

Teacher's Guide



SCIENCE

Primary
Education
Smart+
Prathomsuksa

3



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 3 (Grade 3)

8 chapters

80 hours

Learning areas	Time (hours)
1. Basic Needs of Animals and Humans <ul style="list-style-type: none">Needs of animalsOur needs	10
2. Life Cycles <ul style="list-style-type: none">Life cycles of animalsCaring for the lives of animalsHuman life cycle	12
3. Materials <ul style="list-style-type: none">Separation and assemblage of materialsChanges in materials due to heat	10
4. Forces and Motion <ul style="list-style-type: none">Pushing and pullingEffects of forces on motionTypes of forcesMagnets	12
5. Energy <ul style="list-style-type: none">Forms of energyEnergy transformation	10
6. Electricity <ul style="list-style-type: none">Sources of energyUsing electricity	8
7. The Sun <ul style="list-style-type: none">Day and nightSunrise and sunsetDirectionsThe importance of the Sun	10
8. Air <ul style="list-style-type: none">Components of airImportance of air	8

<ul style="list-style-type: none">• Air pollution• Movement of air	
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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 Basic Needs of Animals and Humans

Time: 10 hours

Strand 1: Biology Science

Standard Sc.1.2

Indicator

Sc.1.2 Gr.3/1 Describe the essential factors for living and growth of humans and animals from collected information.

Sc.1.2 Gr.3/2 Realize the usefulness of food, water and air by taking responsibility for yourselves and animals to have these basic needs appropriately.

Introduction:

Animals need food, water and air to survive. Animals get energy from the food they eat. They can be carnivores, herbivores, or omnivores in their eating strategies. Water helps animal bodies to function properly. Animals breathe in oxygen to generate energy from the food they eat.

Humans also need food, air and water to survive and grow. Foods rich in carbohydrates give us energy. Foods rich in proteins help us growth and repair. Fresh fruits and vegetables contain vitamins and minerals which help us to stay healthy. Water has many functions in our body. We also breathe in oxygen and produce carbon dioxide.

In this chapter, you will guide students to learn about the basic needs of animals and humans. Let them to understand more about their body and how to take care of themselves.

Learning objectives:

Students will be able to:

- Collect data and identify the essential factors for living and growth of humans and animals from the collected information.
- Explain the importance of food, water and air for humans and animals.
- Give ways of taking care for animals so that they get their basic needs appropriately.

Competency:

Communication capacity, capacity for applying life skills, capacity for technological application

Concept:

- Humans and animals need food, water and air to live and grow.
- Food gives strength to the body, water helps body working properly, air is needed for breathing.

Start up:

1. Engage students into lesson by asking them:

- (a) What causes us to grow?
- (b) Have you ever had a pet? Do they grow up? What causes them to grow?
- (c) What do animals need to survive?
- (d) What do we need to survive?

2. To assess prior knowledge about basic needs of animals and humans, ask students what they knew and what they want to know about basic needs of animals and humans.

3. Let students write all their prior knowledge about basic needs of animals and humans in Part K column on page 1 and also write some questions which they want to know more in Part W column on page 1.

Teaching/Learning activities:

1st – 4th hours (Needs of animals)

1. Have students work on Let's Find Out activity on page 2 in the Textbook. Discuss about the similar things that pets need.
2. Let students to find information about what animals need to live and grow. Then, whole class discusses and concludes that animals need food, water and air to stay alive and grow well.
3. Explain to students that some animals eat plants only. Some eat other animals only. Some eat both plants and other animals. Ask students to give examples of such animals. Refer to pages 2 and 3.
4. Explain that animals need water to survive. Refer to page 4.
5. Teacher may show them some video clips of animals in the wildlife areas.
6. Let students think and search for information about breathing in animals. Refer to Let's Think activity on page 5.
7. Teacher asks students to think about what benefits of animals to us. Whole class discusses and concludes that animals are useful.
8. Teacher may ask students some questions:
 - (a) If you are allowed to have a pet, what animal will you choose, and what will you have to prepare and to do?
 - (b) What will happen if we do not take care of our pets?
9. Explain more information about how to take care of pets. Ask students to give ways of taking care of pets and ensure that they get basic needs appropriately. Teacher may assign students to choose one animal, search for its life, and then present in class.

10. Let students to do questions on pages 5 to 10 of the Workbook as their homework.

5th – 9th hours (Our needs)

1. Assign students to do Let's Try activity on page 7. Students should conclude that humans eat food because food will give energy and help our body to grow and repair itself.
2. Lead students to think and discuss why kids need more milk, fish and meat. Refer to Let's Think on page 8.
3. Lead students to discuss about junk food. Why and what would happen if they eat junk food. Refer to Let's Know More and Let's Think on page 9.
4. Assign students to do Let's Try activity on page 10 to conclude that they need to eat three groups of food. Then, discuss and share ideas in class.
5. Ask students that besides food we need to drink water. Water is very important for humans and animals. Explain to them more understanding of how much water we need by watching the following video clip.
Water - Functions of Water in the Body - Benefits of Drinking Water
<https://www.youtube.com/watch?v=gbJxgRqzN3A>
Refer to Let's Know More on page 11.
6. Explain that we need air for respiration process and what respiration is. Refer to page 12.

10th hour (Conclusion)

1. Lead students to conclude that animals and humans need food, water and air for maintaining their life well. We must take care of ourselves by ensuring that we get our basic needs properly.
2. We must eat a variety of foods every day. We must take at least eight glasses of plain water every day and we breathe in clean fresh air.

3. Let students to revise the lesson by answering the questions in Part L column on page 13.
4. Encourage them to watch a video by scanning the QR code on page 13.
5. Enhance students to think about questions that they want to know more about the basic needs of animals and humans in Part W column on page 14. 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.
6. Use the Mind Map on page 14 to help students to understand the relationships between all the subtopics learned in this chapter.
7. Have students to do the questions on pages 11 to 14 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3
- Pictures of animals
- Video clips of wildlife animals
- Supermarket brochure

Assessment:

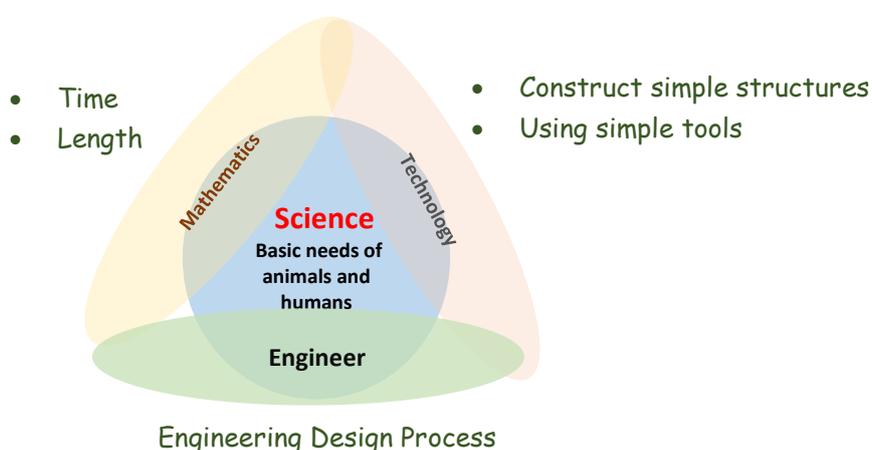
1. Assessing cognitive behavior; test on page 13 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This lesson will engage students to apply their knowledge of food. They will design and create a food tower that represents high energy food for a nine-year-old child. They apply their mathematics concept of time and use engineering design process, as well.

Subject integration



Time: 3 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Review their knowledge content of ourselves by using the following questions:
 - (a) What are essential factors which humans need to live and grow healthily?
 - (b) How does the human body grow?

Lesson development:

1. Let students read a situation on page 15. 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) How many types of food are there?
 - (b) Which food gives us energy?
 - (c) What food should those nine years old children eat?
 - (d) What is the meaning of “stand upright”?
 - (e) How do we make a high tower?
 - (f) What factors affect the tower stand upright?
 - (g) How do we measure time and distances?
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? (Food tower, stand upright, etc.)
 - (b) How do we know that our mission is success?
4. Let students brainstorm and draw their designs including label materials. 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 presents their product and presents their creative work, and explains their journey of creating.

Conclusion:

1. Let students present their work and engage their peers to ask some questions or give some comments or suggestions.
2. 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) What are steps of an engineering design process that we use to solve problems?

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 2 Life Cycles

Time: 12 hours

Strand 1: Biology Science

Standard Sc.1.2

Indicator

Sc.1.2 Gr.3/3 Make a model of life cycle of any animal and compare life cycle of some animals.

Sc.1.2 Gr.3/4 Realize the value of animals' life by not disturbing (changing) the life cycles of animals.

Introduction:

A life cycle is a series of changes that a living thing goes through during its life. Different animals have different life cycles. Each animal has their own unique way of reproducing life such as a butterfly, frog and chicken. We have to care for the lives of animals by not disturbing their habitats. The human life cycle consists of different stages including infancy, childhood, adolescence, adulthood and old age.

In this chapter, students will learn about how animals undergo changes in sizes and shapes during different stages in their life. They will also learn the ways on how to take care of animals. Students will also learn about the stages in the human life cycle.

Learning objectives:

Students will be able to:

- Explain the life cycles of some animals.
- Search for information and make a model of the life cycle of any animal.

- Compare life cycles of some animals.
- Show how to conserve animals by not disturbing their habitats.
- Understand the human life cycle.

Competency:

Thinking capacity, capacity for technological application

Concept:

- Female animals will breed when they become mature. When the offspring grow, they will reproduce. This is a continuous life cycle of animals which each type of animals has different and unique life cycles such as butterfly, frog, hen and human.

Start up:

1. Engage students into lesson by asking them:
 - (a) If you have a pet, how do you take care of it?
 - (b) Is there any change from young to adult?
2. To assess prior knowledge about life cycles, ask students what they knew and what they want to know about life cycles.
3. Let students write all their prior knowledge in Part K column on page 17 and also write some questions which they want to know in Part W column on page 17.

Teaching/Learning activities:

1st – 5th hours (Life cycles of animals)

1. Assign students to do Let's Try activity on page 18. Students should conclude that the different stages of life that an animal passes through are called its life cycle. For example, each chicken starts its life by hatching from an egg.

Chicks grow and change over time, becoming chickens and having babies of their own. A chicken's life cycle begins even before it hatches.

2. Teacher explains more information about the life cycles of animals. Refer to pages 20 and 21.
3. Lead students to create a model of the life cycle of a cat on the board. Refer to page 21. Teacher may ask each group to create their animals' life cycle. Then show and discuss in class.
4. Teacher explains more about kittens and adult cats. Discuss some animals give birth to live young. The young look like the adult animals but they are smaller in size. Refer to page 21.
5. Assign each group to create a model of the life cycle of a frog or a butterfly through the following activities:
 - (a) Search for information about the life cycles of a frog and a butterfly.
 - (b) Observe animals in an animal farm such as a butterfly farm or a frog farm.

Then show and discuss in class.

6. Ask each group to write the life cycle of the animal as assigned. Then show and discuss in class.
7. Teacher explains more about the life cycles of a frog and a butterfly.
8. Teacher lets them compare their animals' life cycle by using their animal's life cycle. Refer to pages 24 and 25.
9. Lead students to think about what foods are eaten by a frog at each stage of its life cycle. Refer to Let's Think on page 25.
10. Have students to do the questions on pages 18 to 20 of the Workbook as their homework.

6th – 7th hours (Caring for the lives of animals)

1. Assign students do Let's Try activity on page 26. Students should conclude that if we have a pet we should study about its life and how to care for the lives of animals.
2. Discuss more about how to take care of animals. Let the animals have their basic needs, such as food, water, air and shelter to grow and live healthily. Animals also need additional care at certain stages of their life cycles.
3. Assign each group to choose one animal and write about ways of taking care of it.
4. Teacher also explains on caring for animal habitats. Ask students some questions such as
 - (a) How do we conserve the habitat of animals?
 - (b) How does habitat loss affect the lives of animals?
5. Have students to do the questions on page 21 of the Workbook as their homework.

8th – 11th hours (Human life cycle)

1. Ask students to prepare some pictures when they were at different ages.
2. Assign students to do Let's Try activity to conclude that we grow and change throughout our life. The human life cycle consists of different stages. Refer to pages 28 and 29.
3. Explain more about each stage of the human life cycle. Refer to pages 29 to 31.
4. Assign students to discuss with their parents about types and amount of food for each stage of the human life cycle. Then discuss in class. Ask them think about different types and amount of food for us to grow and stay healthy. Refer to Let's Find Out on page 31.

5. Have students to do the questions on pages 22 and 23 of this subtopic in the Workbook as their homework.

12th hour (Conclusion)

1. End the lesson by doing questions in Part L column on page 32.
2. Encourage them to watch a video by scanning the QR code on page 32.
3. Whole class discusses about what they want to know more about life cycles in Part W column on page 33. Teacher may guide them if they do not have any ideas such as:
 - (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 33.
5. Explain about some scientific vocabulary. Refer to Glossary on page 33.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3
- Poster of some animal life cycles
- Poster of the human life cycle
- Video clips of animal life cycles and human life cycle

Assessment:

1. Assessing cognitive behavior; test on page 32 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

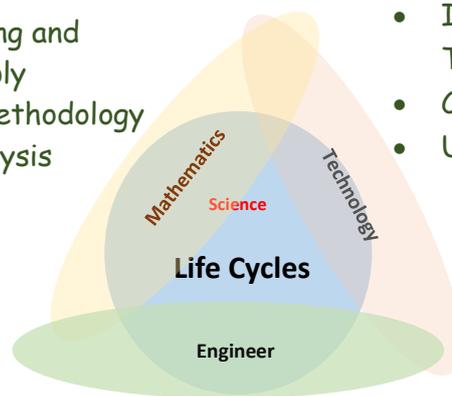
STEM Activity

Overview

This lesson will search for more information about the life cycle of a butterfly. They are required to choose their caterpillar. Then, design and create a home which is suitable for it to grow into a butterfly. They will test their prototype by designing an experiment, using measuring and interpreting data knowledge.

Subject integration

- Understanding and ability to apply statistical methodology for data analysis



- Information and Communication Technology
- Construct simple structures
- Using tool

Engineering Design Process

Time: 5 hours

Start up:

1. Divide students into groups of 3 or 4.
2. Review their understanding about their previous STEM activity and engineering design process by using the suggested questions:
 - (a) What is the engineering design process?
 - (b) What are the purposes of the engineering design process?
 - (c) Who uses the engineering design process?
 - (d) What are the steps that you use in the last chapter?

Lesson development:

1. Let students read a situational question on page 34. 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) Which caterpillars are native to our region?
 - (b) How do you take care of a caterpillar until it turns to a butterfly?
 - (c) How does the habitat of the caterpillar look? (such as size, space, cleanliness)
 - (d) How do you keep the caterpillar safe? (closed system or open system?)
 - (e) Do we need anything to mark the base of the habitat? If yes, what characteristic of those materials, soft or hard? What are they?
 - (f) How can we report our experimental results? What type of chart should we use?
 - (g) How do we keep their habitat clean?
3. Ask students to think about how to assess their project. Discuss in class and set their criteria with the following questions:
 - (a) What are success criteria? (caterpillar growth, etc.)
4. Ask students search for more information about the life cycle of a butterfly. Enhance them brainstorm and draw their designs including label materials. Then, let them follow their plans and create. Teacher should walk around and give some suggestions or check their possible ideas.
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. Let them present their product and share their ideas. Teacher may use these sample questions:
 - (a) What are pros and cons of their product?
 - (b) What are the steps of your design?
 - (c) How much do you pay for your product?
 - (d) Do all of you have the same ideas? Why or why not?

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 3 Materials

Time: 10 hours

Strand 2: Physical Science

Standard Sc.2.1

Indicator

Sc.2.1 Gr.3/1 Explain that an object consists of different materials that can be separated and assembled into a new object using empirical evidence.

Sc.2.1 Gr.3/2 Explain changes in material when it is heated up or cooled down using empirical evidence.

Introduction:

Different materials are used to make different objects. The materials are chosen based on their physical properties. Some objects are made from a combination of different materials. When the materials are separated, we can reuse the materials to make new objects.

In this chapter, you will learn more about materials. You will also know about objects that can be made from the separation and assemblage of materials. Students will know about the changes in a material caused by heat.

Learning objectives:

Students will be able to:

- Identify materials used to make objects.
- Collect data about objects that are made from a combination of different materials.
- Explain that materials can be separated and assemblage to make new objects.
- Collect data on reusing the materials to make new objects.

Competency:

Thinking capacity, problem-solving capacity, capacity for applying life skills

Concept:

- Some objects are made from a combination of different materials. When the materials are separated, we can reuse the materials to make new objects.
- Some materials will change their shapes or colors when heated or cooled.

Start up:

1. Engage students into lesson by asking them:
 - (a) Can you remember what did you learn about materials when you were in Prathomsuka 1 and 2?
 - (b) What do you know about materials?
 - (c) Give you name some toy and non-toy examples.
2. To assess prior knowledge about materials by asking what students knew and what they want to know.
3. Write all their prior knowledge in Part K column on page 36 and have students share what they know about materials. Then, ask students write some questions which they want to know in Part W column on page 36.

Teaching/Learning activities:

1st – 4th hours (Separation and assemblage of materials)

1. Carry out Let's Try activity on page 37. Then, discuss and conclude that some objects are made from a combination of different materials. When the materials are separated, the materials can be reused to make new objects.
2. Explain more information and examples of reusing materials to create a new object. Then ask students to give more examples. Refer to page 38.

5th – 9th hours (Changes in materials due to heat)

1. Carry out Let's Try activity on page 39 to find out the changes in an egg after heat is applied.
2. Give more additional details about changes in materials when heated or cooled. It can change in shape and color. Refer to page 40.
3. Carry out Let's Try activity on page 41 to find out water can change shape and status when it is heated and cooled.
4. Engage students to think about what happens if we place the melted ice pop into a freezer? What changes will it undergo? How do we make pieces of chocolate with different shapes? Refer to Let's Think on page 43.
5. Give more additional details about heat can change some solid materials such as metal and sugar. Refer to page 44.
6. Have students to do the questions on page 27 to 30 of the Workbook as their homework.

10th hour (Conclusion)

1. End the lesson by asking students to do questions in Part L column on page 45.
2. Encourage them to watch a video by scanning the QR code on page 45.
3. Whole class discusses what they want to know more about materials in Part W column on page 46. Teacher may guide students if they do not have any ideas.
4. Use Mind Map on page 46 to help students to understand the relationships between all the subtopics learned in this chapter. Discuss all concepts in this chapter by using the following sample questions:
 - (a) What can cause materials to change?
 - (b) What are the changes in materials due to heat?
 - (c) Can we reuse materials? Can you give one example?

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3

Assessment:

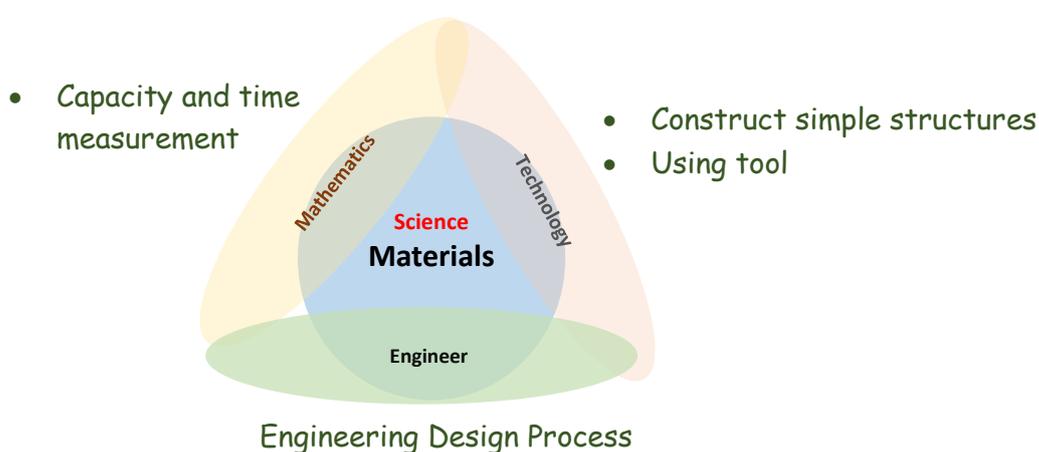
1. Assessing cognitive behavior; test on page 45 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This activity will let students design and create a solar oven which should be able to melt a cup of sugar for dessert preparation. They will choose appropriate materials based on their content knowledge. They also apply their knowledge of capacity and time measurement to test their device.

Subject integration



Time: 4 hours

Start up:

1. Review about engineering design process and technology by asking some of the sample questions:
 - (a) In last activity, we design and create something by using the engineering design process, what is the engineering design process? What are its steps?
 - (b) What is technology? Can you give some examples of technology?
 - (c) What are the benefits of technology?
2. Divide students into groups of 3 or 4.

Lesson development:

1. Students read a situation on page 47. Then, 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) Have you ever tasted Som Tam? How is it?
 - (b) What do we have to prepare for cooking Som Tam?
 - (c) Can we cook if palm sugar is hard? Why not?
 - (d) What energy that the Sun gives to us?
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? (100 grams of palm sugar, etc.
4. Students brainstorm and draw their designs including label materials. 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. Teacher should encourage others to ask or give some comments.

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 Forces and Motion

Time: 12 hours

Strand 2: Physical Science

Standard Sc.2.2

Indicator

Sc.2.2 Gr.3/1 Identify the effect of force on changes in motion of the objects from empirical evidence.

Sc.2.2 Gr.3/2 Compare and give examples of contact force and non-contact force that affects the objects' motion using empirical evidence.

Sc.2.2 Gr.3/3 Distinguish objects using magnetism as a criteria based on empirical evidence.

Sc.2.2 Gr.3/4 Identify the magnetic poles and predict the results between the poles when brought them together from the empirical evidence.

Introduction:

A force involves a pull or a push. There are many examples of forces in our everyday lives such as kicking a ball and climbing up the stairs.

When we exert a force on an object, the force can cause changes in the motion of the object. There are two types of forces, namely contact forces and non-contact forces.

Children might be curious about how a magnet works. A magnet is an object that attracts certain materials such as steel. There are various magnets of different sizes and shapes. A magnet has two poles – the North pole (N) and the South pole (S). Magnets can attract or repel each other.

Learning objectives:

Students will be able to:

- Conduct experiments and explain that pulling or pushing an object requires forces.
- Conduct experiments and explain how an object changes its motion or shape when forces act on it.
- Identify different types of forces.
- Explore and classify objects by using magnetic property.
- Conduct experiments and describe magnetic forces.
- Conduct experiments and explain the concept of a magnetic field.
- State the uses of magnets.

Competency:

Communication capacity, thinking capacity, capacity for applying life skills, capacity for technological application

Concept:

- A force is a push or pull that acts on an object. A force can cause changes in the motion of the object.
- A force can move a stationary object.
- A force can speed up, slow, stop, or change the direction of a moving object.
- A force can change the shape of an object.
- Forces can be categorized into two types, namely contact forces and non-contact forces. A contact force is a force applied to an object by another object that is in contact with it. A non-contact force is a force which acts on an object without coming physically in contact with it.
- Magnetic force is a force that a magnet exerts on magnetic materials including other magnets.

- Magnets attract magnetic materials.
- Magnet has two poles called the North pole and the South pole.
- The like poles of two magnets will repel each other while the unlike poles of two magnets will attract each other.

Start up:

1. To assess prior knowledge about forces and motion by asking what students knew (Part K) and what they want to know (Part W) on page 49.

Teaching/Learning activities:

1st – 3rd hours (Pushing and pulling)

1. Engage students into lesson by letting them do an interesting activity at the playground. Let them observe while they are playing with equipment. Then ask:
 - (a) While you are playing with the playground equipment such as swing, do you move? How? (I move while I am playing with swing.)
 - (b) What causes your moving? (My friends push me.)
 - (c) If you want to stop, what can you do? (My friends pull me.)
 - (d) Can we swing or move by ourselves without any force? (No)
2. Altogether in class discuss and conclude that force can make an object moves or stops. Force involves a push and a pull.
3. Ask students to find out other daily activities where we apply the push and pull forces. Present findings in class. Refer to Let's Find Out on page 51.

4th – 6th hours (Effects of forces on motion)

1. Ask students to do Let's Try activity on page 52. Students should conclude that when we exert a force on an object, the force can cause changes in the motion of the object. We cannot see the force but we can observe its effects.

2. Ask them to find out or search for more information about Sir Isaac Newton and present in class. Teacher may show them some video clips about him. Refer to Let's Know More on page 53.
3. Explain about how forces act on moving objects. A force can speed up, slow, stop, or change the direction of a moving object. A force can change the shape of an object.
4. Engage them to think why a marble does not change its shape when we exert a force on it, but a molding clay changes its shape. Refer to Let's Think on page 55.
5. Explain more information about effects of great force in our environment. Refer to Let's Know More on page 55.
6. Have students do the questions on pages 38 to 42 of the Workbook as their homework.

7th – 8th hours (Types of forces)

1. Ask them to do Let's Try activity on page 56. A force is a push or pull acting upon an object as a result of its interaction with another object. There are a variety of types of forces. The forces are categorized into two types on the basis of whether the force resulted from the contact or non-contact of the two interacting objects.
2. Explain more information about contact forces and non-contact forces. Give them more examples of both forces. Teacher may ask them to give an example of both forces. Refer to pages 57 and 58.

9th – 11th hours (Magnets)

1. Ask students some experience of magnets by using the sample questions:
 1. Have you ever played with magnets?

2. Show them a magnet wrapped with a paper to touch many objects, then ask them what the object in the paper is.
2. Get a few magnets and show them to class. Let students analyze the magnets and then inform them that there are various magnets of different shapes and sizes. Refer to page 59.
3. Carry out Let's Try activity on page 60 to identify objects that are attracted to magnets. Whole class discusses and concludes that:
 - (a) An object that can attract magnetic materials such as iron is called a magnet.
 - (b) All objects can be classified into two groups based on whether they are attracted to magnets, namely magnetic objects and non-magnetic objects.
4. Explain more about some metals that can or cannot be attracted to magnets. Refer to Let's Know More on page 61.
5. Explain about the misconception of the magnetic poles according to Let's Know More on page 62.
6. Carry out Let's Try activity on page 63. Whole class discusses and concludes that magnets attract magnetic objects the strongest at the poles.
7. Teacher gives additional information that there is a magnetic force around a magnet. This force is called a magnetic field.
 - (a) The poles of a magnet are the strongest parts of the magnet.
 - (b) Each magnet has two poles, namely the North pole and the South pole.
8. Carry out Let's Try activity on pages 64 and 65. Whole class discusses and concludes that the like poles of two magnets will repel each other while the unlike poles of two magnets will attract each other.
9. Ask some groups to find out and draw how to make a magnet attracts other magnets as much as possible, and ask other groups to find out and draw how to make a magnet repels other magnets as much as possible.

10. Give more information about how we use magnets in our daily life, then ask them to share their information in class. Teacher provides more information about the uses of magnets in daily life such as a compass.
11. Have students do the questions on pages 43 to 49 of the Workbook as their homework.

12th hour (Conclusion)

1. End the lesson by answering the questions in Part L on page 67.
2. Encourage students to watch a video by scanning the QR code on page 67.
3. Ask students what they want to know more about forces and motion in Part W column on page 68.
4. Use the Mind Map on page 68 to help students to understand the relationships between all the subtopics learned in this chapter.
5. Ensure students understand the terms used in this chapter by referring to the Glossary.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3

Assessment:

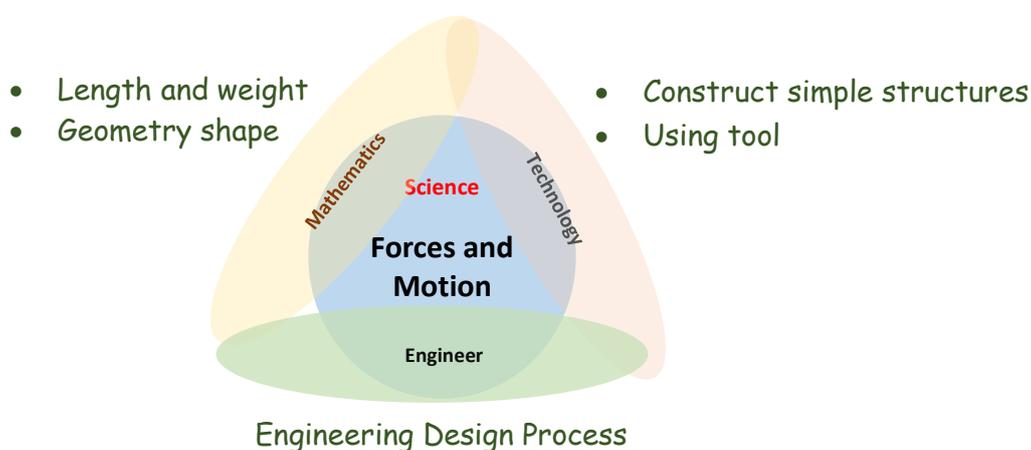
1. Assessing cognitive behavior; test on page 67 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This activity lets students apply the benefits of magnets to everyday life. They will design and create their board games by using magnets, galvanized steel sheet and other materials. They will develop rules of the game, as well.

Subject integration



Time: 4 hours

Start up:

1. Review the concept of magnet that an object that can attract magnetic materials such as iron is called a magnet. Examples of magnetic objects are iron and steel. Examples of non-magnetic objects are glass, paper, plastics, etc.
2. Divide students into groups of 3 or 4.

Lesson development:

1. Students read a situation on page 69. Then, 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 examples of non-magnetic objects and magnetic objects?
 - (b) What is suitable size/shape/number of players of this board game?
 - (c) What are the general rules of the game?
 - (d) How many players in this board game?
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? (board game with magnetic properties, etc.)
4. Students brainstorm and draw their designs including label materials. 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. Students present their work. Ask classmates to give some comments.
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 5 Energy

Time: 10 hours

Strand 2: Physical Science

Standard Sc.2.3

Indicator

Sc.2.3 Gr.3/1 Give examples of the energy transformation; the change of energy from one form energy into another based on empirical evidence.

Introduction:

Energy is the ability to do work. It comes in different forms such as heat energy, sound energy, light energy, electrical energy, kinetic energy, potential energy and mechanical energy. Children might notice that they use electrical energy every day and many household appliances use electricity to work.

In this chapter, you will guide students to identify different forms of energy. Students will also learn about energy transformation.

Learning objectives:

Students will be able to:

- Investigate and explain that energy is the ability to do work.
- Identify different forms of energy.
- Explore and identify that energy can transform from one form to another.

Competency:

Thinking capacity, capacity for applying life skills, capacity for technological application

Concept:

- Energy is the ability to do work.
- There are many types of energy, for instance, mechanical energy, electric energy, light energy, sound energy and heat energy. Energy can change from one type of energy to another.

Start up:

1. Engage students into lesson by asking them:

Do you have toys that can move? Why they can move?

Do you know why hands of clock can move?

Do you know why robot can move?

Can we see energy?

2. To assess prior knowledge about energy by asking what students knew (Part K) and what they want to know (Part W) on page 71.

Teaching/Learning activities:

1st – 4th hours (Forms of energy)

1. Explain students that energy is the ability to do work. There are many types of energy such as mechanical energy, electrical energy, light energy, sound and heat energy. Refer to pages 72 to 75.
2. Teacher may ask students to give more examples of energy and their usages in our daily life.
3. Have students do the questions on page 61 of the Workbook as their homework.

5th – 9th hours (Energy transformation)

1. Carry out Let's Try activity on pages 76 and 77. Lead them to discuss and conclude that energy can change from one form to another. This is called energy transformation.
2. Give more information about energy transformation. Refer to pages 78 to 80.
3. Teacher may ask them to give some examples of the appliances in the classroom that can change from electrical energy into other forms of energy.
4. Assign them to search for more information and make a poster of energy transformation. Then exhibit in class. Refer to Let's Find Out on page 80.

10th hour (Conclusion)

1. End the lesson by doing questions in Part L on page 81.
2. Encourage them to watch a video by scanning the QR code on page 81.
3. Enhance students to think about questions that they want to know more about energy in Part W column on page 82. 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. Use Mind Map on page 82 to help students to understand the relationships between all the subtopics learnt in this chapter.
5. Have students to do the questions on pages 62 to 64 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3
- Picture or poster of energy transformation

Assessment:

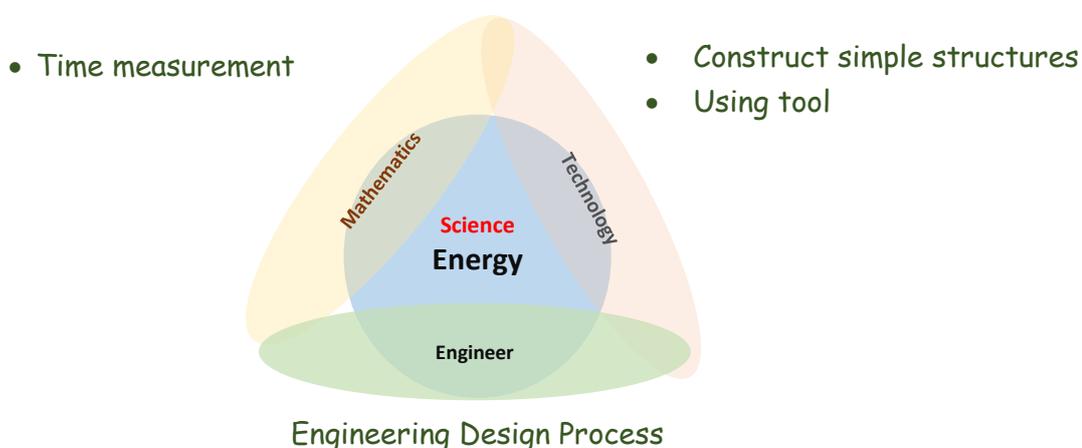
- 1.** Assessing cognitive behavior; test on page 81 (Part L).
- 2.** Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
- 3.** Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

In this chapter, students will apply their knowledge of energy to design and create food battery. Food stores chemical energy. We get energy from the food we eat. Our body converts the chemical energy into other forms of energy, so we use energy to carry out many activities such as walking and playing. Students are required to build a device which generates electricity to turn on a lightbulb.

Subject integration



Time: 3 hours

Start up:

1. Review about engineering design process and technology by asking some of the sample questions:
 - (a) In last activity, we design and create something by using engineering design process, what is engineering design process? What are its steps?

- (b) What is technology? Can you give some examples of technology?
- (c) What are benefits of technology?

2. Divide students into groups of 3 or 4.

Lesson development:

1. Students read a situation on page 83. 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. Engage students to explore and make connections between science, technology, engineering and mathematics by posing the suggested questions:
 - (a) Do fruits have energy? How?
 - (b) What happens after we eat food?
 - (c) Can our body convert energy in food to be used in carrying out activities?
 - (d) What do you know about batteries?
 - (e) Does battery give us energy? What is it?
3. Give students a set of electric circuit – battery, wire, and a bulb. Engage them to make a simple circuit. Then ask:
 - (a) What causes light energy?
 - (b) Is it possible to replace a battery with something such as food?
4. 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? (a device that gives out light from food etc.)
5. Let them brainstorm and draw their designs including label materials. 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.)

6. After they finish their mission, ask them test their product by using the criteria in #4. 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?
7. Let them improve their design. (Teacher can skip this step if you do not have enough time.)
8. Each group prepares and presents their creative work and explains their journey of creating.

Conclusion

1. Each group presents their works and their journey of work. Teacher should encourage peers to ask or give some comments.
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.

Note

- Teacher should give them a brief explanation of a simple circuit.
- Teacher may show them some food that can replace with a battery such as lemon so that they can imagine using other kinds of food instead of lemon.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 6 Electricity

Time: 8 hours

Strand 2: Physical Science

Standard Sc.2.3

Indicator

Sc.2.3 Gr.3/2 Describe the function of the generator and identify the power source for electricity generation based on data collected.

Sc.2.3 Gr.3/3 Realize the advantages and disadvantages of electricity by offering the guidelines of the use of electricity economically and safely.

Introduction:

Our electricity comes from power stations. There are two groups of energy sources – non-renewable energy source and renewable energy source. Children might notice that they use electrical energy every day and many household appliances use electricity to work.

In this chapter, you will guide students to identify electrical energy uses and how to conserve electric energy.

Learning objectives:

Students will be able to:

- Explain how electrical energy is generated and list the energy sources to generate electricity.
- Search for the information and list types of power stations and their sources to generate electricity.
- Search for the information and generate ideas on how to conserve electricity.
- List safety precautions when using electricity.

Competency:

Thinking capacity, capacity for applying life skills, capacity for technological application

Concept:

- Electricity is produced by generators using a variety of natural resources of energy such as wind energy, water energy and natural gas.
- Electricity is important to everyday life. Electricity not only needs to be used correctly, economically and worthily but safety also has to be taken into consideration.

Start up:

1. Engage students into lesson by asking them:
 - (a) What is energy resource for a clock?
 - (b) What are energy resources for our home appliances?
2. To assess prior knowledge about electricity by asking what students knew (Part K) and what they want to know (Part W) on page 85.

Teaching/Learning activities:

1st – 3rd hours (Sources of energy)

1. Explain what energy sources are. List the examples of energy sources. Refer to page 86.
2. Give more information that the energy sources can be categorized into renewable energy sources and non-renewable energy sources. Refer to page 87.
3. Have students do Let's Try activity on page 88. Then discuss and conclude that wind is also a source of energy.
4. Explain more about how a wind power station works. Refer to page 89.

5. Explain more information about other power stations including hydroelectric, geothermal, fossil-fueled, solar thermal and photovoltaic. Refer to pages 90 to 91.
 - (a) What do they use to generate electricity?
 - (b) How do they work?
6. Assign them to find out why renewable energy sources such as wind, waves and sunlight are not popular to generate electricity. Refer to Let's Find Out on page 92.
7. Let students to do questions on pages 69 and 70 of the Workbook as their homework.

4th – 7th hours (Using electricity)

1. Explain how we use electricity in daily life. Electricity can also be used in many ways. Electrical energy can be changed easily into other forms of energy. Refer to page 93.
2. Discuss and explain how to use electricity safely. Refer to pages 94 to 96.
3. Let them understand that electricity can be dangerous if it is not used with care. We should know safety precautions when we use electricity. Search for more information on how we use electricity safely during a flood. Refer to Let's Know More on page 96.
4. Explain that most of the appliances around us need electricity to function. Therefore, we use a large amount of electricity in our daily lives. So, we should conserve electricity.
5. Carry out Let's Try activity on page 98. Discuss by using the following questions:
 - (a) What can we do to conserve electricity?
 - (b) What are the advantages of saving electricity?
 - (c) Can we, students, save electricity? How?

6. Discuss in class about conserving electricity. Carry out Let's Try activity on page 98, then conclude ways to conserve electricity.
7. Teacher may lead students to discuss reasons for conserving electricity, such as saving money, improving our economy, good for the environment, and enhancing quality of life. Teacher gives more information about the ways to save electricity.

8th hour (Conclusion)

1. End the lesson by answering the questions in Part L column on page 100.
2. Encourage them to watch a video by scanning the QR code on page 100.
3. Enhance students to think about questions that they want to know more about electricity in Part W column on page 101. Teacher may
 - (c) give them some examples of questions if students do not have any ideas.
 - (d) ask the whole class or each group to give some questions if their writing skills are not good enough.
4. Use the Mind Map on page 101 to help students to understand the relationships between all the subtopics learned in this chapter.
5. Have students to do the questions on pages 71 to 76 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3
- Poster of safety precautions when using electricity
- Electricity conservation poster

Assessment:

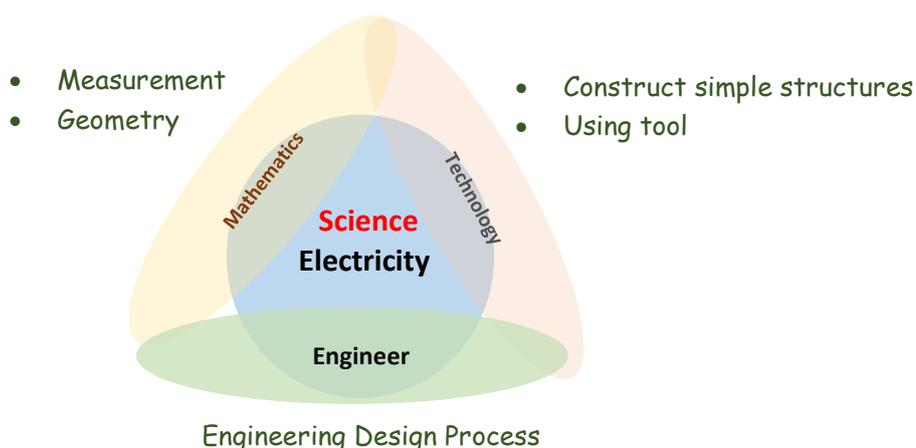
1. Assessing cognitive behavior; test on page 100 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

This activity extends their understanding of the engineering design process that is a series of steps that guides engineering teams as they solve problems. Engineers repeat the steps as many times as needed, making improvements along the way as they learn from failure. So, in this activity students are required to make a pinwheel. They can use their failure from the previous activity to create a better pinwheel by using the engineering design process.

Subject integration



Time: 2 hours

Start up:

1. Lead in lesson by asking the sample questions:
 - (a) What is the engineering design process? What are its steps?
 - (b) Is teamwork important in the engineering design process?
 - (c) What are the advantages of doing in teamwork?

2. Divide students into groups of 3 or 4.

Lesson development:

1. Let students read a situation on page 102. Teacher leads in class by asking these questions:
 - (a) Have you ever done a pinwheel on page 88? How was it?
 - (b) Did it work? Why or why not?
 - (c) What is the weakness of your pinwheel?
 - (d) If you have a chance to improve it, what will you improve?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions.
 - (a) What is the purpose of pinwheels?
 - (b) Did the size of paper relate to pinwheel quality? How?
 - (c) Did pinwheel blade rotate well?
 - (d) Did it move freely?
 - (e) What does pinwheel quality mean?
 - (f) Can you search for more information about pinwheels?
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? (pinwheel rotate well, move freely, etc.)
4. Let students brainstorm and draw their designs including label materials. 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 presents their product and presents their creative work, and explains their journey of creating.

Conclusion:

1. Let students present their work and engage their peers to ask some questions or give some comments or suggestions.
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 The Sun

Time: 10 hours

Strand 3: Earth and Space Science

Standard Sc.3.1

Indicator

Sc.3.1 Gr.3/1 Explain the pattern of direction of the rising and setting of the Sun using empirical evidence.

Sc.3.1 Gr.3/2 Explain the causes of the phenomenon of the rising and setting of the Sun, day and night and setting of directions by using model.

Sc.3.1 Gr.3/3 Realize the importance of the Sun by describing the benefits of the Sun to living organisms.

Introduction:

People on Earth see the Sun appears on one side and fall on the other side every day which rotates in a repetitive pattern.

The Earth is round and rotating around itself at the same time it is moving around the Sun. As the result, when the Sun shines on one side of the globe is day time, while the other side in the dark is night time.

In addition, when people on Earth see the Sun rising on one side; it is defined as the East and see the sun setting on the other side; it is defined as the West. As the East is on our right hand and the West is on our left hand, the front will be the North and the back will be the South.

In day time, the Earth receiving light and heat energy from the Sun enables living things to sustain and survive.

In this chapter, you will guide students to learn about the occurrence of day and night, rising and setting of the Sun and Moon. Students will also learn about directions.

Learning objectives:

Students will be able to:

- Collect data and explain the pattern of direction of the rising and setting of the Sun.
- Describe how day and night occur.
- List the four cardinal directions – North, South, East and West.
- Realize the importance of the Sun.
- Describe the benefits of the Sun to living organisms.

Competency:

Thinking capacity, capacity for applying life skills

Concept:

- The rotation of the Earth causes the occurrence of day and night. The Sun rises in the East and sets in the West.
- The main four directions are North (N), South (S), East (E) and West (W). A compass is a tool that shows us directions.

Start up:

1. Engage students into lesson by asking them:

- (a) Have you ever observe the sky in the early morning?
- (b) What direction that you find the Sun in the morning?
- (c) Does our Earth rotate?
- (d) What differences between day and night?

- (e) How do day and night occur?
2. To assess prior knowledge about the Sun by asking what students knew (Part K) and what they want to know (Part W) on page 104.

Teaching/Learning activities:

1st – 2nd hours (Day and night)

1. Carry out Let's Try activity on page 105 to find out that the Earth spins around itself and causes day and night.
2. Give more additional information about the rotation of the Earth. Refer to page 106.

3rd – 5th hours (Sunrise and sunset)

1. Encourage students to answer the following questions before carry out Let's Try activity on page 107:
 - (a) Does the Sun rise and set in the same directions every day?
 - (b) In the sky is the Sun located in the same position all day long?
 - (c) Does the Sun disappear in the evening?
 - (d) Where is the Sun at night?
 - (e) How can we prove that the sun always rises in the same direction every morning?
2. Carry out Let's Try activity on page 107 to find out that the Sun rises and sets in the same directions every day. Then, teacher gives more details that the Earth rotates around the Sun and at the same time spins around itself from the West to the East. Teacher then adds that the direction where the Sun rises and sets.
3. Carry out Let's Try activity on page 108 to find out the Earth rotates in a counterclockwise direction, that is from the West to the East.

6th – 7th hours (Directions)

1. Teacher asks students some questions:
 - (a) Can we use some tools to find out the direction?
 - (b) What is the purpose of a compass?
 - (c) How does the compass work?
 - (d) How do we use the compass?
 - (e) Does the needle of a compass keep pointing to the same direction?
2. Students discuss and conclude that the needle of a compass keeps pointing to the same direction.
3. Teacher explains more details on how to find out the direction by using the compass.
4. Explain how we can determine the four directions without using a compass but only based on the position of the Sun. Refer to Let's Try on pages 113 and 114. Let a student stand under the Sun and ask him to determine the four directions. Ask students to remember always that the Sun rises from the East and sets in the West.
5. Assign students to apply their knowledge by carrying out Let's Think activity on page 114. Teacher should avoid students from observing the Sun directly. Teacher may
 - (a) give more details about how to observe the Sun safely.
 - (b) tell them or ask them to search for more information on scientists who study the Sun.

8th – 9th hours (The importance of the Sun)

1. Explain that the Sun is important to us. The Sun gives out heat and light. Refer to pages 115 to 117.
2. Ask students to give more examples of the importance of the Sun.

10th hour (Conclusion)

1. End the lesson by answering the questions in Part L column on page 118.
2. Encourage them to watch a video by scanning the QR code on page 118.
3. Enhance students to think about questions that they want to know more about the basic needs of animals and humans in Part W column on page 119. 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. Use the Mind Map on page 119 to help students to understand the relationships between all the subtopics learned in this chapter.
5. Have students to do the questions on pages 81 to 87 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3

Assessment:

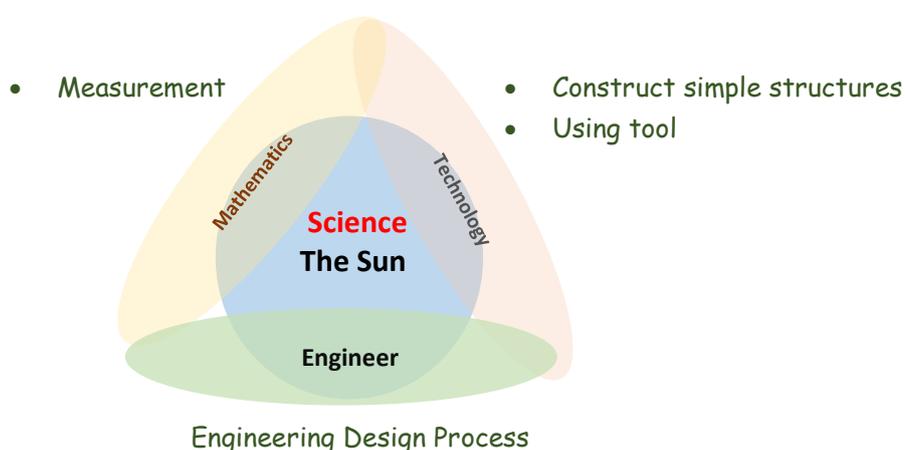
1. Assessing cognitive behavior; test on page 118 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

During daytime, we can dry our things in the Sun. The heat from the Sun helps things to get dried faster. In this chapter, students are required to design and create a fruit dryer. The fruit dryer should be able to keep insects off the fruits. It should be able to dry fruits in less than three days.

Subject integration



Time: 3 hours

Start up:

1. Lead in lesson by asking these sample questions;
 - (a) What is the engineering design process? What are its steps?
 - (b) Is teamwork important in the engineering design process?
 - (c) What are the advantages of doing in teamwork?
2. Divide students into groups of 3 or 4.

Lesson development:

1. Let students read a situation on page 120. Teacher leads in class by asking these questions:
 - (a) What is the average temperature of Thailand?
 - (b) Is it very hot nearly every day?
 - (c) Which part of Thailand almost hot every month?
 - (d) Can we use heat energy from the Sun in our life? What are they?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions.
 - (a) What are the benefits of the Sun to our Earth/living organisms?
 - (b) If we have many harvest product and want to preserve, what should we do?
 - (c) Can we use heat instead of other energy? Is it good energy? Why?
 - (d) What proportion of water in fruits, for instance, banana and mango?
 - (e) What are the reasons to preserve fruit?
 - (f) Is heat from the Sun a good heat resource? Why?
 - (g) How can we preserve fruit without losing any nutrition?
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? (dry fruits in less than three days, etc.)
4. Let students brainstorm and draw their designs including label materials. 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 presents their product and presents their creative work, and explains their journey of creating.

Conclusion:

1. Let students present their work and engage their peers to ask some questions or give some comments or suggestions.

Assessment:

Refer to Scoring Rubric for STEM Activities.

Chapter 8 Air

Time: 8 hours

Strand 3: Earth and Space Science

Standard Sc.3.2

Indicator

Sc.3.2 Gr.3/1 Identify air components, describe the importance of air and the impacts of air pollution on organisms based on collected data.

Sc.3.2 Gr.3/2 Realize the importance of air by presenting the practices in reducing air pollution.

Sc.3.2 Gr.3/3 Explain the wind based on empirical evidence.

Sc.3.2 Gr.3/4 Describe the advantages and disadvantages of wind according to collected data.

Introduction:

Our Earth is surrounded by a layer of air which is called as atmosphere. Air is a mixture of different gases including nitrogen, oxygen, carbon dioxide and noble gases. Other components of air are water vapor, dust and microorganisms. Air moves from the cool place to the warm place. Moving air is called wind.

In this chapter, you will guide students to learn about components of air and importance of air. Students will also learn about the movement of air.

Learning objectives:

Students will be able to:

- Explain the composition of air.
- State the importance of air
- Identify the causes of air pollution.

- Describe the advantages and disadvantages of wind.

Competency:

Thinking capacity, capacity for applying life skills

Concept:

- Components of air are nitrogen, oxygen, carbon dioxide, noble gases, and other components such as water vapor, dust and microorganisms.
- Air is an important factor in the process of living things.
- Air move horizontally from areas of lower temperatures to areas of higher temperatures.

Start up:

1. Lead students to lesson by asking:
 - (a) What are essentials factors for living things?
 - (b) Can living things stay alive without air?
2. To assess prior knowledge about air by asking what students knew (Part K) and what they want to know (Part W) on page 122.

Teaching/Learning activities:

1st – 2nd hours (Components of air)

1. Challenge students by asking:
 - (a) Where is air? How do you know?
 - (b) Which gas has the highest percentage in the air?
2. Explain what air is. Air is a mixture of different gases. Refer to pages 123 to 125.
3. Teacher may compare the components of air by the pie graph on page 123.

3rd hour (Importance of air)

1. Ask some questions:
 - (a) Is air important for living things?
 - (b) What will happen if we have to stay without air?
2. Then explain the importance of air. Besides we use air for breathing, air has many other uses. Refer to pages 126 and 127.

4th – 5th hours (Air pollution)

1. Engage by asking questions before carry out Let's Try activity on page 128. Students should conclude that living things need fresh and clean air to survive. Air pollution occurs when the air contains unwanted and harmful gases, dust particles, smoke or chemicals in large quantities. This causes the air to become contaminated and harmful to humans, animals and plants.
2. Lead to discuss in class about the causes of air pollution.
3. Teacher may state the air pollution status in Thailand about PM 2.5 dust in the atmosphere based on the report of the Pollution Control Department.
4. Explain more about causes and effects of air pollution, and how to reduce air pollution. Refer to pages 129 to 132.

6th – 7th hours (Movement of air)

1. Engage by asking questions before carry out Let's Try activity on page 133:
 - (a) Can the air move? How do you know?
 - (b) What causes air to move?
 - (c) Do air temperatures change or not? How do you know?
 - (d) What do you feel when air around you move?
2. Carry out Let's Try activity on page 133. Teacher can use the following questions to lead to a conclusion:

- (a) Is the temperature between two sides of jar same or different?
 - (b) What is the direction of the movement of the smoke? Where does it move to?
 - (c) What is our conclusion?
3. Teacher explains more details about the movement of air. Refer to pages 134 to 136.

8th hour (Conclusion)

1. End the lesson by answering the questions in Part L column on page 137.
2. Encourage them to watch a video by scanning the QR code on page 137.
3. Enhance students to think about questions that they want to know more about the basic needs of animals and humans in Part W column on page 138. 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. Use the Mind Map on page 138 to help students to understand the relationships between all the subtopics learned in this chapter.
5. Have students to do the questions on pages 92 to 94 of the Workbook as their homework.

Learning materials:

- Primary Education Smart Plus Textbook Science Prathomsuksa 3
- Primary Education Smart Plus Workbook Science Prathomsuksa 3

Assessment:

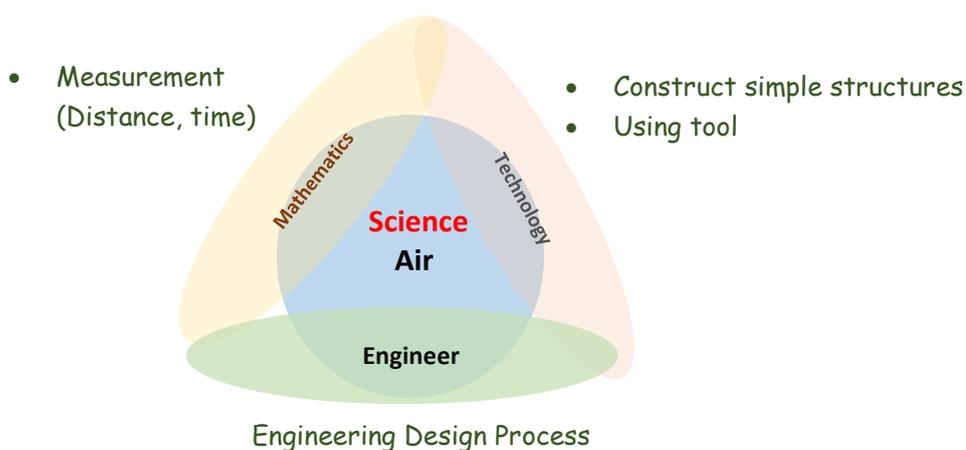
1. Assessing cognitive behavior; test on page 137 (Part L).
2. Assessing affective behavior (refer to Scoring Rubric for Affective Domain).
3. Assessing thinking process (refer to Scoring Rubric for Scientific Thinking).

STEM Activity

Overview

Wind can make things move. Wind is used in many human activities. In this activity, students are required to design and create a racing car that depends on wind to move and then race in class.

Subject integration



Time: 3 hours

Start up:

1. Review about the engineering design process and technology by asking some of these sample questions:
 - (a) Can you give some examples of tools which humans create for our convenience life?
 - (b) Why do we create something in our daily life such as magnifier glass and air conditioner?
2. Divide students into groups of 3 or 4.

Lesson development:

1. Let students read a situation on page 139. Then, 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) How do we know that your car moves fast or not?
2. Enhance students to explore and make connections between science, technology, engineering and mathematics by posing the following questions.
 - (a) What are the advantages of the wind?
 - (b) Can vehicle move because of the wind?
 - (c) What vehicle can move because of the wind?
 - (d) What characteristics of the vehicle that move because of the wind? Weight?
 - (e) What materials should we choose? Why?
 - (f) How do we measure the distance? What tools can we use to measure it?
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, etc.)
4. Let students brainstorm and draw their designs including label materials. 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 presents their product and presents their creative work, and explains their journey of creating.

Conclusion:

1. End the lesson by asking each group presents their works and their journey of creating. Teacher should encourage peers to ask or give some comments.

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