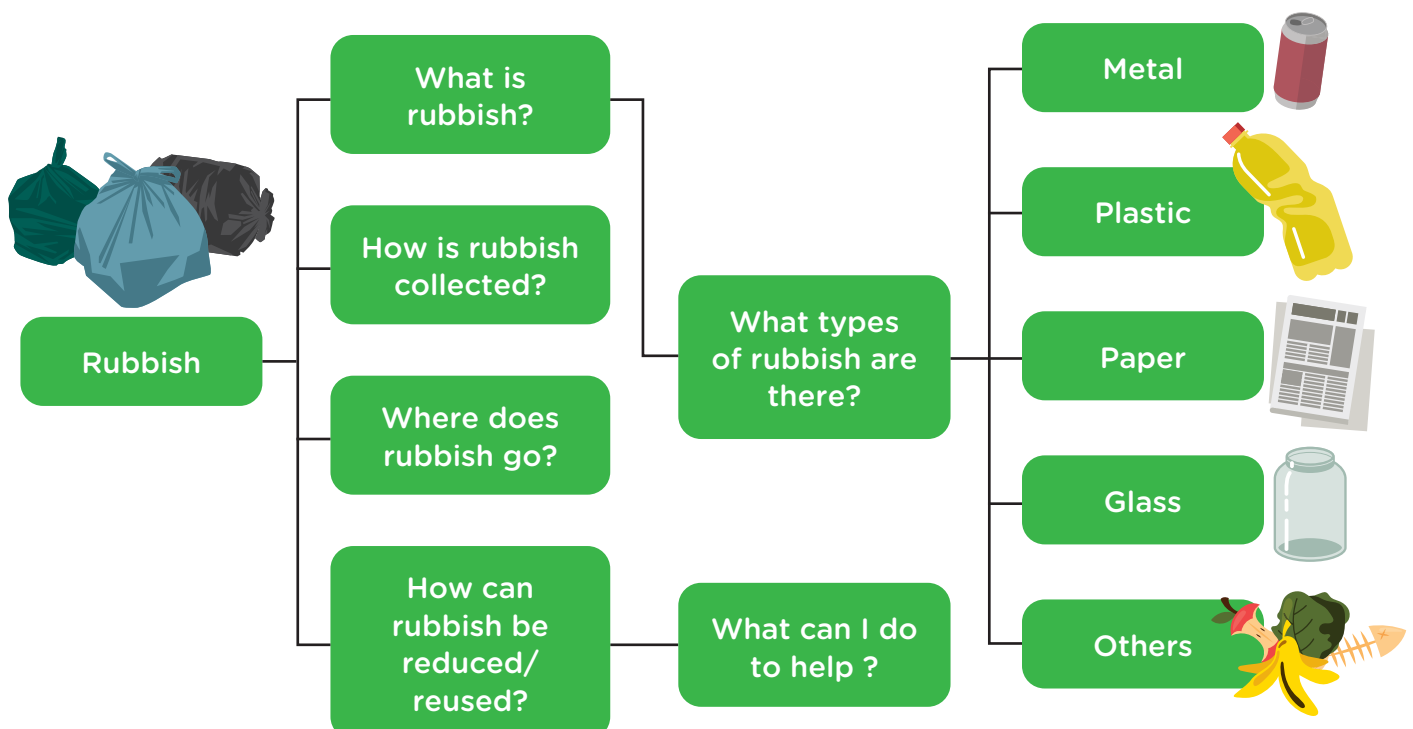
## Flowcharts to sequence events

Flowcharts can be used to help children recap a sequence of events based on their prior experiences or promote thinking and reasoning skills as they put events or processes in a logical order. For example:



## Concept maps to generate and organise ideas showing links amongst ideas

Concept maps can be used to help children organise existing ideas they have and generate new ideas in the process. It also helps them see the relationships between the different ideas they have about a certain topic. For example:





## HELPING CHILDREN TO DEVELOP AND DEMONSTRATE POSITIVE ATTITUDES TOWARDS THE WORLD AROUND THEM

### Developing Care and Respect for People in the Community

Learning experiences can be designed to help children develop an interest and awareness of different people around them. For instance, **through outdoor activities such as neighbourhood walks, children develop a sense of rootedness to the community** as they meet people of different ages, ethnicities and occupations and see how they live and work. In this way, they also **learn to respect and appreciate diversity in beliefs or practices adopted by people in the community and become aware of how their actions might impact and affect the lives of people around them.**

In addition, teachers can **model and teach children how to show respect when common shared spaces (e.g. the void deck of a block of HDB flats) are used** to hold events, such as weddings and funerals. With such awareness, children learn to be considerate towards others and respond appropriately when they come across such events in their neighbourhoods.



Through meeting and interacting with different people in the neighbourhood, children develop a sense of rootedness to the community and learn to respect and appreciate people of different backgrounds.

## Developing Care and Respect for Nature

Children can be nurtured to appreciate and marvel at the wonders of nature and all living things through experiences, such as exploring the outdoors and gardening. Such experiences **help children be aware that animals, like humans, have senses - sight, hearing, taste, touch and smell, and feel pain, cold, hunger, thirst and heat. Plants, on the other hand, not only beautify the environment but also provide shade and have a therapeutic effect on humans.**



Bringing children outdoors gives them opportunities to marvel at the wonders of nature and develop their love for animals and plants around them.



## Developing a Sense of Social Responsibility

**Real world issues** (e.g., vandalism, pollution, global warming, COVID-19 safe management measures) **can be discussed in class so children can develop an awareness of how human behaviours and actions might affect their immediate environment and the people around them.** Teachers can also guide children to recognise that actions, such as water conservation, reducing food wastage, managing carbon footprints are part of efforts towards building a green and liveable Singapore.

### DID YOU KNOW?



When children understand that actions, such as water conservation and reducing/reusing/recycling help to build a sustainable Singapore, they begin to develop a sense of social responsibility and start to reconsider everyday habits to minimise negative effects on others and the environment.



Allowing children to practise the 3Rs - Reduce, Reuse and Recycle - consistently in the preschool centre encourages them to develop good habits and show responsibility and care for the environment.

# Chapter 4

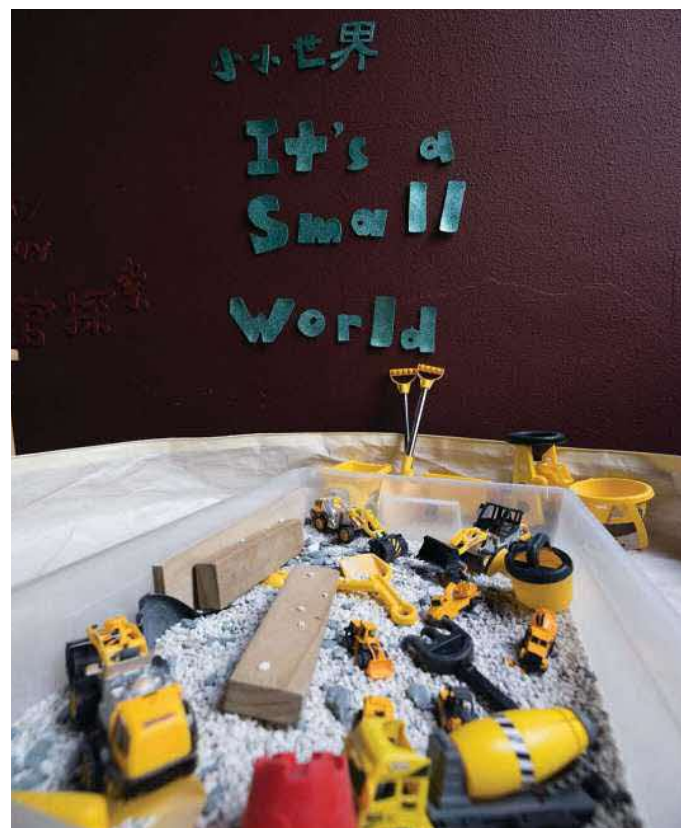
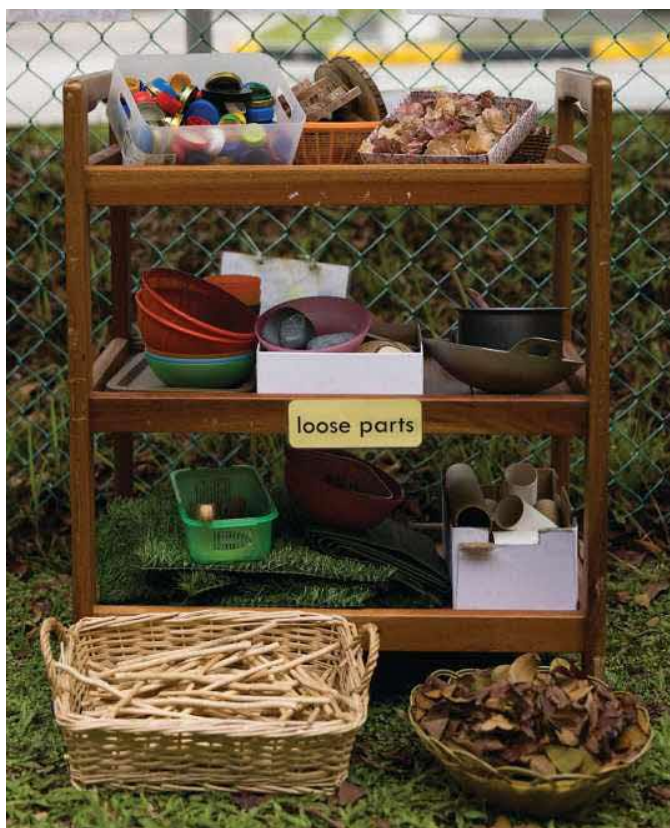
## ORGANISING THE LEARNING ENVIRONMENT



An effective learning environment that promotes inquiry and discovery should be one where children are actively involved in observing, exploring, investigating, finding solutions to problems, drawing conclusions, as well as interacting with and showing care and respect for others at the preschool centre. Such an environment, including **both indoor and outdoor spaces, can be intentionally created, considering the physical, interactional and temporal aspects to make learning more meaningful for children.**



Outdoor spaces such as open spaces on the rooftop can be used meaningfully to promote exploration and discovery.



Providing children with the space, time and a variety of materials including recycled and natural materials and commercially purchased resources, creates countless opportunities for exploration and discovery, as well as creative and critical thinking.



## INDOOR SPACES

The indoor spaces of a preschool centre are often organised into different learning centres to help children work in small groups and concentrate on developing specific process skills while they play and explore. Specific spaces that focus on promoting knowledge, skills and dispositions associated with *Discovery of the World* can be created. For example, at the Discovery Centre, children can be engaged in a variety of activities that allow them to explore, using a range of materials. **They should be given sufficient time to discover new information, find solutions and draw conclusions about a question they have asked or a hypothesis that they have made.** If there are timetable constraints, **it would be useful to have work-in-progress spaces to allow children to continue their exploration and investigation at another time** so that they can pursue their interests further and make meaningful connections between their previous experiences and new discoveries.

### DID YOU KNOW?



Having a work-in-progress space enables children to continue to pursue their interest or work on a problem and try again if they are unsuccessful at first. This provides opportunities to deepen their learning and develop their perseverance. Additionally, when children are able to continue with their exploration, they can try new ways of doing things and this can help them develop inventiveness.



Work-in-progress spaces can be intentionally set up to allow children to continue their exploration and investigation at another time.

The knowledge, skills and dispositions in *Discovery of the World* can also be integrated in other learning centres, such as the Construction or Block Play Centre and Art and Craft Centre if teachers carefully structure these and include appropriate resources for children to:

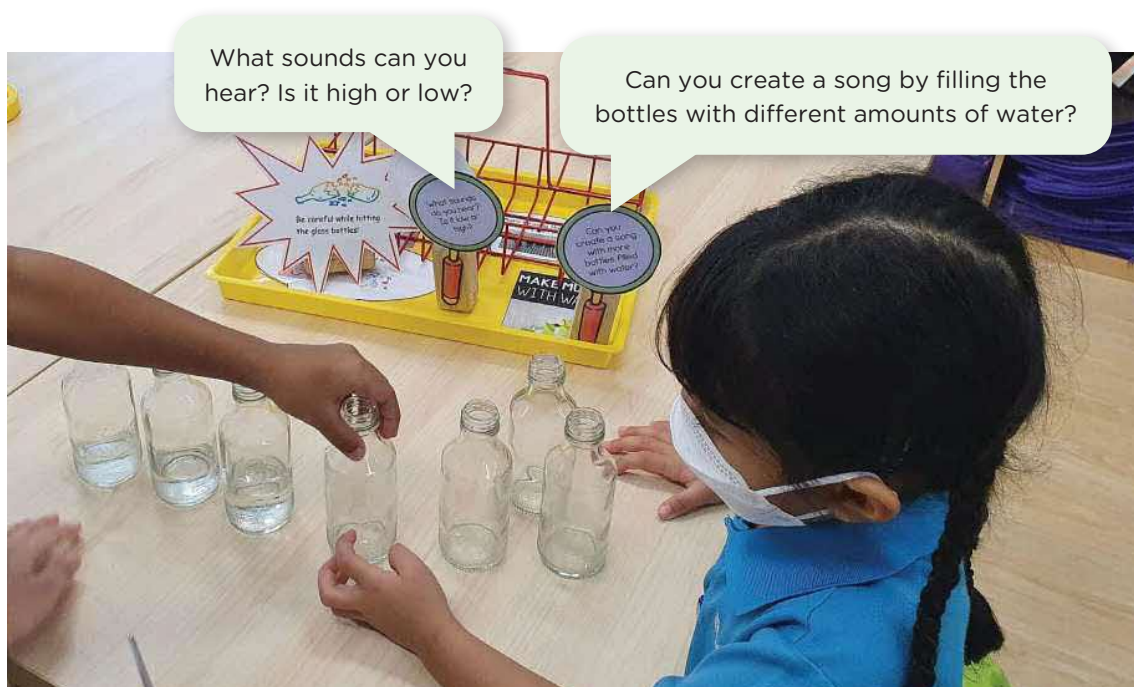
- Sustain and grow their sense of wonder and curiosity, and promote inquiry.
- Engage in meaningful and first-hand experiences.
- Have ready access to tools, materials and books to facilitate information gathering, problem-solving and to carry out investigations.
- Work, play and interact respectfully and cooperatively with their peers and teachers.

## Discovery Centre

The Discovery Centre can be planned to stimulate children's interest and curiosity. It is an area that can be specially set up for children to:

- Learn about things they have seen in the environment.
- Explore new topics of interest.
- Develop and use process skills, such as making observations, problem-solving and decision-making.

Children are free to visit and revisit the Discovery Centre which can feature different topics to cater to different children's interests and needs. **The resources/materials chosen should encourage children to observe, compare, classify, ask questions, experiment and construct new knowledge.**



Prompts can be provided to guide children's inquiry and provide ideas on what they can do with the resources/materials provided.

Depending on children's interest, **the topic and materials featured can be maintained for a sufficiently long period to ensure most children have visited the learning centre but not too long such that they start to get bored with the topic and materials featured.**

Teachers can put up a **“Wonder Wall”** that documents children's questions or wonderment arising from their daily experiences. This allows children to revisit what they have observed, thought or wondered about and attempt to find out the answers to their questions at the Discovery Centre or other learning centres.



The “Wonder Wall” makes visible children's questions or wonderment arising from their daily experiences.



## Resources for the Discovery Centre

**Teachers need to be intentional when selecting resources/materials and organising the learning space.** The resources/materials selected should arouse children's curiosity, promote inquiry and provide opportunities for them to develop or practise their process skills. For example, for the topic on "Simple Machines", the Discovery Centre can have displays of images, books and artefacts that show different types of machines commonly used by people in the past and present (e.g., clocks, telephones, television, computers, washing machines, fans). Children can be provided with resources/materials to work in groups or independently to invent new machines using a variety of scrap or recycled materials.

It is also important for teachers to provide open-ended resources/materials and anticipate potential hazards and take appropriate safety precautions to ensure that the resources made available to children are safe for their use. Prior to inviting children to the Discovery Centre, teachers may need to teach, demonstrate and guide children in using the resources safely and responsibly.



The Discovery Centre can be updated based on the theme or topic of interest but it should include natural materials/live specimens, tools/equipment, visual/audio resources and materials for children to record their observations and findings.



## DID YOU KNOW?



Providing too many resources can be overwhelming and distracting for children. In contrast to the traditional practice of providing as many different resources/materials as possible, it is important to curate what is provided at the Discovery Centre. A smaller but intentional selection of resources/materials encourages children to be more focused and actively engaged to explore and construct knowledge.

**Teachers can consider the following questions to curate what to include at the Discovery Centre and how the learning centre can be organised:**

- *How best can the Discovery Centre be organised? Where can the resources be placed and how can they be arranged to promote exploration and discovery?*
- *Is there a sufficient variety of open-ended resources/materials provided to stimulate children's interest and curiosity and yet not too many such that it is overwhelming or distracting for the children?*
- *How can the resources/materials be used to encourage children to make careful observations using their five senses, gather information, think deeper and problem solve to make sense of the world around them?*
- *What resources/materials can be removed/added to extend children's learning?*



Organising the available resources at the Discovery Centre in trays invites children to explore and try out different investigations on their own with the items provided.



The Discovery Centre does not have to be limited to the indoor space. Outdoor spaces allow for a larger area for children to explore, discover and interact with one another.

The table below provides a list of basic resources and materials which can be placed at the Discovery Centre.

### Natural Materials

- Flowers, seeds, seedpods, leaves
- Feathers
- Herbs and spices
- Plants, fruits, vegetables
- Rocks, stones, pebbles
- Seashells
- Wood pieces, twigs, sticks/branches

Natural materials are easy to find and provide children with many opportunities for endless investigation and open-ended activities. They provide children with a range of sensory experiences with the scents, colours, sounds and textures presented. Having natural materials in the indoor learning spaces also brings nature closer to the children.

### Live Specimens

- Aquarium
- Insects and other small animals
- Terrarium

Live specimens can be placed at the Discovery Centre for children to observe their characteristics and growth patterns. For example, they can observe how mealworms grow and turn into beetles by keeping a record of the changes that occur.

Children can also learn to care for the living things, observe safety rules and be responsible when handling living things brought to their classroom. They must be taught to return all living creatures to their natural habitats after making their observations.

### Tools and Equipment

#### Observation tools:

- Magnifying glasses, viewfinders, binoculars
- Mirrors
- Torch lights

#### Measurement tools:

- Paper clips
- Strings, rope
- Strips of paper
- Multi-link or unifix cubes
- Weighing scale, measuring cup

#### Materials to aid transfer:

- Plastic droppers
- Strainers, sifters, funnels
- Tongs, plastic tweezers

#### Miscellaneous:

- Globe
- Magnets
- Pinwheels, wind chimes
- Prisms
- Pulleys, levers, gears

Children should be actively involved in carrying out investigations to find out how things work and happen. Thus, it is essential that they have simple tools and equipment to facilitate their investigations. There should also be objects that they are curious to find out more about (e.g., small machines, pulleys, magnets).

### Recycled Materials and Loose Parts

- Aluminium drink cans
- Aluminium pie pans
- Bottle caps, bread tags
- Ice cream sticks
- Marbles, buttons, beads
- Old magazines and newspapers
- Paper towel and toilet paper empty rolls
- Plastic bottles, clear containers, glass jars
- Tissue boxes, cardboard boxes, egg cartons

Discarded reusable items or loose parts commonly found around us can be placed at the Discovery Centre. These recycled materials and loose parts are open-ended and allow children to explore many different ways to use, combine and recombine them to construct and create things. As children select materials for reuse in model making, creating new products or making art projects, they develop and use process skills, such as observation, comparison and reasoning, as well as creativity and inventiveness in problem-solving.



**Visual/Audio Resources**

- Brochures, charts, photographs, posters and postcards
- Information or non-fiction books, picture books
- Maps, atlas
- Music recordings (e.g., ethnic songs)
- Sound clips (e.g., bird calls, falling rain, wind)
- Videos (e.g., cultural dances, documentaries for children)

Visual resources help to illustrate and explain concepts and ideas to children. They also draw children's attention and can help them make direct connections with their own environment and practices. For example, photographs showing how people celebrate key events (e.g., National Day) and festivals important to the ethnic groups in Singapore can be displayed to encourage children to talk about their own personal experiences and learn more about their country and the cultures and traditions in Singapore.

**Resources for Recording Purposes**

- Audio/video recorder
- Camera
- Paper, pencils, crayons, colour pencils, markers

At the Discovery Centre, children will be carrying out many investigations and making many observations. Hence, it is useful for them to have easy access to resources/materials that allow them to record their observations and findings.



## Construction/Block Play Centre

The Construction/Block Play Centre provides opportunities for children to represent their world in three-dimensional form. They can construct models of buildings, facilities and parks in their neighbourhood or objects in the environment that fascinate them. Such opportunities help to enhance children's spatial and geographical awareness, as well as creativity and inventiveness as they become more interested in structural designs of buildings, roads, bridges and machines. Children are also problem-solving as they make decisions about the building/construction plans and think of ways to carry out their plans. For example, teachers can ask children to build a structure that will be strong and stable enough to support a toy figure and find out who can build the tallest and most stable structure.

The Construction/Block Play Centre is usually an active area with lots of activities and conversations and should be placed in an area where it will not disturb quiet activities like reading and painting. A big rug in the area is useful to create a kind of boundary for this area and reduce the noise level. Often, it is helpful to set up this learning space in an area that would discourage other children from walking through the space and disturbing the construction work in progress.



Providing a wide range of open-ended materials at the Construction/Block Play Centre encourages exploration, experimentation and different ways to play and problem-solve.

**Where possible, children's completed model or work in progress should be kept or documented and displayed for children to revisit and refine their model, as well as to recall and reflect on the construction process,** such as how they had worked together as a group, what they liked best about the process, and what else they would do to make their model better.

Materials which can be put at the Construction/Block Play Centre to **encourage exploration, experimentation and inventiveness** include **open-ended resources**, such as large and small wooden blocks, foam blocks, interlocking bricks, recycled materials, loose parts, toy people, toy animals and toy vehicles. **Pictures and photographs of different types of structures and relevant questions/prompts** can also be displayed at the Construction/Block Play Centre. These can serve as a **stimulus** and/or **inspiration** for children to work on their own creations. For example, pictures of the neighbourhood around the preschool centre can be displayed for children to identify familiar places, facilities and daily events. Children can refer to these pictures to create a three-dimensional model of their neighbourhood with the open-ended materials provided.

### DID YOU KNOW?



Providing a variety of open-ended resources promotes inventiveness as children explore different ways of using them to solve problems and make new discoveries.

## Art and Craft Centre

The Art and Craft Centre also offers endless opportunities for children to discover and construct new knowledge as they explore different ways of using the art and craft materials available. For example, children can explore and predict what new colours they might get from mixing different colours of paint for use in their artwork. They can also experiment to see which type of paper or scrap material enables them to better create the textures or shapes they wish to create in their artwork.



The Art and Craft Centre offers endless opportunities (e.g, painting on different surfaces, using different materials to paint) for exploration, experimentation and discovery.

## OUTDOOR SPACES

**Learning beyond the classroom offers a rich base of sensorial experiences to promote exploration, quality interactions and purposeful play.** For example, children can engage in activities, such as creating different figures with their shadows or listening out for sounds in their surroundings and guessing what made the sound or where the sound came from. Outdoor spaces within or near the preschool centre should be fully utilised to support and enrich children's daily learning experiences. Examples of such spaces include the corridor, community garden, neighbourhood playground, a field, grass patch, neighbourhood park, void deck, or any other open spaces in the immediate vicinity of the preschool centre.

The outdoor spaces within the preschool centre can be organised into different spaces for exploration and discovery, such as a sensory garden, sound wall, sand and water play areas and spaces for open-ended play.

If there are limited outdoor spaces in the preschool centre, consider the **flexible use of immediate communal and public outdoor spaces where portable/mobile and open-ended materials** and equipment can be easily set up and put away after use.





Portable open-ended materials which provide unlimited opportunities for exploration and discovery can be set up and put away easily after use in the outdoor space.

### DID YOU KNOW?



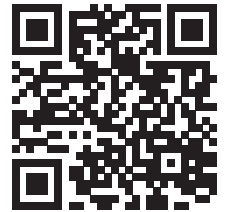
When children are involved in setting up and putting away the play resources/equipment after use, they develop a sense of responsibility towards materials for common use.



To maximise the opportunities for children's exploration and discovery in the preschool centre, teachers can consider how the different outdoor spaces can support their learning:

- a) **In** the outdoors by using it as a physical setting for activities.
- b) **About** the outdoors by getting them to explore and find out more about nature, people and places in the community or neighbourhood.
- c) **Through** the outdoors by taking advantage of the unique characteristics of the outdoors to support children's learning and discovery.

Refer to the *Outdoor Learning: A National Guide for Early Childhood Educators (2019)* for more information on how to design meaningful outdoor learning experiences.



Download the  
[Outdoor Learning  
Guidelines](#)



The unique characteristics of the outdoors offer a rich base of sensorial experiences to stimulate children's curiosity and promote discovery of how things work and why things happen.



As children notice their own shadows and explore making different shadow figures, they discover how shadows are formed and the properties of light.

As outdoor spaces are exposed to environmental factors, greater considerations have to be made to ensure the safety and well-being of children when planning and conducting outdoor learning activities at or near the preschool centre. Some factors to consider include the following:

- Ensure adequate shade from trees nearby or create a sheltered space for water and sand play.
- There should not be slippery surfaces, deep water bodies, rusty surfaces, sharp edges and aggressive wildlife.
- Check that the surfaces of playground equipment are not overheated, broken or faulty.

## Sand and Water Play

**Through sand and water play, children can develop or refine their understanding about various key concepts and ideas.** For example, when they pour sand or water from one container to another and fill up containers of various sizes with sand or water, they are exploring the concept of volume. Similarly, they are developing the concept of density when they observe different objects floating or sinking in water. Furthermore, children's gross and fine motor skills are being developed as they use different tools, containers and equipment (e.g., droppers, scoops, sieves, shovels, pails).

It is advisable to set up the sand and water play area outside the classroom. As outdoor environments are open and less structured, this encourages children to explore and play more freely and spontaneously without worrying about spilling and splashing sand and water onto the classroom floor.

**To help children learn and construct knowledge, teachers should be more selective and purposeful in providing the resources/materials for sand and water play so that children can make use of the purposefully selected materials to discover a particular concept or idea.**

As children play, teachers can observe and where relevant, ask questions and draw attention to significant comments that children make, such as when a child fills a round container and then empties it into a bottle and say, “Hey! They are the same.” Teachers can build on the comment and lead the children to develop concepts and ideas about volume and properties of liquids.



As children engage in sand and water play, they not only discover and construct knowledge but also refine their fine motor skills.



## Gardening

A gardening space in the preschool centre can be reserved for children to enjoy participating in planting and harvesting or simply observing how plants grow over time. If such an outdoor space is not available in the vicinity of the preschool centre, teachers can get children to explore planting in pots or planter boxes. The process of planting can spark many possible investigations. For example, children can vary the conditions for plant growth and observe how one plant is growing compared to another. In the process, children learn more about plants and how to care for them.

### DID YOU KNOW?



Gardening experiences allow children to better understand where their food comes from, especially if they grow edible plants and herbs which they are familiar with. Gardening also presents many opportunities for children to come into close contact with insects and birds. The overall multi-sensory experience helps children develop and show responsibility, care and respect for nature, as well as an appreciation for the hard work of farmers.

The plants and flowers may also attract birds, butterflies, other insects and small animals to the garden. This will allow children opportunities to hunt for items, such as eggs, caterpillars and ants, and to observe them daily to see them grow and change.



Giving children the responsibility to look after the plants in the preschool centre allows them to connect with and show love, care and respect for nature.



# Chapter 5

## MONITORING AND ASSESSING LEARNING AND DEVELOPMENT



Children's everyday experiences in the preschool centre provide the settings in which teachers can observe and find out what and how children are learning and making sense of the world around them. **Stay close to the children when they are exploring or investigating to be able to easily see and hear them.** When children are involved in discovering their world, **take time to observe what they are interested in.** This can be done by paying attention to **what they are looking at, what they are talking about and what they are choosing to do.**



Observing and documenting what children are looking at, what they are talking about and what they are choosing to do help teachers assess and monitor children's progress and development.

## OBSERVING, DOCUMENTING AND ASSESSING CHILDREN'S LEARNING AND DEVELOPMENT

**Records of children's conversations, anecdotal notes, photographs and videos of their actions and samples of their drawings and constructions** can provide information that **help teachers gain a deeper understanding of how and what children perceive about the world around them.** Making sense of the information collected and documented allows teachers to monitor and assess children's progress and make informed revisions to subsequent learning experiences created to build on or further support children's learning and development.



Children's work samples can provide information on their attention to details, what they have gathered from their observations and their ability to represent or communicate their findings.

The drawings, comments and models that children make and questions they ask often provide insights into whether the children can apply what they have learnt or if they have misunderstood previously or newly acquired knowledge and skills.

**To make meaningful interpretations and assessment of children's learning, teachers can consider the following:**

- Collect different forms of evidence that show children demonstrating their understanding, e.g., photographs or videos of children in action, documentation of what they said, children's work samples
- Collect evidence from different contexts, e.g., when children are working individually or in group settings
- Collect the forms of evidence over a period of time to show children's progress in concept or skill development or their patterns of thinking

When observing children's progress in achieving the three learning goals for *Discovery of the World*, have in mind the following questions:

**Learning Goal 1:****Show curiosity and an interest in the world they live in**

- *Do children notice new objects and novel events? How do they express interest in their observations?*
- *Are children eager to explore new experiences, objects, materials and places? How do they respond to new experiences, objects, materials and places?*
- *What questions are children asking? What are they wondering about?*
- *What does a child's work sample or an incident involving a child reveal about the child's interest, curiosity and attitudes towards the world around him/her?*

**Learning Goal 2:****Use essential process skills to make sense of the world around them**

- *What do the children ask or talk about during an investigation?*
- *What resources do the children choose to help them gather information?*
- *What and how much details have they observed?*
- *What similarities and differences have they observed?*
- *How do they make inferences/predictions?*
- *How do the children record what they have learned and discovered?*
- *How do they communicate their discoveries?*
- *What comments do they make about one another's discoveries?*
- *What do children's questions/comments show about their understanding? Are there gaps or misconceptions? Do they show an application of concept or skill that was introduced previously?*
- *How do children challenge each other's thinking process in a respectful way?*



**Learning Goal 3:****Develop a sense of responsibility, care and respect for the world around them**

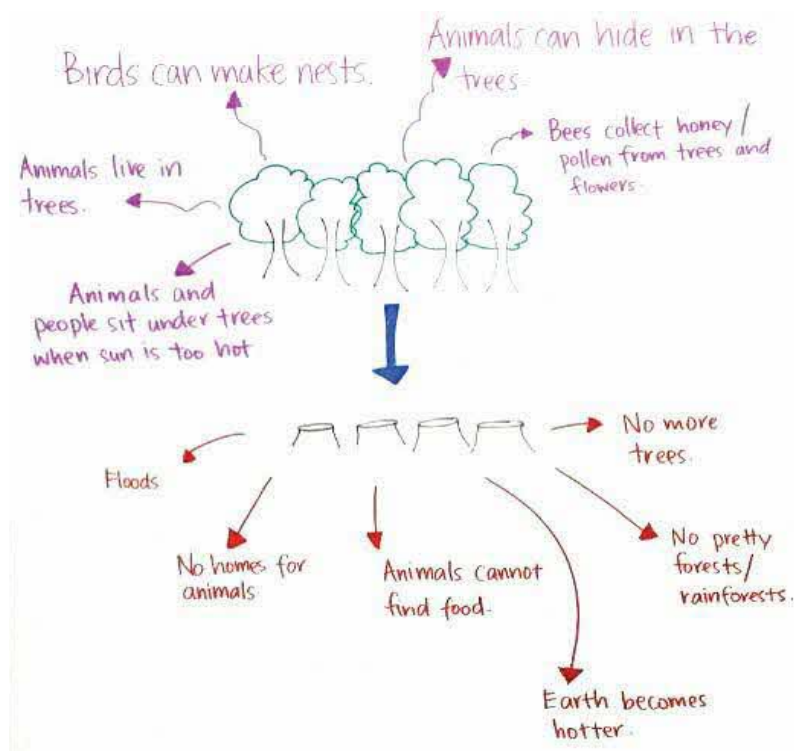
- *Are children able to show responsibility, care and respect for living and non-living things without being reminded?*
- *How do they show responsibility, care and respect for living and non-living things?*
- *How do they encourage others to do the same?*

## EXAMPLES OF OBSERVATION, DOCUMENTATION AND ASSESSMENT OF CHILDREN'S LEARNING AND DEVELOPMENT

### Example 1

#### Context and Observation

As a lead-up to Earth Day, the N2 children were introduced to conservation and environmental issues. After reading a book about trees, the teacher asked the children to brainstorm the uses of trees and what would happen if all the trees were cut down. Through prompts and effective questioning by the teacher, the children gave some suggestions on the consequences of cutting down all trees. After the brainstorming, the teacher organised and represented the children's ideas in a graphic organiser and guided them to develop an awareness of how human actions can affect the world they live in.



To help the children relate the concept of environmental conservation to their daily life, the teacher brought the children outdoors to appreciate nature in a nearby park. During the walk, Akal and Yu Ling noticed and pointed to a bird on one of the trees. Pointing to the bird, Akal said, *“Look! There is a bird on the tree!”* The children stopped to look at the bird. Akal asked, *“Why is it not moving? What is it doing there? Is it alive?”* Yu Ling said, *“The tree is home for the bird.”* The children continued their walk and were happy to see many pretty flowers along the way. Yu Ling saw a butterfly flying towards a flower and said, *“A butterfly! What is it doing on the flower?”* The teacher explained that it was feeding on the flower nectar. When Akal saw one of the children touching the flowers, he said, *“We cannot pluck the flowers.”* The teacher asked, *“Why did you say this?”* Akal replied, *“The flowers and leaves are home for the butterflies.”* Yu Ling added, *“Because the butterflies will have no more food to eat.”* Upon returning to the classroom, the teacher had the children think about how they could help to protect the plants and animals around them.

### Documentation, Interpretation and Assessment

The teacher could document his/her observations to reflect Akal’s and Yu Ling’s progress in the learning goals for *Discovery of the World* in a table like the one shown below. The teacher should make use of this interpretation and assessment to plan subsequent activities to reinforce and extend Akal’s and Yu Ling’s learning.

| <b>Learning Goal/Other Indicators of Learning and Development</b>                                                                                                                                                                                                                                           | <b>Documentation</b><br><i>(What aspects of my observation of the child should I pay more attention on?)</i>                                                                                                                                                                                                                                                  | <b>Interpretation and Assessment</b><br><i>(What do the observations tell me about the child?)</i>                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Learning Goal 1: Show curiosity and an interest in the world they live in</p> <p>Learning Goal 3: Develop a sense of responsibility, care and respect for the world around them</p> <p>Values: care, respect, responsibility</p> <p>Learning Dispositions: sense of wonder and curiosity, engagement</p> | <ul style="list-style-type: none"> <li>Akal and Yu Ling pointed out and asked questions about animals and plants they saw during the walk in the park. Akal said, <i>“Look! There is a bird on the tree!”</i> and asked, <i>“Why is it not moving? What is it doing there? Is it alive?”</i> Yu Ling said, <i>“The tree is home for the bird.”</i></li> </ul> | <ul style="list-style-type: none"> <li>Akal and Yu Ling showed a sense of wonder and curiosity and were enthusiastic in asking questions about their observations during the walk.</li> <li>They demonstrated an awareness of the role of plants, the needs of animals and the importance of showing responsibility, care and respect for plants and animals.</li> </ul> |

- After seeing one of the children touching the flowers, Akal said, *"We cannot pluck the flowers. The flowers and leaves are home for the butterflies."* while Yu Ling added, *"Because the butterflies will have no more food to eat."*

- Based on what she heard from the teacher about butterflies feeding on the flower nectar, Yu Ling showed an awareness of how their actions could have an impact on the world they live in as she recognised how plucking flowers from plants would affect the butterflies.

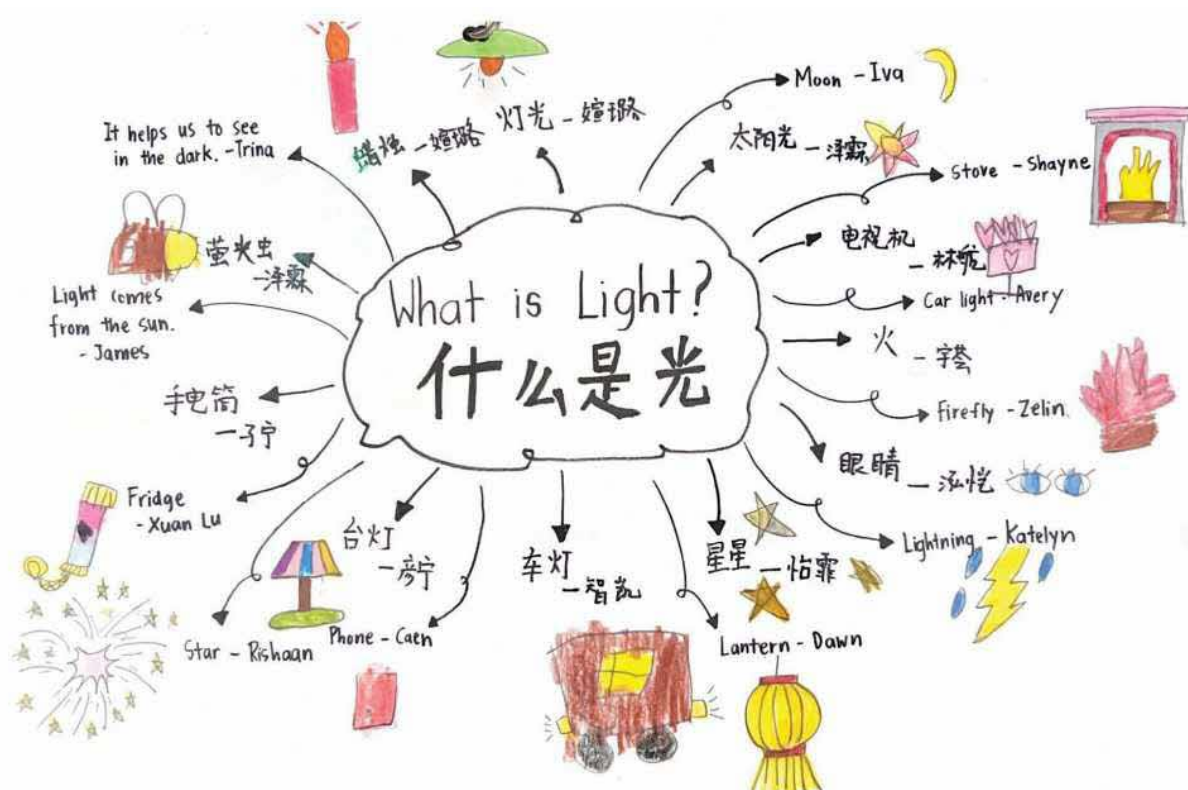
### Possible Follow-up Activities to Reinforce/Extend Learning

- Have the children represent their observations and learning from the walk at the park through drawings.
- Invite the children to talk about what they like during the walk at the park and suggest what can they do to show responsibility, care and respect for the plants and animals around them.
- To build on Akal's and Yu Ling's curiosity and interest, invite them to create posters to encourage their friends and others in the preschool centre to show responsibility, care and respect for the environment.
- To help the children better appreciate nature and understand how else they can play a role in conserving trees, show a video on the uses of trees/plants and how paper is made. This will help the children become aware that paper comes from trees and why they should not waste paper and should reduce, reuse and recycle paper.
- To help the children practise what they have learnt on a daily basis, set up a recycling corner and encourage them to make use of the recycled materials for their artwork and other creations.

## Example 2

### Context and Observation

The K1 children were learning about light and shadows. In the classroom, they were asked to share about the different sources of light they could find at home. As they brainstormed the different sources of light, they began to understand the importance of light and how it is used daily.



The teacher read a book about how people used to make use of the sun's light and shadow to tell time. Ethan exclaimed, "Wow! Does that mean the sun can be used as a clock?" The teacher decided to illustrate the idea by conducting a sundial experiment. Each child then made a simple sundial and went out at different times of the day to observe and record how the shadow changed over time. Ethan expressed excitement and interest each time they went out. Before Ethan and his friends went out for the third time that day, Ethan commented, "I think this time the shadow is going to be longer than just now." The teacher asked, "Why do you say this?" Ethan replied, "I don't know, I just have a feeling."





## Documentation, Interpretation and Assessment

The teacher could document his/her observations to reflect Ethan's progress in the learning goals for *Discovery of the World* in a table like the one shown below. Besides the anecdotal records shown below, samples of Ethan's work (e.g., records of his observations of shadows) could also inform the teacher's interpretation and assessment of Ethan's learning. The teacher should make use of this interpretation and assessment to plan subsequent activities to reinforce and extend Ethan's learning.

| <b>Learning Goal/Other Indicators of Learning and Development</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Documentation</b><br><i>(What aspects of my observation of the child should I pay more attention on?)</i>                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Interpretation and Assessment</b><br><i>(What do the observations tell me about the child?)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Learning Goal 1: Show curiosity and an interest in the world they live in</p> <p>Learning Goal 2: Use essential process skills to make sense of the world around them</p> <p>Social and Emotional Competency 2: Develop self-management and regulation</p> <p>Social and Emotional Competency 4: Build relationships with family, friends and significant adults</p> <p>Executive Functioning Skills: inhibitory control</p> <p>Learning Dispositions: sense of wonder and curiosity, engagement</p> | <ul style="list-style-type: none"> <li>Ethan exclaimed, "Wow! Does that mean the sun can be used as a clock?" when he heard that people used to tell time by looking at the sun's light and shadows.</li> <li>While Ethan was excited and would be the first to line up each time the class went out to observe their sundial experiment, he would wait for his turn to observe and record how the shadow of his sundial changed over time.</li> <li>Ethan observed and recorded the shadow changes over time.</li> </ul> | <ul style="list-style-type: none"> <li>Ethan showed a sense of wonder and curiosity and was eager to find out how the sun's light and shadows can be used to tell time.</li> <li>He asked questions which not only showed his interest and curiosity but also his ability to connect his new learning (i.e., the sun's light and shadows can be used to tell time) to his prior knowledge (i.e., the clock is used to tell time).</li> <li>Ethan was able to make careful observations and recordings of the shadow changes.</li> </ul> |

- Before Ethan went out to observe the shadow for the third time that day, he said, *“I think this time the shadow is going to be longer than just now.”* When asked how he knew, he replied, *“I don’t know, I just have a feeling!”*

- Ethan did not make use of the earlier recordings or prior knowledge to make an informed guess of whether the shadow will be shorter or longer, which suggests that he needs help to develop the skill of predicting.
- Ethan demonstrated self-control which is an important part of executive functioning as he managed to regulate his excitement in the sundial experiment by waiting in line for his turn to observe the shadow. This will enable him to work and play cooperatively with his friends which will help him to build positive relationships with others.

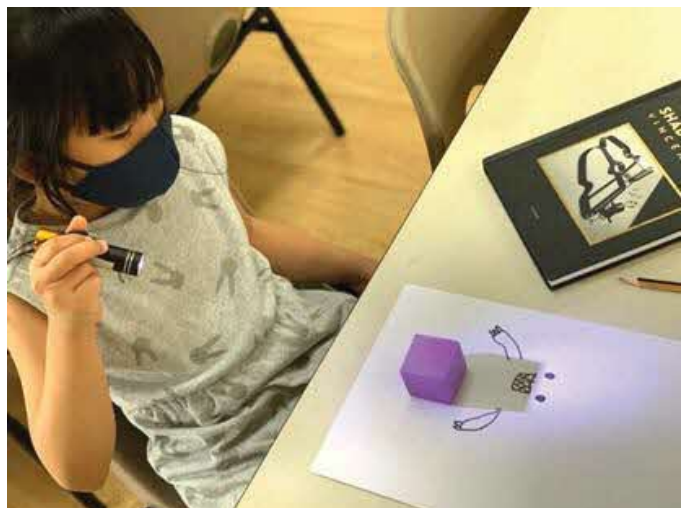
### Possible Follow-up Activities to Reinforce/Extend Learning

- To help Ethan develop his skill of predicting, the teacher could provide prompts, such as *“Remember what you saw earlier, the shadows became shorter each time we came out. Why do you think that was the case? What changed? How do you think the size of the shadow will change this time?”* This will prompt Ethan to make use of his earlier observations to predict how the shadow might change.
- To sustain Ethan’s interest and develop his process skills further, encourage him to explore more and to carry out experiments to investigate how the position of the light source would affect the size of the shadows. After he has done so, encourage him to predict how the shadow size would change if the light source were to be placed at another position. Invite him to explain his prediction before doing another experiment to check if the result would be the same as what he predicted. If the results of the experiment do not align with his initial

predictions, have him carry out the experiment several more times with the light source at different positions to help him discover the pattern of how the size of the shadow changes with the position of the light source.



- Invite Ethan to share his observations and encourage him and the rest of the children to ask questions about the changes in the size of the shadows. Help them to make connections between what they have observed outdoors and indoors on shadow changes.
- Guide Ethan and the rest of the children to come up with their own conclusions about how shadows are formed.
- Have Ethan and the rest of the children represent their discoveries in different ways (e.g., drawing/writing down what they discovered or making a video documenting what they discovered). The teacher can help to scribe the observations/findings, if necessary.
- Use further questions that Ethan and other children might have to guide them to find answers to these questions. They may refer to sources, such as information books, online platforms, asking their parents and experts, and conducting experiments.
- As another possible extension, introduce the book, “Shadowology” by Vincent Bal who creatively illustrated pictures using shadows of objects that are used in our daily lives. This can be a stimulus to encourage the children to use their imagination and creativity in creating pictures using shadows of different objects of their choice and in the process, reinforcing and extending what they have learnt about light and shadows.



## Example 3

### Context and Observation

The K2 children spotted several bridges during their walk along the Singapore River and started to ask questions about the structures and uses of bridges. Observing that the children were interested in finding out more about bridges, the teacher printed out photographs of some iconic and different types of bridges found in Singapore, including bridges found on roads, in the parks and across rivers/lakes.



The teacher asked the children to compare the bridges and identify similarities and differences between them. As the children looked at the photographs, Fiona raised her hand and waited for her turn to share her thoughts. When it was her turn, she said, “*These bridges are very*

*high.*” When prompted on why she thought the bridges were high, she said while pointing to a photograph, “*It looks hard to cross over to the other side below. So the bridges go high to help people cross easily up there.*”



After the class identified more similarities and differences between the bridges, the teacher prompted them to think of how they could classify the bridges according to their characteristics.

Some children suggested classifying according to where the bridges can be found (e.g., on the road, in the park) or according to how the bridges are shaped. The children worked in small groups to sort the photographs they have into various categories. In her group, Fiona said excitedly, “*Let’s try another way of putting them into two groups, bridges for cars and bridges for people.*” She started to put the pictures of the bridges into these two groups even as her friends were still sharing other ways of putting the bridges into groups.



## Documentation, Interpretation and Assessment

The teacher could document his/her observations to reflect Fiona's progress in the learning goals for *Discovery of the World* in a table like the one shown below. The teacher should make use of this interpretation and assessment to plan subsequent activities to reinforce and extend Fiona's learning.

| <b>Learning Goal/Other Indicators of Learning and Development</b>                                                                                                                                                                                                                                                                                                                                                               | <b>Documentation</b><br><i>(What aspects of my observation of the child should I pay more attention on?)</i>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Interpretation and Assessment</b><br><i>(What do the observations tell me about the child?)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Learning Goal 2: Use essential process skills to make sense of the world around them</p> <p>Social and Emotional Competency 2: Develop self-management and regulation</p> <p>Social and Emotional Competency 4: Build relationships with family, friends and significant adults</p> <p>Executive Functioning skills: inhibitory control, cognitive flexibility</p> <p>Learning Dispositions: appreciation, inventiveness</p> | <ul style="list-style-type: none"> <li>• In the large group setting, when the class was comparing the different bridges and identifying similarities and differences, Fiona raised her hand and waited for her turn to share her thoughts.</li> <li>• Fiona shared that the bridges were very high. When prompted on why she thought the bridges were high, she pointed at a photograph and said, <i>"It looks hard to cross over to the other side below. So the bridges go high to help people cross easily up there."</i></li> </ul> | <ul style="list-style-type: none"> <li>• Fiona was able to follow class routines as she waited for her turn before sharing her thoughts about the features of bridges, demonstrating self-regulation and appropriate classroom and social behaviour in a group discussion.</li> <li>• When comparing some bridges, Fiona was observant and noticed a similarity across them.</li> <li>• Fiona was also able to infer with reason why the bridges were built high based on what she observed in the photographs and her own understanding of bridges.</li> </ul> |

- During group work time, once Fiona had her own idea of how to put the bridges into groups, she started to put the bridges into two groups, without listening to and considering suggestions from her group members.
- She showed inventiveness and flexible thinking when she suggested a different way of classifying the bridges (i.e., according to function).
- In the small group setting, Fiona was not so open to listen to the views of others which suggests that she needs support in learning to recognise that she can learn from ideas contributed by others to develop the learning disposition, appreciation.

### Possible Follow-up Activities to Reinforce/Extend Learning

- To build on the children's interest in bridges, invite Fiona and the rest of the children to design and build three-dimensional (3-D) models of bridges to serve different functions/groups of people (e.g., elderly, disabled). Provide different sources of information (e.g., information books or relevant websites on bridges or the needs of different groups of people) so that the children can draw on these and their earlier observations of bridges to come up with ideas. This will provide further opportunities for Fiona and the class to practise process skills, such as observing and gathering information from different sources.
- Encourage the children to draw and plan on paper how they would like to design and build their bridges and decide what materials to use before translating their plans into 3-D models of the bridges. This process will not only strengthen their observation skills to identify key features and details they would like to include in their bridges but also help them practise and improve their executive functioning skills as they first plan what to do and then complete the task by following their plan, making adjustments, if needed, along the way.

- To help Fiona learn to respect and appreciate the different views of others, provide more opportunities for her to work in small groups to complete a common activity/task. For example, provide a variety of open-ended materials and have the groups discuss and consider what kind of bridge they would like to build, which materials to use and how they could go about building their bridge. During the brainstorming process, model and encourage Fiona to listen to different views of her group members and make use of ideas from everyone in the group to build a bridge together.
- Create opportunities for Fiona to further develop process skills, such as encouraging her to represent and communicate information gathered in different ways. For example, invite Fiona to share what she has found from the various sources of information and learnt from her experience of building a bridge model. Encourage her to communicate her findings in different ways (e.g., using a 3-D model, drawing).

# Bibliography





- Abruscato, J. A., & DeRosa, D. A. (2009). *Teaching children science: A discovery approach* (7th ed.). Pearson.
- Artinian, T. (2018). Engaging teachers and toddlers in Science. *Young Children*, 73(4), 62-69.
- Bautista, A., Moreno-Nunez, A., Ng, S. C., & Bull, R. (2018). Pre-school educators' interaction with children about sustainable development: Planned and incidental conversations. *International Journal of Early Childhood*, 50, 15-32.
- Blake, S. (2009). Engage, investigate, and report: Enhancing the curriculum with scientific inquiry. *Young Children*, 64(6), 49-53.
- Elliot, E., Eycke, K. T., Chan, S., & Müller, U. (2014). Taking kindergartners outdoors: Documenting their explorations and assessing the impact on their ecological awareness. *Children, Youth and Environments*, 24(2), 102-122.
- Harlan, J. D., & Rivkin, M. S. (2008). *Science experiences for the early childhood years* (9th ed.). Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.
- Lind, K. L. (2000). *Exploring science in early childhood education: A developmental approach*. (3rd ed.). Delmar Thomson Learning.
- Martin, D. J., Jean-Sigur, R., & Schmidt, E. (2005). Process-oriented inquiry – A constructivist approach to early childhood science education: Teaching teachers to do science. *Journal of Elementary Science Education*, 17(2), 13-26.
- Ministry of Education, Singapore. (2017). *Teaching and learning guidelines on the use of information and communication technology in pre-school centres*. Singapore: Ministry of Education.
- Ministry of Foreign Affairs, Singapore. (2018). *Towards a sustainable and resilient Singapore*. Singapore's Voluntary National Review Report to the 2018 UN High-Level Political Forum on Sustainable Development.
- National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College. *Technology and interactive media as tools in early childhood programs serving children from birth through age 8*.
- Storey, S. O. (2004). Teacher questioning to improve early childhood reasoning (Doctoral Dissertation, The University of Arizona).
- Outdoor Learning Committee. (2019). *Outdoor learning: A national guide for early childhood educators*.

Rahman, N. A., Yusop, N. A., & Yassin, S. (2018). Science process skills in pre-schoolers through project approach. *International Journal for Studies on Children, Women, Elderly and Disabled*, 5, 104-113.

Ritz, W. C. (Ed.). (2007). *A head start on science: Encouraging a sense of wonder*. National Science Teachers Association.

Samuelsson, I. P., & Park, E. (2017). How to educate children for sustainable learning and for a sustainable world. *International Journal of Early Childhood*, 49, 273-285.

Saracho, O. N. (2012). *An integrated play-based curriculum for young children*. New York: Routledge.

Seefeldt, C., Galper, A., & Jones, I. (2012). *Active experiences for active children: Science (3rd ed.)*. Upper Saddle River, NJ: Pearson.

Inventors of Tomorrow: Hands-On Science and Engineering Education for Kids Age 3-6. (2017). *Teaching the science process skills*.

National Association for Research in Science Teaching. (2018). *The science process skills*.

Wang, G., Zhou, X., & Cui, H. (2019). Exploring education for sustainable development in a Chinese kindergarten: An action research. *East China Normal University Review of Education*, 2(4), 497-514.

Worth, K. (2010). Science in early childhood classrooms: Content and process. *Early Childhood Research and Practice*, 12(2).



Ministry of Education  
SINGAPORE

Pre-school Education Branch

ISBN 978-981-18-7423-9



9 789811 874239