

Teacher's Guide



SCIENCE

Primary
Education
Smart+
Prathomsuksa



Based on the Basic Education Curriculum B.E. 2551
(Revised Edition B.E. 2560)

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Preface

The learning standards of science based on the Basic Education Curriculum B.E. 2551 (revised Edition B.E. 2560) are divided into four main strands. They are:

Strand 1: Biology Science

Strand 2: Physical Science

Strand 3: Earth and Space Science

Strand 4: Technology

All the elements in this course including the contents, the teaching and learning activities, and the measurement and evaluation of the learning outcomes are very important to be coherent in order to lay a good strong foundation in the students in every level from Grade 1 to Grade 12.

Students not only need to know and understand the basic knowledge of science, but also to apply it in their daily lives and hopefully when they further their studies in the disciplines of science. The contents of each strand are relevant and suitable for each level, neither too easy nor too difficult. There are also links between the knowledge, the learning process and learning activities that encourage students to develop thinking skills which include analytical, creative and critical thinking skills. Besides that, students are encouraged to develop science process skills and also the 21st century skills. These skills allow students to be long-life learners and succeed in this information age. For example, by knowing how to carry out researches and construct their own knowledge with the use of inquiry strategies, students can solve their problems systematically. They can make great decisions based on the various kinds of information and empirical evidences gathered.

Goals

The new teaching and learning of science focuses on students themselves, allowing them to discover the knowledge mostly by themselves. With their fundamental knowledge and the results from their scientific investigations, students can construct their own principles, conceptual ideas and understandings systematically.

The teaching and learning of science has the following important goals:

1. To understand principles, theories and rules that are fundamental in science.
2. To understand the nature of science and the limitations of science.
3. To have important skills for study, research and technological development.
4. To realize the relationship between science, technology, humanity and the environment in which they affect and influence each other.
5. To apply knowledge and understanding in science and technology in order to benefit the society and life.
6. To develop the process of thinking and imagination, and the ability to manage and solve problems with excellent communication and decision-making skills.
7. To be a scientist who upholds values, moral and ethics issues when applying scientific knowledge and technology wisely.

General learning outcomes in each strand

This revised curriculum aims to provide the knowledge of science to students and focuses on the relation between the knowledge and the learning process. Students will develop important skills to carry out researches, construct the knowledge using the inquiry approach and solve a variety of problems. By having students participate in every stage of learning and doing various practical activities that suit each level, they will acquire the following general learning outcomes in each strand:

✧ **Biology Science**

Learning about life and living things, elements of living things, life processes, structures and functions of living things (how they live?), heredity, diversity of living things in the environment, the environment and the evolution of organisms.

✧ **Physical Science**

Learning about the nature of substances, changes in substances, motion, energy and waves.

✧ **Earth and Space Science**

Learning about the components of the universe, interactions within the Solar System, space technology, Earth system, geological changes and the processes of changes of the climate and their effects on organisms and the environment.

❖ Technology

- **Design and Technology**

Learning about the technology for living in the fast-changing society. Using knowledge and skills in science and mathematics creatively to solve problems and improve our life by applying the engineering processes. Choosing an appropriate technology with consideration for the impact on life, society and the environment.

- **Computer Science**

Learning about computational thinking, analytical thinking, systematic problem solving and the application of computer science, information technology and communication to solve the real life problems effectively.

Strands and Learning Standard

Strand 1: Biology Science

Standard 1.1: Understand the diversity of the ecosystem, the relationships between non-living things and living things, the relationships between organisms in the ecosystem, the energy transfer, the changes in the ecology, the meaning of population, the problems and impacts on the natural resources and environment, the guidelines for natural resource conservation and the environmental solutions including the applications of knowledge to benefit.

Standard 1.2: Understand the properties of organisms, the basic unit of life, the movement through cells, the relationships between structures and functions of different organ systems in animals and humans that work together, and the relationship between structures and functions of organ systems in plants that work together including the applications of knowledge to benefit.

Standard 1.3: Understand the processes and the importance of inheritance, the genetic materials, the genetic changes affecting organisms, biodiversity and the evolution of organisms including the applications of knowledge to benefit.

Strand 2: Physical Science

Standard 2.1: Understand the properties of matter, the component of matter, the relationships between the properties, structures and the energy bonds between particles, the principles and the nature of changes in the states of matter, the solution forming and the chemical reactions.

Standard 2.2: Understand the nature of forces in everyday life, the effects of forces on objects and the various kinds of movements of objects including the applications of the knowledge to benefit.

Standard 2.3: Understand the meaning of energy, the transition and transfer of energy, the interaction between matter and energy, energy in everyday life, the nature of waves, and the phenomena related to sound, light and electromagnetic waves including the applications of knowledge to benefit.

Strand 3: Earth and Space Science

Standard 3.1: Understand the components, the characteristics, the processes of forming and the evolution of the universe, the galaxy, the stars and the Solar System including the interactions within the objects in the Solar system that affects the organisms and the applications of knowledge to benefit.

Standard 3.2: Understand the components and relationships of the Earth's systems, the changes on the Earth's surface and inside the Earth, geohazards and the changes on the climate including the impacts on the organisms and environment.

Strand 4: Technology

Standard 4.1: Understand the key concepts of technology for living in a rapidly changing society, the applications of knowledge and skills in science and mathematics creatively to solve problems and improve our life with the engineering design processes and the selection of appropriate technology with consideration for the impact on life, society and the environment.

Standard 4.2: Understand and apply computational thinking in solving real life problems systematically, and use information technology and communication to learn, work, and solve problems effectively, knowingly and ethically.

Learners' Quality of Grade 3 students

- Understand the general characteristics of living things and life of living things around us.
- Understand the appearances, types and some properties of materials used in making objects and the change of material around us.
- Understand the pull and push of magnetic force and the effect of force on the change of movement of objects, electrical energy and electricity generation, sound generation and visualization.
- Understand the phenomena of the Sun, the Moon, the stars, sunrise and sunset, daytime and nighttime and direction, characteristics and the importance of air, formation of wind, advantages and disadvantages of wind, characteristics of stones, soil classification and utilization.
- Ask questions or impose problems on the subject to learn as assigned or from their own interest. Observe, survey, investigate by using simple tools. Collect data, record and explain survey results. Investigate by writing or drawing and communicate what you learn through storytelling or mime or gestures to help others understand.
- Solve simple problems using troubleshooting steps. Have basic skills in using information technology and communication, keep personal information secure.
- Show enthusiasm and interest in learning. Be creative about the subject as given or from their own interest. Participate in showing opinions and accepting others' opinions.

- Show responsibility by completing assigned tasks determinedly, considerably, economically, honestly until the tasks are accomplished and work with others happily.
- Realize the benefits of using knowledge and scientific processes to everyday life and learn more, carry out a project or piece of work as assigned or from their own interest.

Yearly Teaching Plan

Science Prathomsuksa 1 (Grade 1)

7 chapters

80 hours

Learning areas	Time (hours)
1. Plants <ul style="list-style-type: none">• Common plants around us• Different plants in different places• Parts of a plant	13
2. Animals <ul style="list-style-type: none">• Common animals around us• Where do animals live?• Parts of an animal	12
3. Ourselves <ul style="list-style-type: none">• Parts of our body• Uses of our body parts• Five senses• Taking care of our body parts	15
4. Materials <ul style="list-style-type: none">• Materials around us• Grouping of materials• Combination of materials to make objects	15
5. Sound <ul style="list-style-type: none">• What is sound?• How does sound travel?	8
6. Day Sky and Night Sky <ul style="list-style-type: none">• Night sky• Day sky	7
7. Rocks <ul style="list-style-type: none">• Characteristics of rocks	10

Note: The hours needed for each subtopic can be changed when necessary. The above allocated hours are just a suggestion. Total hours for this subject is as prescribed in the basic learning time structure, while the learners must attain the standard as prescribed in the learning standards and indicators.

Chapter 1 Plants

Time: 13 hours

Strand 1: Biology Science

Standard Sc.1.1

Indicator

Sc.1.1 Gr.1/1. Identify the names of plants and animals that live in different other places from collected information.

Sc.1.1 Gr.1/2. Describe the appropriate environment and habitats that suit to the plants and the animals where they live.

Standard Sc.1.2

Indicator

Sc.1.2 Gr.1/1. Identify, describe and tell the functions of each part of the human body, animals and plants. Also, describe how each part in human body works together in order to do activities from collected data.

Introduction:

Children are aware that plants are living things. We can observe the plants grow everywhere. A habitat is the place where a living thing lives. Different plants live in different habitats. Young children might curious on some plants can bear beautiful flowers, fruits and leaves.

In this chapter, you will help students become aware of some common plants in the local areas. You will also help them to identify the names of plants that live in different places such as in the field, in the garden and in the swamps. Students will identify and describe the functions of each part of a plant.

Students should beware that if there is any change in the environment of plants, it will affect their livings.

Learning objectives:

Students will be able to:

- Observe and identify the common plants in the community.
- Identify the plants that live in different places.
- Identify, describe and tell the functions of each part of plants.

Competency:

Capacity for applying life skills

Concept:

- The parts of the plants are roots, stems or trunks, leaves, flowers and fruits.
Not all plants have the same parts.
- Each part of the plant has its functions.
- Different areas may have different kinds of plants because ecosystem of each area will be suited for different types of plants.
- If there are any changes in the environment of plants, it will affect the plants.

Start up:

1. To assess prior knowledge about plants and their parts, ask students what they knew and what they want to know about plants.
2. Let students write all their prior knowledge in Part K column on page 1 and also write some questions which they want to know in Part W column on page 1.

Teaching/Learning activities:

1st – 3rd hours (Common plants around us)

1. Have students work on Let's Try activity on page 2 in the Textbook. Some questions:
 - (a) What are some of the common plants in your area?
 - (b) Where do most of these plants grow? Do they live on land or in water?
2. Students can explore some common plants on pages 3 and 4.
3. Let students to do the questions on pages 7 and 8 of the Workbook as their homework.

4th – 6th hours (Different plants in different places)

1. Let students to carry out Let's Try activity on page 5 in the Textbook.
 - (a) Have students observe plants in different areas. Then, teacher points that we can find different plants in different areas.
 - Some plants live in the water, such as the pond and lake. (Examples: water lily plants and watercress plants)
 - Some plants live on land, such as in the garden and in the field. (Examples: chili plants and watermelon plants)
 - Some plants live on other plants. (Examples: orchid plants and staghorn fern plants)
 - (b) Ask students some questions about the plants in each area.
 - Do all plants live in the same area?
 - Can you give an example of plant which can live in water?
 - Do plants need habitats that are suitable for the plants to grow and live healthily?
 - What would happen to the plants if their habitats are changed?

2. Define what a habitat is. Introduce some plants that live on land, on other plants, in water, swamps, or deserts. Ask few volunteers to give some more examples of these plants. Refer to pages 6 to 8.
3. Have students to do the questions on page 9 of the Workbook as their homework.

7th – 12th hours (Parts of a plant)

1. Have students work on Let's Try activity to identify the parts of a plant on page 9 in the Textbook.
 - (a) Let students observe the chosen plant, then draw the plant in the space given in the Textbook.
 - (b) Ensure that students include leaves, a stem, a flower and roots in their drawing and label each part correctly.
 - (c) Ask students some questions about the plants.
 - What are the general parts of a plant?
 - Do all plants in the garden produce flowers?
 - What does each part of a plant do?

Students answer the questions based on their experiences.

2. Discuss the parts of the plant with your students. Refer to page 10.
3. Let students carry out Let's Try activity to study the leaves of different plants on page 11.
 - (a) Show a few examples of plants that have different shapes and sizes of leaves.
 - (b) What is the function of leaves?
4. Explain to students that leaves come in many sizes and shapes and they are often used to help identify plants. Refer to page 12.
5. Introduce other parts of plants including flowers, fruits and seeds, roots and stems. Explain the function of each part of a plant. Refer to pages 13 to 15.

6. Have students to do the questions on pages 10 to 13 of the Workbook as their homework.

13th hour (Conclusion)

1. Revise the lesson by answering the questions in Part L column on page 16.
2. Encourage them to watch a video by scanning the QR code on page 16.
3. Enhance students to think about questions that they want to know more about the plants in Part W column on page 17. Teacher may
 - (a) give them some examples of questions if students do not have any ideas.
 - (b) ask the whole class or each group to give some questions if their writing skills are not good enough.
4. Review the lesson by referring to the Mind Map on page 17.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

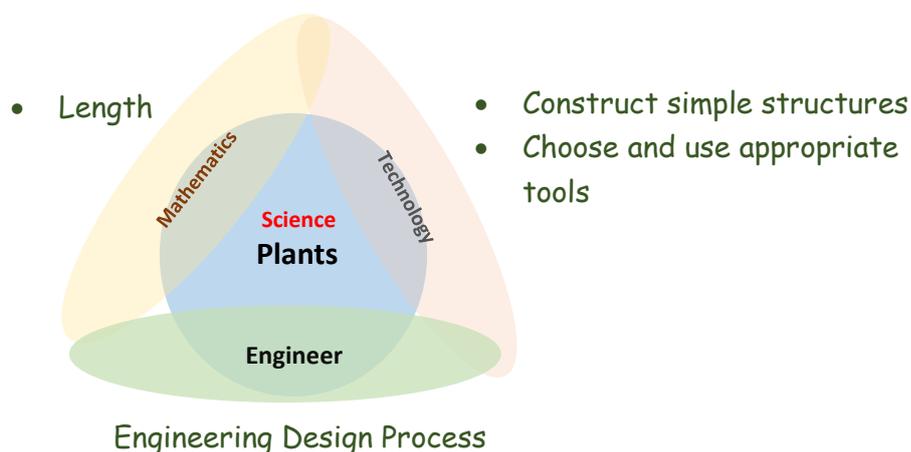
1. Assessing cognitive behavior; test on page 16 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will extend students' concept of plant parts. The lesson will connect science, technology, engineering design process, mathematics and arts as well. The lesson will engage students to design and create a rainbow garden by using materials teacher provided.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.

Lesson development:

1. Let students read a situation on page 18. Then, the whole class discusses and identifies a problem by answering the following questions.
 - (a) What is a problem of this situation?

- (b) What are our missions?
 - (c) What do you need to know to get started?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions.
- (a) What is the meaning of ‘free standing’ and ‘rainbow color’?
 - (b) What are our possible solutions for the free-standing rainbow garden?
 - (c) Can we bend the pipe cleaner in order to be free-standing? How does it look like?
 - (d) How tall are they? (15-40 cm)
 - (e) What materials do we need?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
- (a) What are success criteria? (free-standing rainbow garden, plants with their parts, rainbow color etc.)
4. Let students brainstorm and draw their designs. Then, let them follow their plans and create.
5. After they finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:
- (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
7. Each group presents their product and explains their journey of creating.

Conclusion:

1. End the lesson by asking students if everyone came up with the same design, and why not? They should answer that they all have different ideas, and this speaks to the importance and role of diversity in engineering and problem-solving.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 2 Animals

Time: 12 hours

Strand 1: Biology Science

Standard Sc.1.1

Indicator

Sc.1.1 Gr.1/1. Identify the names of plants and animals that live in different other places from collected information.

Sc.1.1 Gr.1/2. Describe the appropriate environment and habitats that suit to the plants and the animals where they live.

Standard Sc.1.2

Indicator

Sc.1.2 Gr.1/1. Identify, describe and tell the functions of each part of the human body, animals and plants. Also, describe how each part in the human body works together in order to do activities from collected data.

Introduction:

When we look in our environment, we discover different types of animals. They live in appropriate habitats such as on land and in water. Their habitats include the farms, seas, forests and deserts.

Animals have different body parts. Each of the body parts of the animal has its own function. Animals move in multiple ways. They walk, run, jump, swim or fly, performing movements that help them to survive in their habitats.

In this chapter, you will help students to identify the different animals that can be found in the local areas. You will help them to identify the names of the animals. They will explore the appropriate environment and habitats that suit to the animals where they live. You will also help students to observe the parts of animals and search for information to explain their functions. Your students will also explore how animals move.

Learning objectives:

Students will be able to:

- Observe and identify the common animals in the local areas.
- Observe the external parts of animals and search for information to explain their functions.
- Name animals' habitat correctly.
- Identify the movements of animals.

Competency:

- Thinking skills

Concept:

- Different areas may have different kinds of animals because the environment of each area will be suited for different types of animals.
- If there are any changes in the environment of animals, it will affect the animals.
- Animals have different body parts. Each part has its own functions. For example, the parts of a cow are eyes, ears, nose, mouth, legs, tail and fur.
- Some animals have special parts such the horns, wings, beak, fins and gills.

- Animals move in different ways. They move by running, flying, swimming, jumping or crawling.

Start up:

1. To assess prior knowledge about animals and their parts, ask students what they knew and what they want to know about animals.
2. Let students write all their prior knowledge in Part K column on page 20 and have students share what they know about animals and also write some questions which they want to know in Part W column on page 20.

Teaching/Learning activities:

1st – 2nd hours (Common animals around us)

1. Have students work on Let's Try activity on page 21 in the Textbook.
 - (a) Ask students some questions:
 - Have you ever seen these animals in the real life? If yes, write down their names.
 - What animals did you gather or choose?
 - Where does it live, on land or in water?
 - (b) Teacher may let students share their pictures to the class and tell their experience about the animals. Let a few students to describe their pet.
2. Let students to know more about animals. Refer to page 22.
3. Have students to do the questions on pages 20 and 21 of the Workbook as their homework.

3rd – 5th hours (Where do animals live?)

1. Ask students to carry out Let's Try activity on pages 23 and 24. Ask students some questions:
 - (a) Based on this activity, which place do you find the animals the most?
 - (b) What will happen to animals if their habitats are destroyed?
2. Let students to explore different animals that live in different places such as on the farm, in the sea, in the forests or in the deserts. Refer to pages 24 to 26.
3. Have students to do the questions on page 22 of the Workbook as their homework.

6th – 8th hours (Parts of animals)

1. Have students work on Let's Try activity on page 27 in the Textbook. Students will observe the different body parts of the animals. Some questions:
 - (a) Do all animals have the same body parts?
 - (b) What body parts are not common to all animals? Name two.
 - (c) What is the function of gills for animals?
2. Explain more about the body parts of animals and their functions. Refer to pages 28 to 29.
3. Have students work on Let's Try activity to group animals based on their body parts on pages 30 and 31 in the Textbook. Teacher may let students name the animals. Choose one of the animals and identify all body parts of the animal.
4. Have students to do the questions on pages 23 to 27 of this subtopic in the Workbook as their homework.

9th – 11th hours (Movements of animals)

1. Present a video clip or a slideshow presentation with animation of the movements of animals. Let students observe their movement and identify the body parts used for movement.
2. Teacher may also present flash cards with words containing different movements of animals and let students read the words correctly.
Examples: walk, run, swim, jump, fly, crawl, slither
3. Discuss the movements of animals with students. Refer to pages 32 to 33.
4. Adopt a whole-class questioning strategy to help students understand the movements of animals. Sample questions:
 - (a) Can you give some examples of animals that move by swimming?
 - (b) Can you give two examples of animals that crawl?
 - (c) How do animals with wings move?
 - (d) What are the body parts that animals use for movement?
5. Have students to do the questions on pages 27 and 28 of this subtopic in the Workbook as their homework.

12th hour (Conclusion)

1. Revise the lesson by asking students to do questions in Part L column on page 34.
2. Encourage them to watch a video by scanning the QR code on page 34.
3. Whole class discusses about what they want to know more about animals in Part W column on page 35. Teacher may guide them if they do not have any ideas such as:
 - (a) What do animals eat?
 - (b) Can we categorize animals by using other criteria?
 - (c) How do fish breathe? What name of that organ?
4. Review the lesson by referring to the Mind Map on page 35.

Learning materials:

- Pictures of animals
- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

1. Assessing cognitive behavior; test on page 34 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

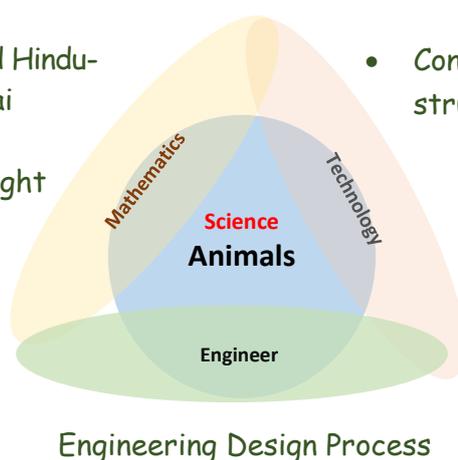
STEM Activity

Overview

This lesson will extend students' concept of animal parts. Students will apply their knowledge of science and mathematics in order to design and create their own animals. The imaginative animals may be not real on our planet. The important point is they can use their creative thinking integrated with their learning concepts for design and doing something real.

Subject integration

- Write and read Hindu-Arabic and Thai numerals
- Length and weight
- Construct simple structures



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Whole class discusses about animals, let them think by using some questions such as:
 - (a) What is your favorite animal? Why?
 - (b) Do you think we can use animal as symbol of something such as sport? Give some other examples.

Lesson development:

1. Students read a situation on page 36. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What is a problem of this situation?
 - (b) What are our missions?
 - (c) What do you need to know to get started?
 - (d) Do you have enough knowledge of animals? If not where can we look for?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions:
 - (a) What characteristics of animal does your team prefer? (wing, foot, tail, scale, horn, etc.)
 - (b) What are our possible solutions for the structure that can stand on its own? (play dough structures, hard paper structures, pipe cleaner structures, etc.) How does it look like?
 - (c) What is the size of the structure/ how big is it?
 - (d) What materials do we need?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (stand on its own at least 5 minutes, interesting figures, represent both of characteristics of living things and non-living things, etc.)
4. Students brainstorm and draw their designs. Then, let them follow their plans and create. (Teacher may ask each group to present some brief ideas before they start so that teacher can give some suggestions for their possible solution or prevent trial and error.)
5. Let students create and follow their plans. After they finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:

- (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
 7. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion:

1. End the lesson by asking students if everyone came up with the same design, and why not? They should answer that they all have different ideas but same target, and this speaks to the importance and role of diversity in engineering and problem-solving.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 3 Ourselves

Time: 15 hours

Strand 1: Biology Science

Standard Sc.1.2

Indicator

Sc.1.2 Gr.1/1. Identify, describe and tell the functions of each part of the human body, animals and plants. Also, describe how each part in the human body works together in order to do activities from collected data.

Sc.1.2 Gr.1/2. Recognize the importance of parts of the body of yourself by taking care them appropriately, safely and health care.

Introduction:

The human body has many different parts, each with special functions. Children can most readily learn to identify external body parts. The body parts include hair, head, nose, eyes, ear, mouth, neck, hand, finger, arm, leg, foot and toe. For example, we use our mouth to talk, to eat and to breathe.

We learn by using our senses. The five senses include sight, hearing, touch, smell and taste. It is important to know our body in order to take care of it and live a healthy life.

In this chapter, you will guide students to get more familiar with our body parts and their functions.

Learning objectives:

Students will be able to:

- Identify and name the body parts.

- Discuss the uses of our body parts and how they work together to do particular things.
- Identify the five senses including sight, smell, hearing, taste and touch.
- Discuss and present how to take care of our body parts in order for us to live safely and stay healthy.

Competency:

Thinking skills

Concept:

- Our body parts perform different functions but work together to do particular things. Our organs should be well taken care of and protected from harm.

Start up:

- To assess prior knowledge about parts of our human body and their functions by asking what students knew and what they want to know.
- Write all their prior knowledge in Part K column on page 38 and have students share what they know about parts of our human body. Then, ask students write some questions which they want to know in Part W column on page 38.

Teaching/Learning activities:

1st – 3rd hours (Parts of our body)

1. Whole class discusses about our body parts. Then, ask students to do Let's Try activity on page 39. Students should conclude that humans have different body parts. Refer to page 40.

2. Teacher may ask them to recognize their body parts in the mirror, compare with their friends, and then ask some questions:
 - (a) Does everyone have the same body parts?
 - (b) What are the parts of the head?
3. Have students to do the questions on pages 36 and 37 of the Workbook as their homework.

4th – 7th hours (Uses of our body parts)

1. Discuss about the uses of our body parts including eyes, ears, nose, mouth, hands and arms, legs and brain. Refer to pages 41 to 45.
2. Teacher may ask students some other related questions.
 - (a) What is the use of the mouth?
 - (b) Which body parts do you use when you are watching televisions?
 - (c) Which parts of the body help you listen to music?
 - (d) What part of the body do we use to feel?
 - (e) Do we use more than one body part to carry out activities?
3. Then, ask students to do Let's Try activity on page 46. Students should conclude that the parts of our body perform different functions but work together to do particular things.
4. Give more examples to show how our body parts work together to carry out activities. Refer to page 47.
5. Have students to do the questions on pages 38 and 39 of the Workbook as their homework.

8th – 11th hours (Five senses)

1. Explain each of the five senses in detail and give students a chance to explore their knowledge using their five senses. Refer to pages 48 to 50.
2. Ask students to observe something in classroom such as desk, school uniforms, etc. Then, ask them to answer the following questions.
 - (a) Did you see a book (some other object in the classroom)?
 - (b) Is your shirt soft or hard?
 - (c) Is your desk rough or smooth?
 - (d) What color is your shirt / skirt?
 - (e) Did you smell something?
 - (f) What did you hear?
 - (g) Is lime juice sour?
 - (h) What does mango taste?
3. Teacher gives students more additional information of five senses that usually work together to give us a clear picture of the things around us. Scientists use the five senses to observe many things.
4. Have students to do the questions on pages 40 to 42 of the Workbook as their homework.

12th – 14th hours (Taking care of our body parts)

1. Have students carry out Let's Try activity on how to brush our teeth properly on page 51.
 - (a) Ask them to demonstrate brushing teeth or washing hands with soap or drawing picture of taking care of our body parts.
 - (b) Then, discuss and let students present how to take care of our body parts in order for us to live safely and stay healthy.

2. Discuss some ways to take good care of our body parts. Refer to pages 52 to 54.
3. Ask some related questions.
 - (a) How do you care for your eyes?
 - (b) Can we put things into our ears?
4. Have students to do the questions on pages 43 to 44 of the Workbook as their homework.

15th hour (Conclusion)

1. Revise the lesson by asking students to do questions in Part L column on page 55.
2. Encourage them to watch a video by scanning the QR code on page 55.
3. Whole class discusses what they want to know more about ourselves in Part W column on page 56. Teacher may guide if they do not have any ideas such as:
 - (a) What are our internal organs?
 - (b) Why can we feel when we touch something?
 - (c) What does the stomach look like?
4. Review the lesson by referring to the Mind Map on page 56.
5. Have students to do the questions on page 45 of the Workbook as their homework.

Learning materials:

- Old magazine picture of person
- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

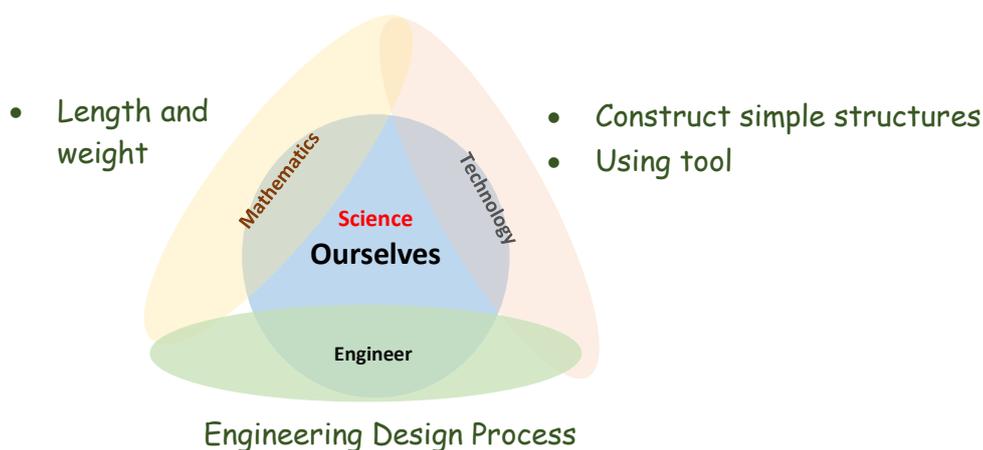
1. Assessing cognitive behavior; test on page 58 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will extend students' concept of how to take care of our organs in order for us to live safely and stay healthy. They will realize that why helmet is important when biking. The lesson will engage students to design and create a 'helmet' that would protect an egg during fall. Assume that the egg shell is your skull and the egg white and yolk are your brain.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Review their knowledge content of our body parts by using the following questions:
 - (a) What are our body parts? Name them.
 - (b) How do our external organs work when we do particular things? Do they work alone or work together?
 - (c) Why do we have to take care of our body parts? How do we do?

- (d) What parts of the body work together when we bike? Why should we be careful when we bike?

Lesson development:

1. Students read a situation on page 57. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What is a problem of this situation?
 - (b) What are our missions?
 - (c) What do you need to know to get started?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions:
 - (a) What is the function of the helmet? What are the characteristics of the helmet?
 - (b) What materials do we need?
 - (c) What are the characteristics of the egg shell? Does it break easily?
 - (d) What are the characteristics of protection material?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (egg shell does not break, etc.)
4. Students brainstorm and draw their designs. Then, let them follow their plans and create. (Teacher may ask each group to present some brief ideas before they start so that teacher can give some suggestions for their possible solutions or prevent trial and error.)
5. After they finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:
 - (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)

7. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion:

1. End the lesson by asking students if everyone came up with the same design, and why not? They should answer that they all have different ideas but same target, and this speaks to the importance and role of diversity in engineering and problem-solving.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 4 Materials

Time: 15 hours

Strand 2: Physical Science

Standard Sc.2.1

Indicator

Sc.2.1 Gr.1/1. Explain the observed characteristics or properties of materials that are utilized for making toys or articles of everyday use. Articles can be made of one material or many materials based on empirical evidence.

Sc.2.1 Gr.1/2. Identify kinds of materials and classify the materials based on the observed properties.

Introduction:

We see so many objects around us such as pencil, book, table, desk and toys. The objects are made of different materials. Different kinds of materials such as glass, plastic, rubber, wood and metals can be used to make common objects. Some objects are made from combination of different materials.

Materials have different properties that are suitable for different purposes and uses. We can group materials based on their hardness, strength, elasticity, flexibility, ability to float and transparency.

In this chapter, you will guide students to know what materials are used to make objects and their properties. They will also learn how to group the materials based on their properties.

Learning objectives:

Students will be able to:

- Identify kinds of materials and objects they are used to make.
- Describe the properties of materials that are used to make objects of everyday use.
- Classify the materials based on the observed properties.
- Describe objects can be made of one material or many materials based on empirical evidence.

Competency:

Thinking capacity, communication capacity

Concept:

- The objects around us are made from different materials.
- Wood, rubber, plastic, glass and metal are some of the materials we can find around us.
- Objects can be made of one or more type of materials.
- We can group materials based on their properties, including their hardness, strength, elasticity, flexibility, ability to float and transparency.

Start up:

1. To assess prior knowledge about materials by asking what students knew and what they want to know about materials.
2. Write all their prior knowledge in Part K column on page 59 and have students share what they know about materials. Then, ask students to write some questions which they want to know in Part W column on page 59.

Teaching/Learning activities:

1st – 4th hours (Materials around us)

1. Let students to carry out Let's Try activity on page 60.
 - (a) Ask them to give three more examples of objects in their daily life. Identify what materials used to make these objects and their properties.
 - (b) Some questions:
 - Are these objects made of the same material?
 - Why are fabrics used to make the handkerchief?
 - What are some of the examples of objects that are made of wood?
 - Can you name some objects that are made of plastic?
2. Let students read more details about materials on pages 60 to 62. Then, teacher explains more information about materials and their properties.
3. Have students do the questions on page 53 of the Workbook as their homework.

5th – 10th hours (Grouping of materials)

1. Have students carry out Let's Try activity on pages 63 and 64. Students observe the objects given and identify materials that are used to make these objects. Group the materials based on their hardness.
 - (a) Based on this activity, which objects are considered hard?
 - (b) Compare the hardness of metal spoon and plastic spoon. Which material is harder?
2. Teacher explains more details about the hardness of materials. Refer to pages 64 and 65.
3. Let students to carry out Let's Try activity to group the materials based on their strength on pages 65 and 66.
4. Explain to students about the strength of materials. Refer to page 67.

5. Have students carry out Let's Try activity to group the materials based on their elasticity on pages 67 and 68.
6. Define the term "elasticity" and also discuss the elasticity of rubber band. Refer to pages 68 and 69.
7. Ask students to carry out Let's Try activity to group the materials based on their flexibility on pages 69 and 70. Students conclude that a material is flexible if it can be bent without breaking.
8. Have students carry out Let's Try activity to group the materials based on their ability to float on pages 71 and 72. Some materials can float on water while some materials sink in water.
9. Let students to conduct Let's Try activity to group the materials based on their transparency on pages 73 and 74.
10. Have students do the questions on pages 54 to 58 of the Workbook as their homework.

11th – 14th hours (Combination of materials to make objects)

1. Discuss with students about some objects are made from combination of different materials. Refer to pages 75 and 76.
2. Let students to do the questions on page 59 in the Workbook.

15th hour (Conclusion)

1. Revise the lesson by answering the questions in Part L column on page 77.
2. Encourage students to watch a video by scanning the QR code on page 77.
3. Ask students what they want to know more about materials in Part W column on page 78.
4. Teacher may let them study the Mind Map on page 78.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

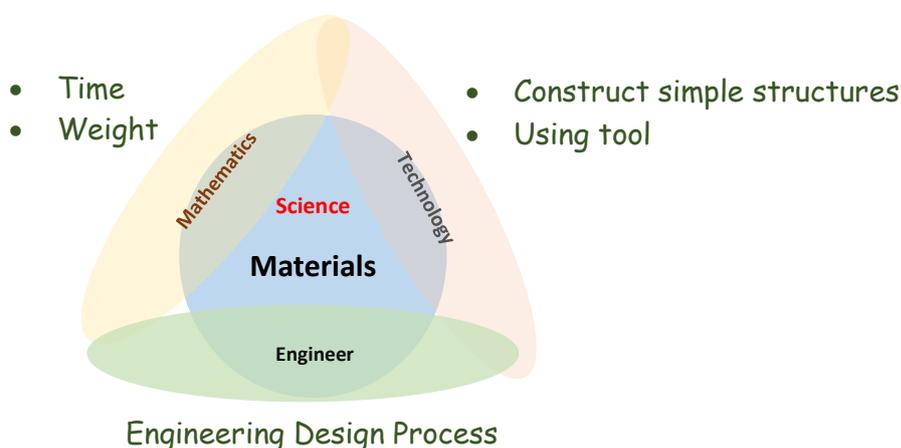
1. Assessing cognitive behavior; test on page 77 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will extend students' concept of materials. Students investigate the characteristics of each type of material, then choose suitable materials for making their own toys. Their mission is to create a parachute that can hold an object of 100 g as long as possible.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Review their content knowledge of materials and characteristics of materials by using the following questions:
 - (a) What are the properties of materials?
 - (b) When we want to make some objects, what do we have to consider?
(type and properties of materials)

Lesson development:

1. Students read a situation on page 79. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What is a problem of this situation?
 - (b) What are our missions?
 - (c) What do you need to know to get started?
 - (d) If we want to make some devices that can stay in the air as long as possible, what are the characteristics of materials we can think of?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions:
 - (a) What are the purposes of parachute in this activity?
 - (b) What materials are suitable for making the parachute? Why?
 - (c) What characteristic of materials that can stay in the air? Can you give some examples of those materials?
 - (d) Does the size of a parachute affect its time of staying in the air?
3. Ask students to think about how to assess their product. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (can carry an object of 100 g, stay as long as possible in the air, etc.)
4. Students brainstorm and draw their designs. Then, let them follow their plans and create. (Teacher may ask each group to present some brief ideas before they start so that teacher can give some suggestions for their possible solutions or prevent trial and error.)
5. After they finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:
 - (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)

7. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion:

1. End the lesson by asking students:
 - (a) If everyone came up with the same design, and why not? They should answer that they all have different ideas but same target, and this speaks to the importance and role of diversity in engineering and problem-solving.
 - (b) If we have limited budget for this project, which model of your classmate team will be considered as a good project?
 - (c) If you are the owner of a toy parachute factory, which design is good? Why?

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 5 Sound

Time: 8 hours

Strand 2: Physical Science

Standard Sc.2.3

Indicator

Sc.2.3 Gr.1/1. Describe the origin, direction and movement of a sound regarding to empirical evidence.

Introduction:

Children are used to play with sound. They always prefer to make sound and noise. They always make sound when they play and learn. In this chapter, you will let students to explore about sound. Students will do some activities that explain what make sound and how sound travels. Students will recognize that sounds move in all directions. At the end of the chapter, students will create their musical instrument.

Learning objectives:

Students will be able to:

- Describe the origin of a sound.
- Name the natural and artificial sources of sound.
- Describe the direction and movement of a sound based on empirical evidence.

Competency:

Capacity for applying life skills, thinking skills

Concept:

- Sound comes from vibrating objects and can be heard by our ears.
- The sources of sound can be natural or artificial.
- Sound travels in all directions away from the source.

Start up:

1. To assess prior knowledge about sound, ask students what they knew and what they want to know about sound.
2. Let students write all their prior knowledge in Part K column on page 81 and also write some questions which they want to know in Part W column on page 81.

Teaching/Learning activities:

1st – 3rd hours (What is sound?)

1. Let students to carry out Let's Try activity on pages 82 and 83.
 - (a) Ask them some questions after using the plastic ruler.
 - What do you observe when you only hold the plastic ruler? Is there any sound from the ruler?
 - What happened when you push the ruler downward and release?
 - Can you hear any sound when the ruler move?
 - (b) Let students strike a tuning fork. Ask students some questions:
 - What do you observe when you only hold the tuning fork? Is there any sound from the tuning fork?
 - What can you observe when you strike the tuning fork?
 - (c) Ask students to strike the tuning fork again and dip in water immediately. Use questions to lead to conclusion.
 - What can you observe when you dip the tuning fork in water?

- What is your conclusion?
 - What is your evidence for your conclusion?
2. Explain to students that sound comes from vibrating objects and can be heard by our ears. Refer to page 83.
 3. Teacher can let them do more activities in order to have more understanding of what make sound.
 - (a) Teacher may ask students to touch their vocal cord while they speak or let them observe a guitar string while it is plucked.
 - (b) Teacher may use video clip of insects which can make sounds.
 - (c) Then, engage them to explore sounds in their school environment.
 4. Let students to carry out Let's Try activity on page 84. Ask students some questions about the sources of sound in each area.
 - (a) When your friend plays guitar in classroom, can we hear the sound both in the classroom and outside classroom?
 - (b) What happened to us if we hear loud noise?
 5. Give more information about the natural and artificial sources of sound. Refer to page 85.
 6. Have students do the questions on pages 61 and 62 of the Workbook as their homework.

4th – 7th hours (How does sound travel?)

1. Have students carry out Let's Try activity on page 86. Ask students some questions:
 - (a) Do you hear the bell ringing at every station?
 - (b) Does sound travel in all directions? Why?
 - (c) What will happen if the sound travels only one direction?
2. Explain to students how sound travels. Refer to page 87.

8th hour (Conclusion)

1. Revise the lesson by asking students to do questions in Part L column on page 88.
2. Enhance students to think about questions that they want to know more about sound in Part W column on page 89. Teacher may
 - (a) give them some examples of questions if students do not have any ideas.
 - (b) ask the whole class or each group to give some questions if their writing skills are not good enough.
3. Review the lesson by referring to the Mind Map on page 89.
4. Have students to do the questions on page 63 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

1. Assessing cognitive behavior; test on page 88 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

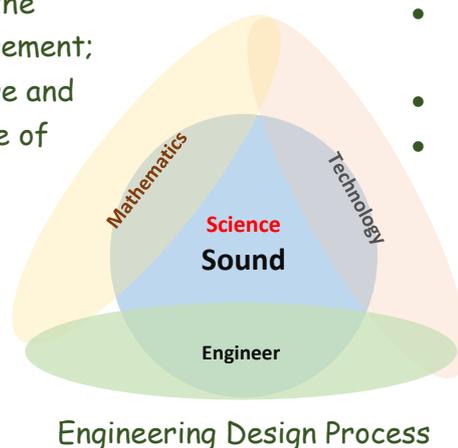
STEM Activity

Overview

This lesson will extend students' concept of sound. The lesson will connect science, technology, engineering design process, mathematics and arts as well. The lesson will engage students to design and create a musical instrument.

Subject integration

- Understanding the basics of measurement; ability to measure and estimate the size of objects to be measured.
- Information and Communication Technology
- Construct simple structures
- Using tool



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Lead students to discuss about their previous activity of sound.
 - (a) How is sound produced?
 - (b) What is the engineering design process?
 - (c) What are purposes of the engineering design process?
 - (d) Who uses the engineering design process?

Lesson development:

1. Students read a situation on page 90. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What will you do?
 - (b) What are our missions?
 - (c) What do you need to know to get started?
2. Engage students to explore and make connections between science, technology, engineering and mathematics by posing the suggested questions:
 - (a) What causes sound?
 - (b) What are the different types of musical instruments?
 - (c) What used materials that we should use?
 - (d) What tools that we should use?
 - (e) Is your instrument making sounds?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (musical instrument that functions well, etc.)
4. Let students to begin designing and creating their instruments. Let them brainstorm and draw their designs. Then, let them follow their plans and create. Help with construction when necessary. (Teacher may ask each group to present some brief ideas before they start so that teacher can give some suggestions for their possible solution or prevent trial and error.)
5. Once students have completed their instruments, give them time to practice playing them. Teacher may use the following questions:
 - (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
7. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion

1. Let them present their devices and share their ideas. Teacher may use the following sample questions:
 - (a) What are your steps of design and creating this device?
 - (b) What are benefits of this activity?
 - (c) Do all of you make the same instrument with the same idea? Why or why not?

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 6 Day Sky and Night Sky

Time: 7 hours

Strand 3: Earth and Space Science

Standard Sc.3.1

Indicator

Sc.3.1 Gr.1/1. Identify stars that appear in the sky during the day and night from collected data.

Sc.3.1 Gr.1/2. Explain why we cannot see the stars during the day using empirical evidence.

Introduction:

Children are curious why they can see the Sun in the day sky and the Moon in the night sky. They are aware that they can see the stars and the Moon in the nighttime. There are clouds in the sky too.

In this chapter, you will help students observe and identify the objects seen in the sky at daytime and nighttime.

Learning objectives:

Students will be able to:

- Enumerate the objects seen in the sky at daytime and nighttime.
- Identify and compare what they can notice in the sky during the day and at night.
- Explain why we cannot see the stars during the day using empirical evidence.

Competency:

Thinking competency, capacity for technological application, problem-solving capacity

Concept:

- In the day, we see the Sun and clouds in the sky. At night we can see the stars, clouds and sometimes the Moon in the sky.

Start up:

1. Lead students in a conversation about the sky by using the sample questions:
(Answers may vary)
 - (a) Have you ever look at the sky?
 - (b) Who like to look at the sky? Why?
 - (c) What color is the sky?
 - (d) Does the sky at night look similar to the sky during the day? How?
2. To assess prior knowledge about the sky by asking what students knew and what they want to know about the sky.
3. Write all their prior knowledge about the day sky and night sky in Part K column on page 92 and have students share what they know about the sky. Then, ask students write some questions which they want to know in Part W column on page 92.

Teaching/Learning activities:

1st – 3rd hours (Night sky)

1. Discuss with students about objects can be seen in the night sky. Refer to page 93.
2. Have students work on Let's Try activity on pages 93 and 94 in the Textbook.
 - (a) Assign students to observe the different shapes of the Moon at night.

- (b) It should be better to assign students 3-4 weeks before starting this chapter.
- (c) Discuss with students by using the following questions:
- Does the Moon always appear the same when you look up at the night sky?
 - Does the Moon look bright in the night sky?
 - Does the Moon give out its own light?
 - Does the Moon look the same from every part of Earth?
 - Can we see the Moon in the early morning?
 - How is the sky when we find the Moon in the morning?
3. Let students to carry out Let's Try activity on page 95 to explain why we can see the Moon looks bright in the night sky.

4th – 6th hours (Day sky)

1. Engage students to think about the day sky. What are there in the sky during daytime? Is it the same or different from nighttime?
2. Let students to carry out Let's Try activity on page 96.
3. Discuss with students about the objects in the day sky. Refer to page 97.
4. Let students to carry out Let's Try activity to explore why we cannot see the stars in the day sky on page 98.

7th hour (Conclusion)

1. Review what they have learned by doing the questions in Part L column on page 99.
2. Encourage them to watch a video by scanning the QR code on page 99.

3. Enhance students to think about questions that they want to know more about the day sky and night sky in Part W column on page 100.
4. Review the lesson by referring to the Mind Map on page 100.
5. Have students do the questions on pages 66 to 68 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

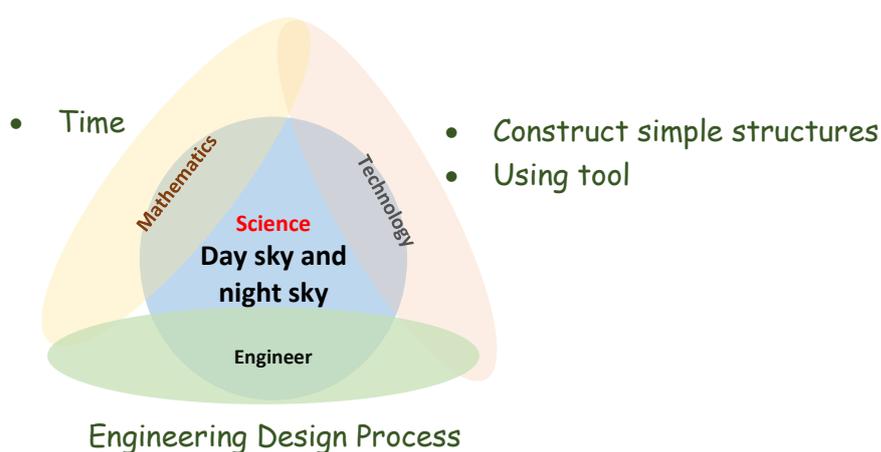
1. Assessing cognitive behavior; test on page 99 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will engage students to design and create a ‘vehicle’ to transport 5 ‘astronomers’ represented by coins to the other side of the classroom. They will apply their knowledge of materials in the chapter 4 and data of space science and technology from internet for their designs.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Review what they have learned about the sky by using the guiding questions:
 - (a) What is a scientist who studies space science called?
 - (b) What vehicle is used to study about the space or other objects in the sky?

Lesson development:

1. Students read a situation on page 101. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What is a problem of this situation?
 - (b) What are our missions?
 - (c) What do you need to know to get started?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions:
 - (a) If we want to make some devices that can transport across classroom, what are the characteristics of materials we can think of?
 - (b) How does technology help us to study about the space? Can you search for information on the internet?
 - (c) What are the uses of technology in studying the sky and objects in the space?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (distance across classroom, etc.)
4. Students brainstorm and draw their designs. Then, let them follow their plans and create. (Teacher may ask each group to present some brief ideas before they start so that teacher can give some suggestions for their possible solution or prevent trial and error.)
5. After students finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:
 - (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
7. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion:

1. Each group presents their projects and lets peers ask some questions.
2. End the lesson by asking students if everyone came up with the same design, and why not? They should answer that they all have different ideas but same target, and this speaks to the importance and role of diversity in engineering and problem-solving.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 7 Rocks

Time: 10 hours

Strand 3: Earth and Space Science

Standard Sc.3.2

Indicator

Sc.3.2 Gr.1/1. Explain the observed key characteristics of the external conditions of rocks.

Introduction:

Different rocks have different characteristics. In this chapter, you will help students to observe characteristics of rocks such as color, cleavage, weight, hardness and texture. The teacher may help students to sort the rocks in their local area by using their characteristics.

Learning objectives:

Students will be able to:

- Observe the characteristics of rocks.
- Sort the rocks based on their characteristics.

Competency:

Capacity for communication skills

Concept:

- Rocks are non-living things. Rocks can be found around us. Different rocks have different characteristics.
- We can sort the rocks based on their colors, presence of cleavage, weight, hardness and texture.

Start up:

1. To assess prior knowledge about rocks, ask students what they knew and what they want to know about rocks.
2. Let students write all their prior knowledge on their Textbooks on page 103 (Part K) and also write some questions which they want to know on page 103 (Part W).

Teaching/Learning activities:

1st – 9th hours (Characteristics of rocks)

1. Have students work on Let's Try activity on pages 104 to 106 in the Textbook. Ask students some questions:
 - (a) Do all rocks have the same or different characteristics?
 - (b) What properties can we use to sort the rocks?
 - (c) What other characteristics that you can observe and can be used to sort the rocks?
 - (d) What are the benefits of sorting the rocks?
 - (e) A student sorted rocks into two groups: heavy and light. Which property did the student use to sort the rocks into groups?
2. Teacher explains more about rocks that they are non-living things. Rocks can be found around us. Discuss with the students that rocks have the observed key characteristics.
 - (a) Different rocks have different colors. Some rocks have a mixture of colors, some rocks have only one color.
 - (b) Some rocks have cleavage. These rocks break or split easily along these lines.
 - (c) Some rocks are heavy, some rocks are light.

(d) Different rocks have different hardness levels. Some rocks are hard and they can scratch glass. Very soft rocks can be scratched with a fingernail.

(e) The texture of a rock depends on the grains on the rock.

Refer to pages 107 to 110.

3. Let students to do the questions on pages 70 and 71 of the Workbook as their homework.

10th hour (Conclusion)

1. Revise the lesson by asking students to do questions in Part L column on page 111.
2. Encourage them to watch a video by scanning the QR code on page 111.
3. Enhance students to think about questions that they want to know more about rocks in Part W column on page 112. Teacher may
 - (a) give them some examples of questions if students do not have any ideas.
 - (b) ask the whole class or each group to give some questions if their writing skills are not good enough.
4. Review the lesson by referring to the Mind Map on page 112.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 1
- Primary Education Smart Plus Workbook Science Prathomsuksa 1

Assessment:

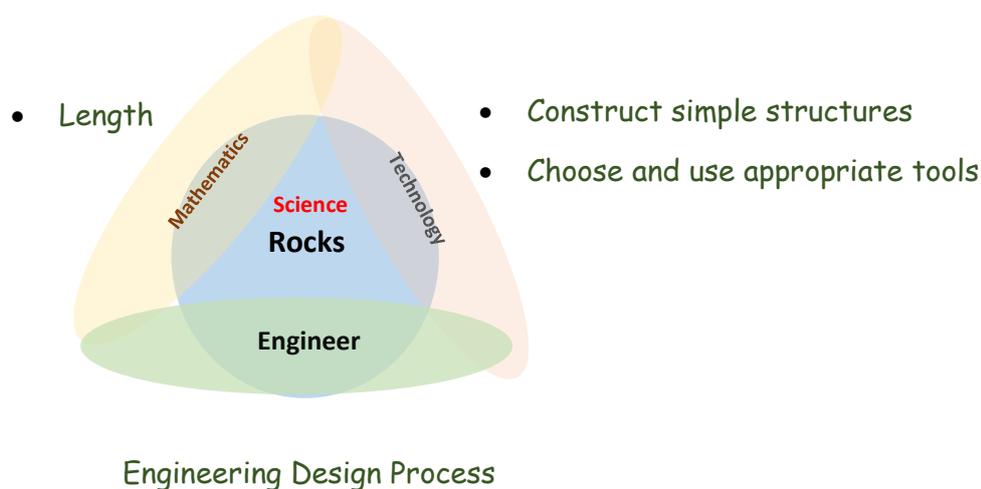
1. Assessing cognitive behavior; test on page 111 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will extend students' concept of rock characteristics. The lesson will connect science, technology, engineering design process, mathematics and arts as well. The lesson will engage students to design and create a rock tower by using rocks that students collected.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.

Lesson development:

1. Let students read a situation on page 113. Then, the whole class discusses and identifies a problem by answering the following questions:
 - (a) What is a problem of this situation?
 - (b) What are our missions?

- (c) What do you need to know to get started?
- 2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions:
 - (a) What are the characteristics of a rock tower?
 - (b) What are our possible solutions for the rock tower that is free-standing?
 - (c) What materials do we need?
- 3. Ask students to think about how to assess their project. Discuss in class and set their criteria by using the following questions:
 - (a) What are success criteria? (free-standing rock tower, etc.)
- 4. Let students brainstorm and draw their designs. Then, let them follow their plans and create.
- 5. After they finish their mission, ask them to test their product by using the criteria in #3. Teacher may use the following questions:
 - (a) What works or what does not work?
 - (b) How will you modify your solution to make it better?
- 6. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
- 7. Each student group presents their product and explains their journey of creating.

Conclusion:

- 1. End the lesson by asking students if everyone came up with the same design, and why not? They should answer that they all have different ideas, and this speaks to the importance and role of diversity in engineering and problem-solving.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Scoring Rubric for Affective Domain

Skill	Needs improvement (1)	Partially proficient (2)	Proficient (3)	Advanced (4)
Self-motivation	Consistently fail to meet established deadlines	Take initiative to complete assignments and improve or correct behaviors	Occasionally complete and turn in assignments before the scheduled deadline	Never miss a deadline and often complete assignments well ahead of deadlines
Communication	Unable to speak or write clearly and is unable to correct their behaviors despite intervention by instructors, does not actively listen	Needs work to speak or write clearly, sometimes able to identify alternative communication strategies	Speak clearly, write legibly, listen actively, and adjust communication strategies to various situations	Comfortable utilize a variety of communication styles, write legibly, speak clearly, and listen actively
Teamwork	Manipulate the team or act with disregard to the team, disrespectful to team members, resistant to change or refuse to cooperate in attempts to work out solutions	Sometimes act for personal interest at the expense of the team, act independent of the team or appear non-supportive, and occasionally unwilling to work out a solution	Place the success of the team above self-interest, do not undermine the team, help and support other team members, and show respect for all team members	Place success of the team above self-interest, take a leadership role and use good management skills while leading, and involve all team members in the decision-making process
Neatness	The work appears sloppy and unorganized. It is hard to know what information goes together	The work is organized but may be hard to read at times	The work is neat and organized. It is easy to read	The work is neat, clear, and organized. It is easy to read
Completion	Most of the work is not complete even additional time or suggestions were given	Some work is not complete and need additional suggestions	Some work is not complete and additional time	All works are complete
Responsibility	Always relies on others to complete assignments	Rarely does the work and needs constant reminders to stay on task	Usually does the work and seldom needs reminders to stay on task	Always does assigned work without being reminded

Scoring Rubric for Scientific Thinking

Skill	Needs improvement (1)	Partially proficient (2)	Proficient (3)	Advanced (4)
State problem / question	Need assistant to state the problem or identify the information	Sometimes state the problem or identify the information correctly	Occasionally state the problem or identify the information correctly	Work alone and correctly state the problem and identify the information and the steps needed to arrive at a solution
Conclusion/Synthesis thinking ability	Conclusions drawn were lacking, incomplete, or confused and need help to write conclusion or answer questions	Sometimes ask for guidance to write or complete a conclusion	Occasionally answer questions and complete a conclusion in complete sentences	Always writes response to whether hypothesis was wrong or wrong and answer in complete sentences
Using scientific reasoning for explanation	No evidence of scientific reasoning was used	Some evidence of scientific reasoning was used	Effective scientific reasoning was used	Employed refined and complex reasoning and demonstrated understanding of cause and effect
Using scientific concepts and related content	Always relies on others in using scientific concepts	Minimal reference to relevant scientific concepts, principles, or big ideas	Provided evidence of understanding of relevant scientific concepts, principles, or big ideas	Provided evidence in depth and sophisticated understanding of relevant scientific concepts, principles, or big ideas

Scoring Rubric for STEM Activities

Skill	Needs improvement (1)	Partially proficient (2)	Proficient (3)	Advanced (4)
Creativity	The project has little creative and unique aspects	The project has some creative and unique aspects	The project adequate has creative and unique aspects	The project has plenty of creative and unique aspects
Communication and collaboration	The information is not organized. Data is presented inaccurately. There is no drawing plan	Some information is clear and organized. There is a drawing plan without any label	Most information is clear and organized. There is a clearly labeled drawing plan	All information and data are clear and organized. They are presented accurately. There is a clearly labeled drawing plan
Technology operations	No technological resource was used in the project or was used incorrectly	Little technological resource was used in the project or was not used correctly	Technological resource was used in the project correctly	Multiple technological resources were used appropriately
Teamwork	Pupils demonstrate no cooperation, courtesy, enthusiasm, confidence, and accuracy	Pupils demonstrate little cooperation, courtesy, enthusiasm, confidence, and accuracy	Most pupils demonstrate some cooperation, courtesy, enthusiasm, confidence, and accuracy	All pupils demonstrate high level of cooperation, courtesy, enthusiasm, confidence, and accuracy
Presentation	Presentation lacks detail needed to understand the team's solution	Presentation provides adequate explanation of how the solution was developed and how it works	Presentation or visual aids provide clear, effective, and creative explanation of how solution was developed and how it works	Presentation and visual aids provide very clear, effective, and creative explanation of how solution was developed and how it works