KEMENTERIAN
PENDIDIKAN
MALAYSIA

KURIKULUM STANDARD SEKOLAH RENDAH

Sains

Dokumen Standard Kurikulum dan Pentaksiran

Tahun 5

(EDISI BAHASA INGGERIS)

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(Edisi Bahasa Inggeris)

Bahagian Pembangunan Kurikulum

APRIL 2019

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RUKUN NEGARA

BAHAWASANYA Negara kita Malaysia mendukung cita-cita hendak:
Mencapai perpaduan yang lebih erat dalam kalangan seluruh masyarakatnya;
Memelihara satu cara hidup demokratik;
Mencipta satu masyarakat yang adil di mana kemakmuran negara
akan dapat dinikmati bersama secara adil dan saksama;
Menjamin satu cara yang liberal terhadap tradisi-tradisi
kebudayaannya yang kaya dan berbagai corak;
Membina satu masyarakat progresif yang akan menggunakan
sains dan teknologi moden;

MAKA KAMI, rakyat Malaysia, berikrar akan menumpukan seluruh tenaga dan usaha kami untuk mencapai cita-cita tersebut berdasarkan atas prinsip-prinsip yang berikut:

KEPERCAYAAN KEPADA TUHAN
KESETIAAN KEPADA RAJA DAN NEGARA
KELUHURAN PERLEMBAGAAN
KEDAULATAN UNDANG-UNDANG
KESOPANAN DAN KESUSILAAN

FALSAFAH PENDIDIKAN KEBANGSAAN

“Pendidikan di Malaysia adalah suatu usaha berterusan ke arah lebih memperkembangkan potensi individu secara menyeluruh dan bersepadu untuk melahirkan insan yang seimbang dan harmonis dari segi intelek, rohani, emosi dan jasmani, berdasarkan kepercayaan dan kepatuhan kepada Tuhan. Usaha ini adalah bertujuan untuk melahirkan warganegara Malaysia yang berilmu pengetahuan, berketerampilan, berakhlak mulia, bertanggungjawab dan berkeupayaan mencapai kesejahteraan diri serta memberikan sumbangan terhadap keharmonian dan kemakmuran keluarga, masyarakat dan negara”

Sumber: Akta Pendidikan 1996 (Akta 550)

DEFINISI KURIKULUM KEBANGSAAN

3. Kurikulum Kebangsaan

(1) Kurikulum Kebangsaan ialah suatu program pendidikan yang termasuk kurikulum dan kegiatan kokurikulum yang merangkumi semua pengetahuan, kemahiran, norma, nilai, unsur kebudayaan dan kepercayaan untuk membantu perkembangan seseorang murid dengan sepenuhnya dari segi jasmani, rohani, mental dan emosi serta untuk menanam dan mempertingkatkan nilai moral yang diingini dan untuk menyampaikan pengetahuan.

Sumber: Peraturan-Peraturan Pendidikan (Kurikulum Kebangsaan) 1997
[PU(A)531/97.]

FALSAFAH PENDIDIKAN SAINS KEBANGSAAN

Selaras dengan Falsafah Pendidikan Kebangsaan, pendidikan sains di Malaysia memupuk budaya Sains dan Teknologi dengan memberi tumpuan kepada perkembangan individu yang kompetitif, dinamik, tangkas dan berdaya tahan serta dapat menguasai ilmu sains dan keterampilan teknologi.

Sumber: Kementerian Sains, Teknologi dan Inovasi (MOSTI)

KATA PENGANTAR

Kurikulum Standard Sekolah Rendah (KSSR) yang dilaksanakan secara berperingkat mulai tahun 2011 telah disemak semula bagi memenuhi dasar baharu di bawah Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025 supaya kualiti kurikulum yang dilaksanakan di sekolah rendah setanding dengan standard antarabangsa. Kurikulum berasaskan standard yang menjadi amalan antarabangsa telah dijelmakan dalam KSSR menerusi penggubalan Dokumen Standard Kurikulum dan Pentaksiran (DSKP) untuk semua mata pelajaran yang mengandungi Standard Kandungan, Standard Pembelajaran dan Standard Prestasi.

Usaha memasukkan standard pentaksiran di dalam dokumen kurikulum telah mengubah lanskap sejarah sejak Kurikulum Kebangsaan dilaksanakan di bawah Sistem Pendidikan Kebangsaan. Menerusinya murid dapat ditaksir secara berterusan untuk mengenal pasti tahap penguasaannya dalam sesuatu mata pelajaran, serta membolehkan guru membuat tindakan susulan bagi mempertingkatkan pencapaian murid.

DSKP yang dihasilkan juga telah menyepadukan enam tunjang Kerangka KSSR, mengintegrasikan pengetahuan, kemahiran dan nilai, serta memasukkan secara eksplisit Kemahiran Abad Ke-21 dan Kemahiran Berfikir Aras Tinggi (KBAT).

Penyepaduan tersebut dilakukan untuk melahirkan insan seimbang dan harmonis dari segi intelek, rohani, emosi dan jasmani sebagaimana tuntutan Falsafah Pendidikan Kebangsaan.

Bagi menjayakan pelaksanaan KSSR, pengajaran dan pembelajaran guru perlu memberi penekanan kepada KBAT dengan memberi fokus kepada pendekatan Pembelajaran Berasaskan Inkuiri dan Pembelajaran Berasaskan Projek, supaya murid dapat menguasai kemahiran yang diperlukan dalam abad ke-21.

Kementerian Pendidikan Malaysia merakamkan setinggi-tinggi penghargaan dan ucapan terima kasih kepada semua pihak yang terlibat dalam penggubalan KSSR. Semoga pelaksanaan KSSR akan mencapai hasrat dan matlamat Sistem Pendidikan Kebangsaan.

Dr. MOHAMED BIN ABU BAKAR
Pengarah
Bahagian Pembangunan Kurikulum
Kementerian Pendidikan Malaysia

INTRODUCTION

The Standard-Based Curriculum for Primary School (KSSR) for Science is designed to develop science literacy by providing basic knowledge of science for pupils to become science literate through the understanding of basic science concepts around the pupils to enable them to pursue Science education at secondary level.

Science KSSR is designed to produce individuals who are intellectually, spiritually, emotionally and physically balanced as articulated in the National Education Philosophy. Hence, Standard-Based Curriculum and Assessment Document (DSKP) is designed by integrating 21st Century Skills to enable pupils to compete globally.

Knowledge, skills and values that are inculcated in the primary school science curriculum provide meaningful learning for pupils by taking into consideration their cognitive level and surroundings. Hence, the interest to learn science can be nurtured from the early stage of schooling, to be developed and enhanced at secondary level.

Science subjects at secondary level are designed to produce pupils who are science literate, innovative, and able to apply scientific knowledge, make decisions and solve problems in real life. These subjects also provide opportunities for pupils who are scientifically inclined to pursue their studies in the fields of Science, Technology, Engineering and Mathematics (STEM) at tertiary level.

Benchmarking of the science curriculum was done with high performing countries in international assessments to ascertain that the science curriculum is relevant and equivalent with other countries in the world.

In moving towards becoming a developed country, Malaysia needs to create a scientific, progressive, innovative, and foresighted community that do not only utilise the latest technologies but can also contribute to the future establishment of technological and scientific civilisation. In order to achieve this aspiration, we need to foster critical, creative and competent citizens who practise the culture of science and technology.

AIMS

Science KSSR is designed to instil interest and develop pupils' creativity through experiences and investigations in acquiring science knowledge, scientific skills, thinking skills as well as scientific attitudes and noble values.

OBJECTIVES

Science KSSR enables pupils to achieve the following objectives:

1. Using the inquiry approach to fulfil their curiosity to gain new knowledge by exploring the world around them.
2. Applying scientific skills and thinking skills critically and creatively to explain phenomenon scientifically.
3. Acquiring more abstract and complex knowledge on science facts and concepts.
4. Applying knowledge, skills and values critically, creatively and analytically in making decisions, solving problems and inventing.
5. Cultivating scientific attitudes and noble values in life.
6. Demonstrating responsive attitudes towards preserving the environment to face challenges at local, national and global levels.

FRAMEWORK OF THE STANDARDS-BASED CURRICULUM FOR PRIMARY SCHOOL (KSSR)

KSSR is designed based on six strands, which are Communication; Spiritual, Attitudes and Values; Humanity; Personal Competence; Physical Development and Aesthetics; and Science and Technology. The six strands are the main domain which support each other and are integrated with critical, creative and innovative thinking. This integration aims to develop the human capital who treasures noble values based on religion, is knowledgeable, is competent and is able to think critically, creatively and innovatively as illustrated in Figure 1. Science Curriculum is designed based on six strands of KSSR Framework.

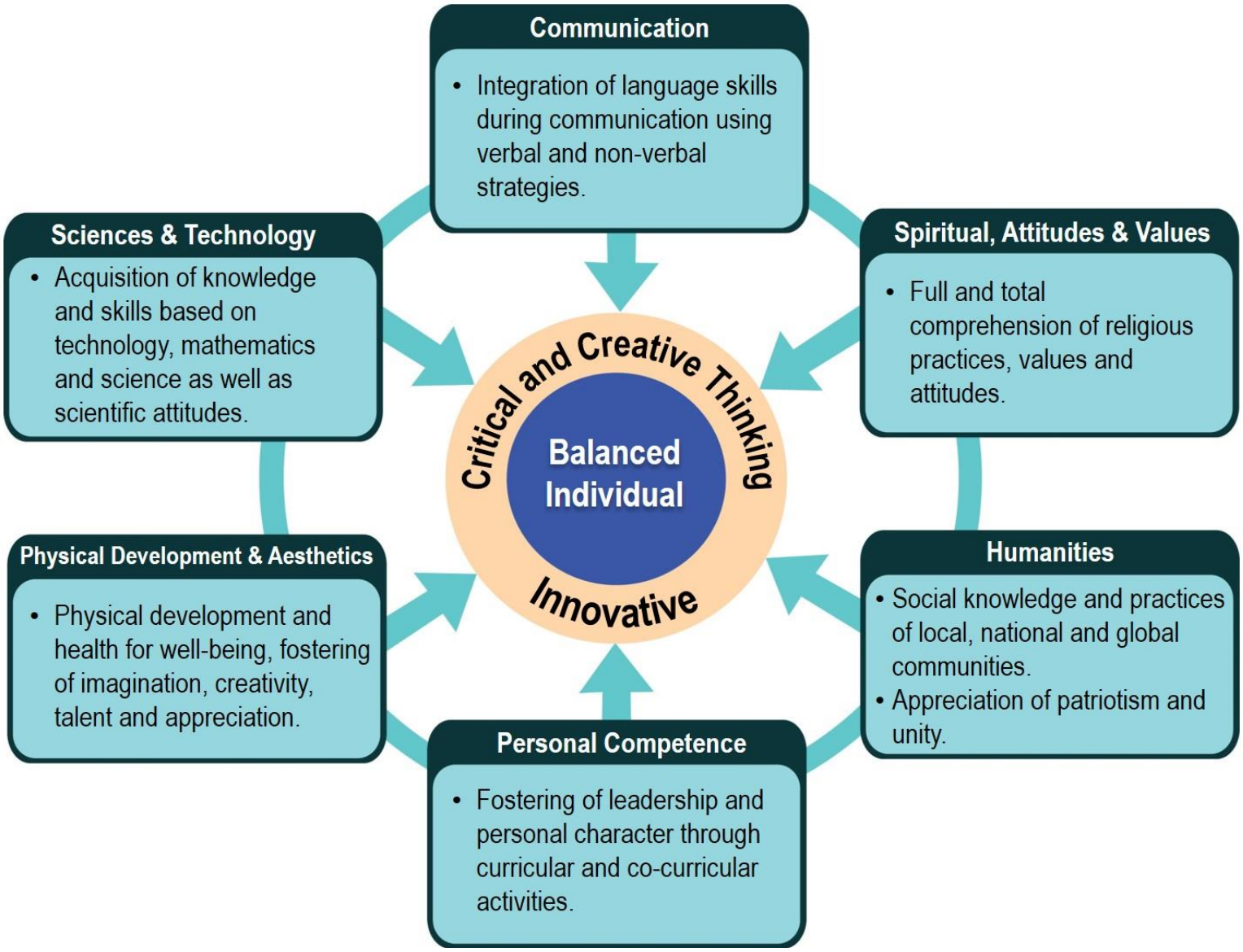


Figure1: Framework of the Standard-Based Curriculum for Primary School

FOCUS

Science KSSR focuses on thoughtful learning involving scientific and thinking skills for the acquisition of knowledge through inquiry as the main approach in science education. The science curriculum also aims to prepare pupils to face the rapid technological development and various challenges in the 21st century. Pupils who undergo this curriculum will become the human resources in the field of science and technology that will contribute towards national development.

Science KSSR is developed based on three domains; knowledge, skills and values. These three domains are being experienced by pupils through inquiry method to produce thoughtful science individuals (Figure 2). The inquiry approach includes pupil-centred learning, constructivism, contextual learning, problem-based learning, mastery learning, as well as, related strategies and methods.

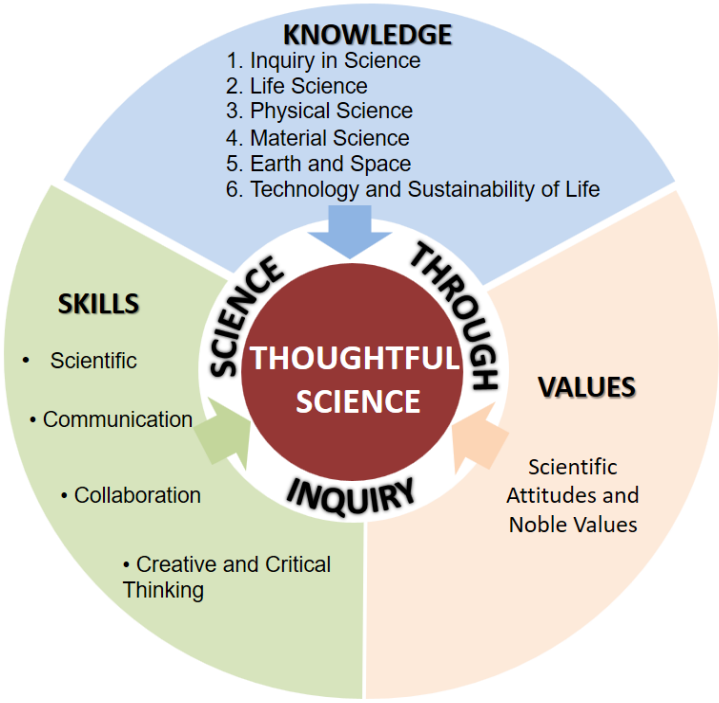


Figure 2: The Conceptual Framework for Science Curriculum

Thoughtful Science

Thoughtful science refers to the quality of pupils intended to be produced by the national science education system. Thoughtful science pupils can understand scientific ideas and are able to communicate using scientific language. Therefore, pupils will be able to evaluate as well as apply knowledge and scientific skills sensibly in daily life based on scientific attitudes and noble values. Thoughtful science also intends to produce creative and critical individuals to fulfil the needs of the 21st century, where the competence of the country is highly dependent on the ability of human capitals that can think critically and creatively, generate ideas and solve problems.

Thoughtful Learning

Thoughtful learning is achieved when pupils are actively involved in the teaching and learning process. In this process, the teaching and learning activities are planned to elicit ideas and encourage pupils to conceptualise, solve problems and make decisions. Therefore, thinking skills are indirectly inculcated among pupils.

Thinking skills can be categorised into critical and creative thinking. Pupils who think critically always evaluate ideas systematically before accepting them. Pupils who think creatively are highly imaginative, can generate genuine ideas, and innovate existing ideas as well as products. Thinking strategy is a higher level of thinking process that involves several steps. Each step requires critical and creative thinking skills. Thinking strategy is the final aim of the thinking process.

Critical Thinking Skills

Critical thinking skills are the ability to evaluate an idea logically and rationally to make a fair consideration by using reasons and reliable evidences. A brief description of each critical thinking skill is shown in Table 1.

Table 1: Critical Thinking Skills

CRITICAL THINKING SKILLS	DESCRIPTION
Attributing	Identifying criterias such as characteristics, features, qualities and elements of a concept or an object.
Comparing and Contrasting	Finding similarities and differences based on criteria such as characteristics, features, qualities and elements of an object or event.
Grouping and Classifying	Separating and grouping objects or phenomena into groups based on certain criteria such as characteristics, features. Grouping according to common characteristics or features.
Sequencing	Arranging objects and information in an orderly based on the quality or quantity of common characteristics or features such as size, time, shape or number.
Prioritising	Arranging objects or information in an orderly manner based on their importance or priority.
Analysing	Processing information in detail by breaking it down into smaller parts to understand concepts or events as well as to find the implicit meanings.
Detecting Bias	Detecting views or opinions that have the tendency to support or oppose something.
Evaluating	Making considerations and decisions using knowledge, experiences, skills and values, and giving justifications.
Making Conclusions	Making a statement about the outcome of an investigation based on a hypothesis.

Creative Thinking Skills

Creative thinking skills are the ability to produce or create something new and valuable by using genuine imagination and unconventional thinking. A brief description of each creative thinking skill is as shown in Table 2.

Table 2: Creative Thinking Skills

CREATIVE THINKING SKILLS	DESCRIPTION
Generating Ideas	Producing ideas related to something.
Relating	Making connections in certain situations or events to find a structure or pattern of a relationship.
Making Inferences	Using data collection and previous experience to conclude and explain events.
Predicting	Making forecast about events based on observations and previous experiences or reliable data.
Making Generalisations	Making general statement on certain mattersfor a group based on observations on samples or some information from the group.
Inventing	Producing something new or modifying something already in existence to overcome problems in a systematic manner.
Visualising	Forming perceptions or making mental images about a particular idea, concept, situation or vision.
Synthesising	Combining separate elements to produce an overall picture in the form of writing, drawing and artefact.

CREATIVE THINKING SKILLS	DESCRIPTION
Making Hypotheses	Making a general statement about the relationship between the manipulative and responding variables to explain an observation or event. The statement can be tested to determine its validity.
Making Analogies	Forming an understanding about a complex or an abstract concept by relating it to simple or concrete concepts with similar characteristics.

Thinking Strategies

Thinking strategies are ways of thinking that are structured and focused to solve problems. Description of each thinking strategy is as shown in Table 3.

Table 3: Thinking Strategies

THINKING STRATEGIES	DESCRIPTION
Conceptualizing	Making generalisations towards construction of meaning, concept or model based on inter-related specific common characteristics.
Making Decisions	Selecting the best solution from several alternatives based on specific criteria to achieve the intended aims.
Problem Solving	Finding the right solutions systematically for uncertain or challenging situations or unforeseen circumstances.

Besides thinking skills and thinking strategies, reasoning skill is also another priority. **Reasoning** is a skill used in making logical, rational and fair consideration. Mastery of critical and creative thinking skills and thinking strategies is easier if an individual is able to provide reasoning in inductive and deductive manners. Figure 3 gives an overall picture of the Thinking Skills and Thinking Strategies (TSTS).

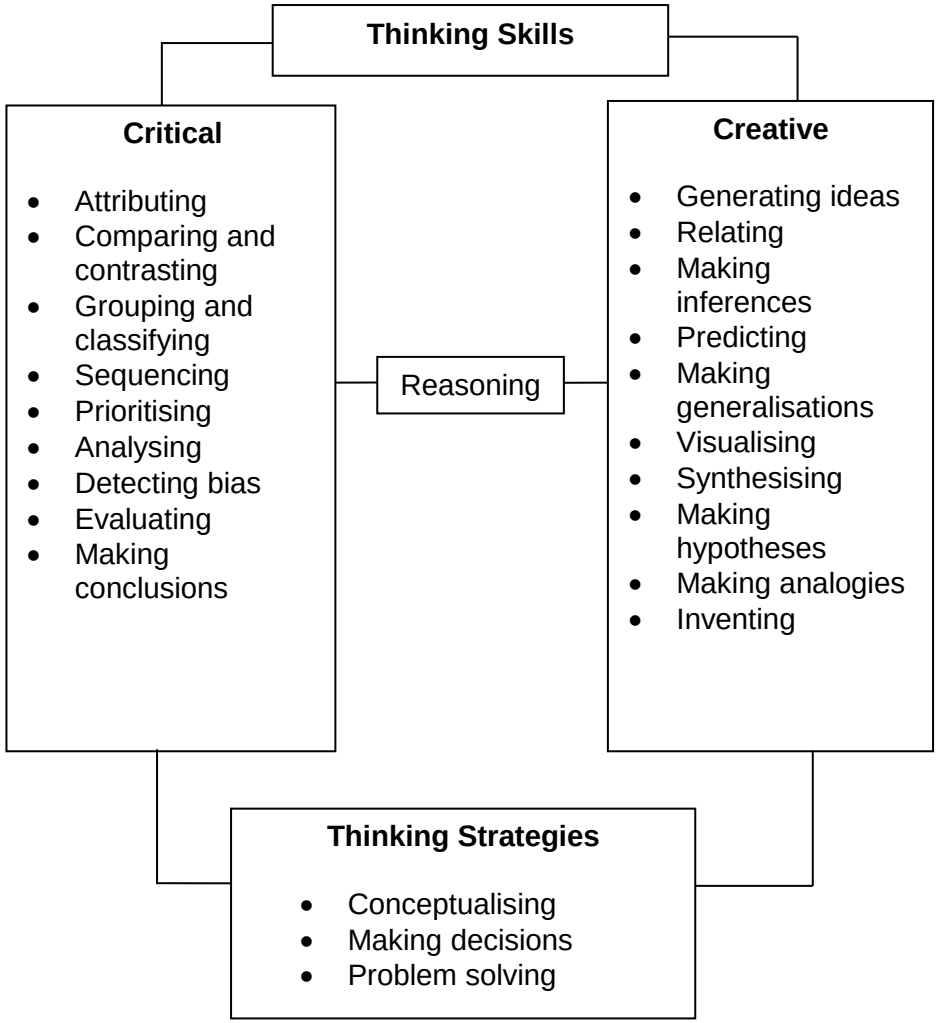


Figure 3: TSTS Model in Science

Mastery of Thinking Skills and Thinking Strategies (TSTS) through the teaching and learning of science can be developed through the following stages:

1. Introducing TSTS;
2. Practising TSTS with teacher's guidance;
3. Practising TSTS without teacher's guidance;
4. Applying TSTS in new situations and developing it with teacher's guidance; and
5. Using TSTS together with other skills to accomplish thinking tasks.

Further information about the stages of the implementation of TSTS can be referred in the guidebook "*Buku Panduan Penerapan Kemahiran Berfikir dan Strategi Berfikir dalam Pengajaran dan Pembelajaran Sains"* published by Curriculum Development Centre in 1999.

Scientific Skills

Science KSSR emphasises on inquiry method and problem solving. In the process of inquiry and solving problems, scientific skills and thinking skills are applied. Scientific skills are essential skills to carry out activities using scientific methods such as conducting experiments and projects. Scientific skills consist of science process skills and manipulative skills.

Science Process Skills

Science Process Skills (SPS) are skills that are required to find solutions to problems or make decisions systematically. They are mental processes that enhance creative, analytical and systematic thinking. Mastery of Science Process Skills together with suitable attitudes and knowledge ensures pupils think effectively. Description of each SPS is shown in Table 4.

Table 4: Science Process Skills

SCIENCE PROCESS SKILLS	DESCRIPTION
Observing	Using the sense of sight, hearing, touch, taste or smell to gather information about objects and phenomena.
Classifying	Through observations to group objects or phenomena according to similarities and differences.

SCIENCE PROCESS SKILLS	DESCRIPTION
Measuring and Using Numbers	Making quantitative observations using numbers and tools with standard units. Measurement makes observations more precise.
Making Inferences	Using data collection and previous experiences to conclude and explain events.
Predicting	Making forecast about events based on observations and previous experiences or reliable data.
Communicating	Using words or graphic symbols such as tables, graphs, diagrams or models to describe an action, object or event.
Using Space-Time Relationship	Describing changes in parameters with time such as location, direction, shape, size, volume, weight and mass.

SCIENCE PROCESS SKILLS	DESCRIPTION
Interpreting Data	Giving rational explanations about an object, event or pattern from the collected data.
Defining Operationally	Defining concepts by describing what must be done and observed.
Controlling Variables	Identifying manipulated variables, responding variables and constant variables. In an investigation, a variable is manipulated to observe its relationship with the responding variable. At the same time, the other variables are kept constant.
Making Hypothesis	Making a general statement about the relationship between the manipulated variable and responding variable to explain an observation or event. The statement can be tested to determine its validity.

SCIENCE PROCESS SKILLS	DESCRIPTION
Experimenting	Planning and conducting an investigation to test a hypothesis, collecting and interpreting data until a conclusion can be obtained.

Manipulative Skills

In a scientific investigation, manipulative skills are psychomotor skills that enable pupils to:

- Use and handle science apparatus and substances correctly;
- Handle specimens correctly and carefully;
- Sketch science specimens, substances and apparatus correctly;
- Clean science apparatus using correctly; and
- Store science apparatus and substances correctly and safely.

Science laboratory or science room is an essential infrastructure for the implementation of scientific investigations or experiments to help pupils achieve the desired performance standards. The use of the science laboratory or science room requires systematic and clear procedures to ensure the smooth process of teaching and learning as well as to ensure the safety of the users. Rules of the science laboratory or science room should be disclosed to pupils so that the concept of compliance with the rules of the science laboratory or science room can be cultivated.

Relationship between Science Process Skills and Thinking Skills

The mastery of SPS requires pupils to master the relevant thinking skills. The thinking skills that are related to each SPS is shown in Table 5.

Table 5: Relationship between Science Process Skills and Thinking Skills

SCIENCE PROCESS SKILLS	THINKING SKILLS
Observing	Attributing Comparing and contrasting Relating
Classifying	Attributing Comparing and contrasting Grouping and classifying

SCIENCE PROCESS SKILLS	THINKING SKILLS
Measuring and Using Numbers	Relating Comparing and contrasting
Making Inferences	Relating Comparing and contrasting Analysing Making Inferences
Predicting	Relating Visualising
Using Space-Time Relationship	Sequencing Prioritising
Interpreting data	Comparing and contrasting Analysing Detecting bias Making conclusions Making Generalisations Evaluating
Defining operationally	Relating Making analogies Visualising Analysing

SCIENCE PROCESS SKILLS	THINKING SKILLS
Controlling variables	Attributing Comparing and contrasting Relating Analysing
Making hypothesis	Attributing Relating Comparing and contrasting Generating ideas Making hypotheses Predicting Synthesising
Experimenting	All thinking skills
Communication	All thinking skills

Teaching and Learning Based on Thinking Skills and Scientific Skills

This Science Curriculum focuses on thoughtful learning based on thinking skills and scientific skills. In this curriculum, the intended learning standard is written by integrating acquisition of knowledge with mastery of thinking skills and scientific skills. Thus in teaching and learning, teachers need to emphasise the mastery of skills with acquisition of knowledge as well as the inculcation of scientific attitudes and noble values.

The explicit implementation of SPS in science, encompasses intended skills in the 21st century and indirectly encourages and develops pupils' higher order thinking skills.

Science Process Skills Standards

Science process skills standards for each level of schooling are general suggestions that must be achieved by pupils. Each statement refers to the minimum standard that must be achieved according to their level of schooling and operational cognitive development. SPS at primary school level are explicitly stated as learning standards that must be mastered as a foundation before they further their studies at secondary level. Performance standards for SPS in primary schools are stated in detail in order to assist teachers to determine the development in mastering the skills. The suggested science process standards from primary to secondary schools are shown in Table 6.

Table 6: Science Process Skills Standards

NO.	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1-3)	LEVEL 2 (YEAR 4-6)	LEVEL 3 (FORM 1-3)	LEVEL 4 (FORM 4-5)
1	Observing	Use limbs and all the senses involved to make observations about the phenomena or changes that occur.	Use all the senses involved to make qualitative observations with the appropriate tools to explain phenomena or changes that occur.	• Make accurate and relevant qualitative and quantitative observations to identify patterns or sequences of objects or phenomena. • Use suitable complex equipment for making observations proficiently.	• Make qualitative and quantitative observations to make generalisations based on a pattern or sequence of an object or phenomenon. • Present further findings based on observations of objects or phenomena analytically and specifically.
2	Classifying	Collect/ isolate evidences/ data/ objects/ phenomena based on the observed characteristics.	Compare/ identify similarities and differences based on common characteristics.	Compare/ identify similarities and differences to determine the criteria of selection to categorise evidences/ data/ objects/the phenomenon being studied.	Identify characteristics used to differentiate, collect, select and explain in more detail about the object or phenomenon being studied.

NO.	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1-3)	LEVEL 2 (YEAR 4-6)	LEVEL 3 (FORM 1-3)	LEVEL 4 (FORM 4-5)
3	Measuring and using numbers	Measure with the correct tool and in the correct standard unit.	Measure with the correct tooland in the correct standard unit using the right technique.	• Measure with the correct tool and standard unit with the right technique and record systematically and in a complete way. • Change the base units correctly. • Use the correct derivative units.	• Demonstrate how measurements are taken using the correct tool and standard unit with the right technique and record in a table systematically and in a complete way. • Use more complex derivative units correctly.
4	Making inferences	Give a reasonable explanation for an observation.	Make an initial conclusion or reasonable explanation for an observation using the information obtained.	Create more than one initial conclusion that are reasonable for an event or observation using the information obtained.	• Generate a variety of possibilities to explain complex situations. • Explain the relationship or pattern between observed variables with measurements used for an investigation.

NO.	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1-3)	LEVEL 2 (YEAR 4-6)	LEVEL 3 (FORM 1-3)	LEVEL 4 (FORM 4-5)
5	Predicting	Describe a possible outcome for an event or data.	Make a reasonable assumption of an event based on observations, previous experiences or data.	Able to analyse trends/ flows/ simple developments based on the data obtained to predict the future state of objects or phenomena.	• Pupils can analyse trends/ flows/ simple developments based on the data obtained to predict the future state of an object or phenomenon. • Prediction made can be tested.
6	Communicating	Record information or ideas in any form.	Record information or ideas in a suitable form and present the information or the ideas systematically.	Able to present the results of an experiment or observed data in various forms such as simple graphics, pictures or tables.	Able to present the results of an experiment or observed data in various forms such as graphic, pictures or tables that are more complex to show the relations between the patterns.

NO.	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1-3)	LEVEL 2 (YEAR 4-6)	LEVEL 3 (FORM 1-3)	LEVEL 4 (FORM 4-5)
7	Using space-time relationships	(Not explicitly stated as a Learning Standard)	Arrange occurrences of a phenomenon or an event in chronological order based on time.	• Arrange occurrences of a phenomenon or an event in chronological order based on time. • Interpret and explain the meaning of mathematical relationships.	Use, analyse and interpret numbers and numerical relationships efficiently during problem solving and conducting investigations.
8	Interpreting data	(Not explicitly stated as a Learning Standard)	Select relevant ideas about objects, events or patterns on the data to make an explanation.	Give explanations rationally by making an intrapolation or an extrapolation of the data collected.	• Analyse data and suggest improvements. • Identify and explain the anomalies in the set of data obtained.
9	Defining operationally	(Not explicitly stated as a Learning Standard)	Describe an interpretation of what is carried out and observed in a situation according to a particular aspect.	Describe the most appropriate interpretation of a concept by stating what is carried out and observed for a situation.	Explain the interpretation made about the selection of instruments or methods on what is observed.

NO.	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1-3)	LEVEL 2 (YEAR 4-6)	LEVEL 3 (FORM 1-3)	LEVEL 4 (FORM 4-5)
10	Controlling variables	(Not explicitly stated as a Learning Standard)	Determine the responding and constant variable after the manipulated variable is determined in an investigation.	Determine all variables such as responding variable, manipulated variable and constant variable.	Change the constant variable to the manipulated variable and state the new responding variable.
11	Making hypothesis	(Not explicitly stated as a Learning Standard)	Make a general statement that can be tested, on the relationship between the variables in an investigation.	Form a relationship between the manipulated variable and responding variable, to form a hypothesis that can be tested.	Describe an expected result of the scientific investigation designed.
12	Experimenting	(Not explicitly stated as a Learning Standard)	Conduct an experiment, collect data, interpret the data and summarise to prove the hypothesis and make a report.	Conduct an experiment, make a hypothesis, design the method, select appropriate apparatus, collect data, carry out analysis, make a conclusion and write a report.	Trigger new problems and design an experiment to test the new hypothesis of the triggered problems.

Scientific Attitudes and Noble Values

Positive attitudes and values can be nurtured in pupils through the science learning experience. Positive attitudes and values are as follows:

- Having interest and curiosity towards the environment;
- Being responsible about the safety of themselves, others and the environment;
- Being honest and accurate in recording and validating data;
- Being diligent and persevere
- Having critical and analytical thinking;
- Being flexible and open-minded;
- Being kind-hearted and caring;
- Being objective;
- Being ethical and systematic;
- Being cooperative;
- Being fair and just;
- Dare to try;
- Thinking rationally;
- Being confident and independent;
- Good in time management;
- Appreciating the balance of nature;
- Being respectful and well-mannered;
- Appreciating the contribution of science and technology;
- Realising that science is a means to understand nature;
- Appreciating and practising clean and healthy living; and
- Being thankful to God.

In general, scientific attitudes and noble values are inculcated through the following stages:

- Understanding and being aware of the importance and needs of scientific attitudes and noble values;
- Giving attention to attitudes and noble values; and
- Internalising and practising scientific attitudes and noble values.

Proper planning is required to optimise the inculcation of scientific attitudes and noble values during science lessons. Before starting a lesson, a teacher should go through all learning outcomes in the related content standards including the learning standards which contain the inculcation of scientific attitudes and noble values.

21st CENTURY SKILLS

The KSSR also aims to produce pupils with 21st century skills, focusing on thinking and living skills as well as able to inculcate noble values in their careers. The 21st century skills aim to produce globally competitive pupils with the characteristics stated in the pupils' profile as shown in Table 7. The mastery of the Content Standard (CS) and Learning Standard (LS) in Science curriculum contributes to the acquisition of the 21st century skills among pupils.

Table 7: Pupils' Profile

PUPIL PROFILE	DESCRIPTION
Resilient	Able to face and overcome difficulties and challenges with wisdom, confidence, tolerance and empathy.
Communicator	Able to voice out and express their thoughts, ideas and information confidently and creatively in verbal and written form, using a variety of media and technology.
Thinker	Able to think critically, creatively and innovatively; solve complex problems and make ethical decisions. Think about learning and about being learners themselves. Generate questions and are receptive towards perspectives, values and individual traditions and society. Confident and creative in handling new learning areas.
Teamwork	Cooperate effectively and harmoniously with others. Share collective responsibility while respecting and appreciating the contributions of each member in the team. Acquire interpersonal skills through collaborative activities, which in turn mould them into better leaders and team members.

PUPIL PROFILE	DESCRIPTION
Curious	Develop natural curiosity to explore strategies and new ideas. Learn skills that are needed to carry out inquiry and research, as well as display independent traits in learning. Enjoy continuous life-long learning experiences.
Principled	Honest and have integrity, equality, fair and respect the dignity of individuals, group and community. Responsible for their actions, consequences and decisions.
Informative	Knowledgeable and form a wide understanding which is balanced across various disciplines. Explore knowledge on local and global issues effectively and efficiently. Understand ethical issues/ laws related to the information gained.
Caring/ Concern	Show empathy, compassion and respect towards needs and feelings of others. Committed to serve the society and ensure sustainability of nature.
Patriotic	Portray love, support and respect towards the country.

HIGHER ORDER THINKING SKILLS

Higher Order Thinking Skills (HOTS) are explicitly stated in the curriculum to enable teachers to incorporate in teaching and learning. These will stimulate structured and focused thinking among pupils. Description of HOTS focuses on four levels of thinking as shown in Table 8.

Table 8: Thinking levels in HOTS

THINKING LEVEL	DESCRIPTION
Applying	Using knowledge, skills and values to take actions in different situations.
Analysing	Breaking down information into smaller parts to enhance understanding and make relationship between the parts.

THINGKING LEVEL	DESCRIPTION
Evaluating	Using knowledge, experience, skills and values to consider, make decisions and give justifications.
Creating	Producing creative and innovative ideas, products or methods.

HOTS are the abilities to apply knowledge, skills and values in reasoning and reflecting to solve problems, make decisions and innovate and the abilities to create something. HOTS include critical thinking, creative thinking, reasoning and thinking strategy.

Critical thinking skills are the abilities to evaluate an idea logically and rationally to make a fair consideration using reasons and reliable evidences.

Creative thinking skills are the abilities to produce or create something new and valuable using genuine imagination and unconventional thinking.

Reasoning skills are the abilities of an individual to make consideration and evaluation and rationally.

Thinking strategies are ways of thinking that are structured and focused to solve problems.

HOTS can be applied in the classroom through activities such as reasoning, inquiry learning, problem solving and projects. Teachers and pupils need to use thinking tools such as thinking maps and mind maps as well as high level questioning to encourage pupils to think.

TEACHING AND LEARNING STRATEGIES

Teaching and learning strategies in the Science curriculum emphasise on thoughtful learning. Thoughtful learning can occur through various learning approaches such as inquiry, constructivism, contextual learning, mastery learning, problem/ project-based learning and STEM. Activities in thoughtful learning should be able to elicit critical and creative thinking among pupils and not be confined to routine. Pupils should be explicitly aware of the thinking skills and thinking strategies that they use in their learning.

Pupils are challenged with higher order questions or problems and they are required to solve problems critically and creatively. Pupils are actively involved in teaching and learning which integrates the acquisition of knowledge, mastery of skills, inculcation of noble values and scientific attitudes.

The learning approaches that can be implemented by the teacher in the classroom are as follows:

Inquiry Approach

Inquiry approach emphasises on learning through experiences. Generally, inquiry means to find information, to question and to investigate a phenomenon around them. Discovery is the main characteristic of inquiry. Learning through discovery occurs when the main concepts and principles of Science are investigated and discovered by pupils themselves.

Pupils are able to investigate a phenomenon and make conclusions by themselves through activities such as experiments. Pupils are guided to understand the science concepts through inquiry approach. Thinking skills and scientific skills are developed during the inquiry process. However, the inquiry-discovery approach may not be suitable for all teaching and learning situations.

Constructivism

Constructivism is a theory that suggests pupils learn by building their own understanding that is meaningful to them. The important attributes of constructivism are:

- Teachers consider pupils' prior knowledge;
- Learning is the result of pupils' own effort;
- Learning occurs when pupils restructure their existing ideas by relating new ideas to old ones; and
- Pupils have opportunities to cooperate, share ideas, experiences and reflect on their learning.

Contextual Learning

Contextual learning is an approach that associates learning with pupils' daily life. In this context, pupils do not only learn theoretically but learn to appreciate the relevance of science in their lives. This approach is used where pupils learn by investigating as in the inquiry-discovery approach.

Mastery learning

Mastery learning is an approach that ensures all pupils master the intended learning objectives. This approach is based on the principle that pupils are able to learn if opportunities are given. Pupils should be allowed to learn at their own pace, with the incorporation of remedial and enrichment activities as part of the teaching and learning process.

Problem/ Project-Based Learning

Problem/project-based learning (PBL) is a pupil-centred pedagogy in which pupils learn through experience in resolving issues/problems contained in the stimulus prepared by the teachers or projects given by the teachers. Teachers can prepare issues/problems or projects from a variety of sources such as newspapers, magazines, journals, books, textbooks, cartoons, videos, television, film and others with minor modification to fulfill the requirements of the teaching and learning process.

Real-world problems or relevant projects are used as a platform to encourage pupils to learn about concepts and principles aspired by teachers. PBL can encourage the development of critical thinking skills, problem solving abilities and communication skills.

PBL provides an opportunity for pupils to work in teams, collaborate to find and evaluate research materials, analyse data, justify and make decisions as well as foster traits of lifelong learners. To ensure the effectiveness of PBL, problems provided should;

- motivate pupils to understand concepts clearly and deeply.
- require pupils to make a decision that is reasonable and defend it.
- meet the content/learning standard to be achieved and relate it to the previous/ prior knowledge.
- have appropriate level of complexity to ensure that pupils are able to work together to resolve it.
- Be open-ended and interesting to motivate and enhance pupils' interest to solve them.

STEM (*Science, Technology, Engineering and Mathematics*) Approach

STEM approach is the teaching and learning method which applies integrated knowledge, skills and values of STEM through inquiry, problem solving or project in the context of daily life, environmental and local as well as global community, as shown in Figure 4.

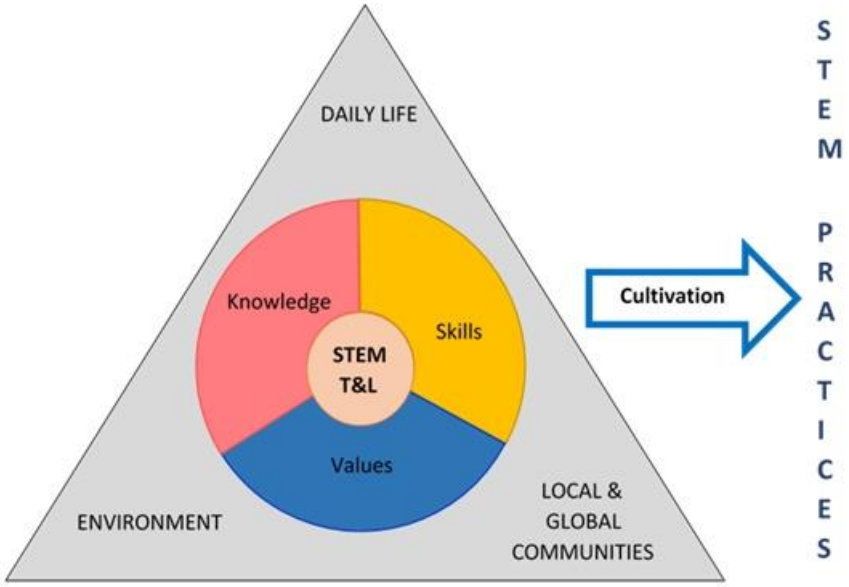


Figure 4: STEM Teaching and Learning Approach

STEM teaching and learning which is contextual and authentic is able to encourage in-depth learning among pupils. Pupils can work in groups or individually according to their ability to cultivate the STEM practices as follows:

1. Questioning and identifying problems.
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analysing and interpreting data.
5. Using mathematical thinking and computational thinking.
6. Developing explanation and designing solutions.
7. Engaging in arguments and discussions based on evidences.
8. Acquiring information, evaluating and communicating about the information.

Computational thinking is the process of cognitive thinking involved in formulating the problem and the solution so that this solution can be represented in a form that can be implemented by human and/or computer effectively. Computational thinking helps pupils organise, analyse and present data or ideas logically and systematically so that complex problems can be resolved easily.

Various teaching and learning methods can increase pupils' interest in science. The less interesting lessons will not motivate pupils to learn, thus affecting their performance. The teaching and learning method should be based on the contents of the curriculum, pupils' abilities and multiple intelligences, availability of resources and infrastructure.

The following are brief descriptions of some teaching and learning methods:

Scientific Investigation/ Experiment

Scientific investigation/experiment is a method commonly used in science lessons. Pupils test hypotheses through investigations to discover specific science concepts and principles scientifically. They carry out scientific investigations/experiments using thinking skills, science process skills, and manipulative skills. Inquiry approach must be used while conducting scientific investigations/experiments. Figure 5 shows the steps in carrying out scientific investigations/ experiments.

In the implementation of Science curriculum, pupils should be given the opportunities to design their own scientific investigations/experiments besides being guided to carry them out. This involves drafting their own experimental method, identifying the data that can be measured, analysing data and presenting the results of their scientific investigations/experiments.

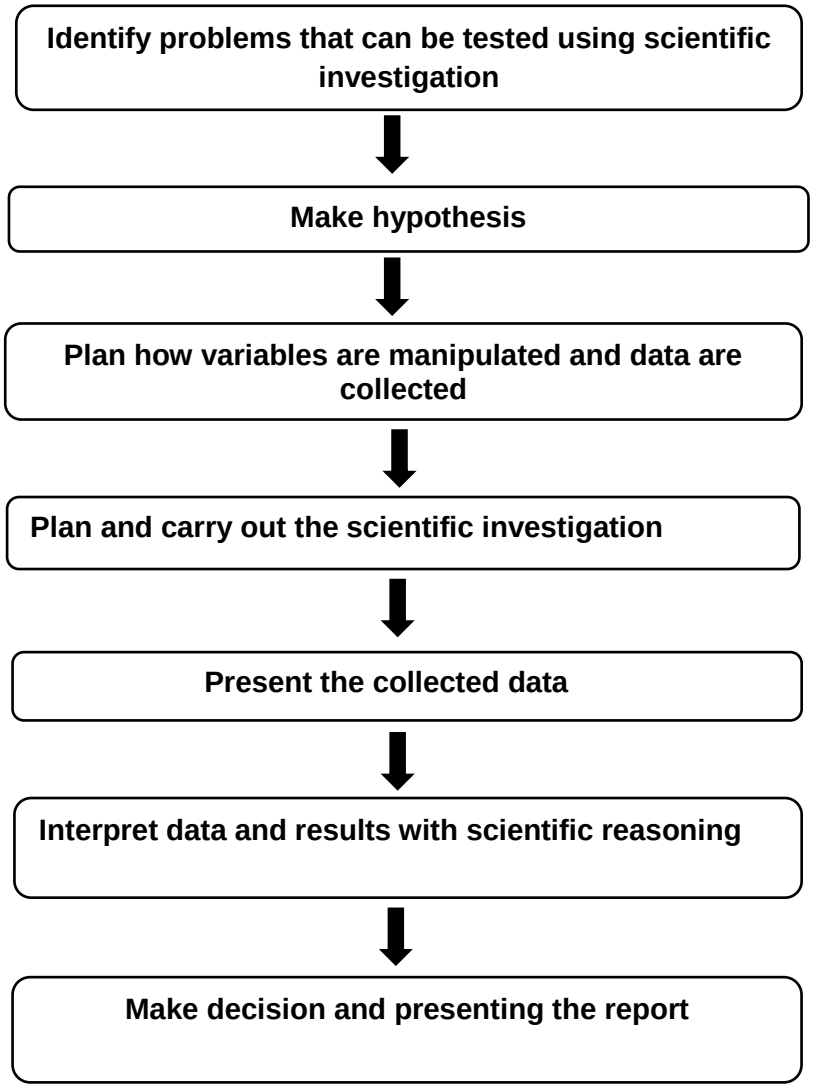


Figure 5: Steps in carrying out scientific investigations/ experiments

Simulation

Simulation is an activity that resembles the actual situation**.** Simulations can be carried out through role-play, games or use of models. In a role-play, pupils act out a particular role spontaneously based on a certain pre-determined conditions. When conducting games, pupils are required to follow certain procedures. Pupils play games in order to learn a particular principle or to understand the process of decision-making. Models are used to represent real objects or situations. Pupils will be able to visualise the real situation, thus understanding the concepts and principles learned.

Project

Project is an activity carried out by pupils to achieve a certain aim based on collaborative learning. A project takes a long time and exceeds formal learning hours to be completed. The outcome of the project such as reports, artefacts and scrapbooks needs to be presented. Project work encourages the development of communication skills, problem solving, time management and application of knowledge.

Visits and Use of External Resources

Learning science is not only restricted in school. Visits to zoos, museums, science centres, research institutes, mangrove swamps and factories can make learning more effective, enjoyable and meaningful. A well planned visit is required to optimise learning. Pupils have to carry out or perform tasks during the visit. Discussions after the visit should be held.

Application of Technology

Technology is one of the tools that has a high potential to enhance interest in learning science. The use of technology such as the television, radio, video, computer and internet makes the teaching and learning of science more interesting and effective. Technology eases teaching and learning of abstract or difficult science concepts. Application software such as word processors, graphic presentation software and electronic spreadsheets are suitable tools to analyse and present data. The use of other technologies such as data loggers and computerised interface in experiments and projects can assist teaching and learning science effectively.

CROSS-CURRICULAR ELEMENTS

Cross-Curricular Elements (CCE) is a value-added element applied in the teaching and learning process other than those specified in the content standard. These elements are applied to strengthen the skills and competency of the intended human capital, capable of dealing with the current and future challenges. The elements in the CCE are as follows:

1. Language

- The use of proper language of instruction should be emphasised in all subjects.
- During the teaching and learning of each subject, the pronunciation aspect, sentence structure, grammar and the terminology of the language need to be emphasised to assist pupils to organise ideas as well as communicate effectively.

2. Environmental Sustainability Awareness

- Awareness towards the love for the environment in the pupils' lives needs to be nurtured through the teaching and learning process in all subjects.
- Knowledge and awareness of the importance of the environment and global sustainability is important to shape pupils' ethics in appreciating nature.

3. Noble Values

- Noble values are emphasised in all subjects to ensure that pupils are aware of its importance and practise them.
- Noble values include the aspects of spirituality, humanity and citizenship which will be practiced in pupils' daily life.

4. **Science and Technology**

- The increase of interest in science and technology will help to improve scientific and technological literacy among pupils.
- The use of technology in teaching can help and contribute to efficient and effective learning.
- The integration of science and technology in the teaching and learning process covers four areas, namely:
    i. The knowledge of science and technology (facts, principles, concepts related to science and technology);
    ii. Scientific skills (process of thought and specific manipulative skills);
    iii. Scientific attitudes (such as accuracy, honesty, security); and
    iv. The use of technology in teaching and learning activities.

5. **Patriotism**

- Patriotism can be nurtured through all subjects, co-curricular activities and community services.
- Patriotism can produce pupils who have the spirit of patriotism and pride as Malaysians.

6. **Creativity and Innovation**
   - Creativity is the ability to use imagination in gathering, extracting and generating ideas or creating something new or authentic using a combination of existing ideas.
   - Innovation is the application of creativity through the modification, rectification and practice of ideas.
   - Creativity and innovation are always inter-connected. Therefore, there is a need to ensure that human capital development is able to meet the challenges of the 21st century.
   - Elements of creativity and innovation should be integrated in the teaching and learning.

7. **Entrepreneurship**
   - The incorporation of entrepreneurship elements aims to develop attributes and entrepreneurial habits that will become a culture among the pupils.
   - Entrepreneurial attributes can be ingrained in teaching and learning through activities that could foster attitudes such as diligence, honesty, trustworthiness and responsibility as well as developing creative minds and innovative ideas to spur the market.

8. **Information and Communication Technology Skills**
   - Information and communication technology (ICT) elements are incorporated in the lessons to ensure pupils are able to apply and strengthen their basic knowledge and skills in ICT.
   - The application of ICT in the lesson does not only motivate pupils to be creative but stimulates interesting and fun teaching and learning as well as improve the quality of learning.
   - ICT should be integrated in the lessons based on appropriate topics to be taught to further enhance pupils' understanding of the subject content.
   - One of the emphases in ICT is the computational thinking that can be applied in all subjects. Computational thinking is a skill that uses logical reasoning concept, algorithms, decomposition, pattern recognition, scaling and evaluation in computer-aided problem solving process.

9. **Global Sustainability**
    - The Elements of Global Sustainability aims to develop pupils with sustainable thinking highly responsive attitude to the environment in their daily lives with the application of knowledge, skills, and values acquired through the elements of the Sustainable Consumption and Production, Global Citizenship and Solidarity.
    - The element of Global Sustainability is important in preparing pupils to face challenges and current issues at the local, national and global levels.
    - This element is taught directly and indirectly in related subjects.

10. **Financial education**
    - Application of financial education elements aims at shaping the future generation that is capable of making right financial decisions, ethical practice and financial management skills to manage the financial affairs responsibly.
    - The Elements of financial education can be applied in teaching and learning directly or indirectly. Direct application is done through the titles that contain explicit financial elements such as the calculation of simple interest and compound interest. Indirect application is integrated through other titles across the curriculum. Exposure to financial management in real life is important to provide pupils with the knowledge, skills and values that can be applied effectively and meaningfully.

CLASSROOM ASSESSMENT

Classroom assessment is a process of obtaining information about the progress of the pupils which is planned, carried out and reported by the teacher concerned. This process happens continuously to enable the teacher to determine pupils' performance level.

Classroom assessment can be executed by a teacher in formative and summative forms. Formative assessment is implemented in line with the teaching and learning process, while summative assessment is carried out at the end of a learning unit, term, semester or year. Teachers need to plan, build items or assessment instruments, administer, review, record and report the performance level that is taught based on DSKP.

In order to ensure that the assessment helps to improve the capability and mastery of the pupils, the teacher must perform the assessment that has the following features:

- Using a variety of assessment methods such as observation, oral and writing.
- Using a variety of assessment strategies that can be implemented by teachers and pupils.
- Taking into consideration the various levels of knowledge and skills learned.
- Allowing pupils to show a wide range of learning ability.
- Assessing the performance level of pupils based on Learning Standard and Performance Standard.
- Take further action for remedial and enrichment.

Science Performance Standards for Primary School

Classroom assessment for Science KSSR is executed based on three main domains which are knowledge, skills and values. Knowledge assessment of a certain theme includes the integration of science process skills, aimed to get information on the level of pupils' understanding in a specific content standard holistically. Assessment of SPS can be carried out throughout the year. Hence, it is important for teachers to use their professional judgement to determine pupils' performance level. Performance level of pupils is divided into six levels as shown in Table 9.

Table 9: Description of Performance Level of Knowledge and Skills

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the knowledge and scientific skills.
2	**Understand** the knowledge and scientific skills as well as explain their understanding.
3	**Apply** the knowledge and scientific skills to perform tasks.
4	**Analyse** the knowledge and scientific skills to **solve problems or perform a task.**
5	**Evaluate** the knowledge and scientific skills to **solve problems** or **perform a task.**
6	**Invent** using the knowledge and scientific skills to **solve problems** and **make decision** or perform a task systematically and become a role model.

Scientific attitudes and noble values are also assessed throughout the year to give opportunities for the pupils to achieve a higher performance level, thus become a practice and culture in their daily life. Assessment of scientific attitudes and noble values for Primary School Science are carried out by referring to Table 10.

Table 10: Description of Performance Levels for Scientific Attitude and Noble Values

PERFORMANCE LEVEL	DESCRIPTOR
1	Interest.
2	Interest and curious
3	Interest, curious, honest and accurate in recording data.
4	Interest, curious, honest and accurate in recording data, dare to try and systematic.
5	Interest, curious, honest and accurate in recording data, dare to try, systematic, cooperative, diligent and perseverant in completing task.
6	Interest, curious, honest and accurate in recording data, dare to try, systematic, cooperative, diligent and perseverant in completing task, courteous and responsible for oneself, peers and the environment.

Overall Performance Level for Science

The overall performance level must be determined in order to give a value of performance level to pupils at the end of the primary schooling. The overall performance level includes the content, scientific skills, scientific attitudes and noble values. Therefore, teachers should assess pupils holistically on all aspects during the pupils' learning process. This should be done on an ongoing basis through various methods such as their achievement in topical tests, observations, exercises, presentations, pupils' verbal responses, group projects and others. Teachers should use their professional judgement through their experiences with pupils, their wisdom and discussions with colleagues in order to provide a value of their pupil's overall performance level by referring to Table 11.

Table 11: Description of Overall Performance Level for Science KSSR

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the knowledge and scientific skills as well as show interest in science.
2	**Understand** the knowledge and scientific skills as well as explain their understanding to show interest and curiosity.
3	**Apply** the knowledge and scientific skills to solve problems or perform tasks honestly and record data accurately.
4	**Analyse** the knowledge and scientific skills to **solve problems** or **perform tasks** systematically and dare to try.
5	**Evaluate** the knowledge and scientific skills to **solve problems** or **perform tasks** as well as **make decision,** honest and accurate in recording data, dare to try, systematic, cooperative, diligent and perseverant.
6	**Create** using knowledge and scientific skills to **solve problems** and **make decision** or **perform tasks** systematically, cooperative, diligent, perseverant, be responsible to oneself, peers and the environment, courteous and become a role model.

CONTENT ORGANISATION

Science KSSR emphasises on the mastery of knowledge, skills and values that are suitable to the pupils' abilities. Implementation of the Science curriculum is in accordance with the Circular Letter (*SPI*) *KPM Bil.8 Tahun 2016*. The minimum time allocated for Science Level II is 64 hours per year.

The content of Science KSSR consists of three main columns which are Content Standard (CS), Learning Standard (LS) and Performance Standard (PS). The meaning of CS, LS and PS are in Table 12. There is also a column for remarks which consists of suggested localised activities, notes and scope as guidance for teachers. Teachers may carry out additional activities apart from the suggested activities according to their creativity and the needs to achieve the LS.

Science KSSR for Year 1 to Year 6 are organised thematically in the learning fields of Inquiry in Science, Life Science, Physical Science, Material Science, Earth and Space, and Technology and Sustainability of Life.

Table 12: Description of Content Standards, Learning Standards and Performance Standards.

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD
Specific statements about what pupils should know and can do during the schooling period encompassing the knowledge, skills and values.	A predetermined criteria or indicator of the quality in learning and achievement that can be measured for each content standard.	A set of general criteria which reflects the levels of pupils' achievement that they should display as a sign that certain topic has been mastered by pupils.

The scope for Level II SPS focuses on twelve skills. The skills are observing, classifying, measuring and using numbers, making inferences, predicting, controlling variables, communicating, using space-time relationship, interpreting data, defining operationally, making hypothesis and experimenting. SPS can be inculcated using the knowledge content in the LS or independently.

Inculcation of SPS should be repeated throughout the year to provide opportunities for pupils to improve and enhance mastery of the intended skills. The scope of knowledge for Level II is shown in Table 13.

Table 13: Content of KSSR Science Level II

THEME	SCOPE
Inquiry in Science	Science process skills
Life Science	Human: breathing, excretion and defecation, respond to stimuli, skeletal system, blood circulatory system, relationship between body systems, reproductive system and nervous system. Animals: breathing organs, vertebrates, survival of the species and interaction among animals. Plants: respond to stimuli, photosynthesis, survival of the species, seeds dispersal, interaction among plants, preservation and conservation. Microorganisms.
Physical Science	Properties of light, sound, sources and forms of energy, renewable and non-renewable energy, sources of electrical energy, series and parallel circuit, safety precautions in handling electrical appliances and conservation of electricity, heat and temperature, force and its effects, frictional force, air pressure and speed of objects.
Materials Science	Basic sources of materials, properties of materials, rusting, states of matter, changes in states of matter, natural water cycle, food spoilage, food preservation and waste management.

Table 13: Content of KSSR Science Level II

THEME	SCOPE
Earth and Space	Gravity of Earth, rotation and revolution of the Earth, phases of the Moon, constellations, phenomena of eclipses and the Milky Way galaxy.
Technology and Sustainability of Life	Lever, simple machines and complex machines, uses of tools in life, stability and strength of objects and structures, the advantages and disadvantages of technology.

THEME

INQUIRY IN SCIENCE

TOPIC

1.0 SCIENTIFIC SKILLS

1.0 SCIENTIFIC SKILLS				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
1.1 Science Process Skills	Pupils are able to : 1.1.1 Observe by using all the senses involved and tools if necessary to make qualitative observations to explain phenomenon or changes that occur. 1.1.2 Classify by comparing or identifying similarities and differences based on common characteristics. 1.1.3 Measure and use numbers by using appropriate tools and standard units with correct techniques. 1.1.4 Make inferences by stating the initial conclusion or by giving reasonable explanations for the observation made using the information gathered.	1	Recall the science process skills.	Suggested activities: Carry out an investigation to acquire science process skills such as: (i) Measure temperature using a standard tool and unit with the correct techniques. (ii) Carry out experiments to determine the factors that cause rusting. (iii) Carry out experiments to determine the factors that affect the brightness of bulbs in series or parallel circuit.
		2	Describe the science process skills.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	1.1.5 Predict by making reasonable assumptions of an event or phenomenon based on observations, prior experiences or data. 1.1.6 Communicate by recording information or ideas in suitable forms and presenting them systematically. 1.1.7 Use space-time relationship by arranging occurrences of phenomenon or event in a chronological order based on time. 1.1.8 Interpret data by selecting relevant ideas about an object, an event or the trend of the data to make an explanation.	3	Apply the science process skills to perform a task.	
		4	Analyse the science process skills to solve problems or to perform a task.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	1.1.9 Define operationally by describing an interpretation of a task carried out and observed in a situation according to determined aspects. 1.1.10 Control variables by determining the responding and constant variables after the manipulated variables in an investigation have been determined.	5	Evaluate the science process skills to solve a problem or to perform a task.	
	1.1.11 Make a hypothesis by making a general statement that can be tested based on the relationship between the variables in an investigation. 1.1.12 Carry out experiments by using the basic science process skills to collect and interpret data, summarise to prove the hypothesis and write a report.	6	Design an experiment to solve a problem systematically and be responsible to oneself, peers and environment.	

THEME

LIFE SCIENCE

TOPIC

2.0 HUMAN
3.0 ANIMAL
4.0 PLANT

<table>
<tr><th colspan="4">2.0 HUMAN</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="2">2.1 Human Skeletal System</td><td rowspan="2">Pupils are able to:

2.1.1 Describe the function of the main human skeletal system.

2.1.2 Identify the bones and position of joints in human skeletal system.

2.1.3 State the function of joints in human skeletal system.

2.1.4 Provide reasoning on the importance of skeletal system to human body.

2.1.5 Explain the observations of human skeletal system through written or verbal forms, sketches, ICT in a creative way.</td><td>1</td><td>Label the main human skeleton.</td><td rowspan="2">Notes:

Function of the main human skeleton:
<table><tr><th>Main Skeleton</th><th>Function</th></tr><tr><td>Backbone</td><td>supports the body</td></tr><tr><td>Skull</td><td>protects the brain</td></tr><tr><td>Rib</td><td>protects internal organs</td></tr><tr><td>Hand and leg bones</td><td>support and movement</td></tr></table>
Suggested activity:

Observe human skeletal model/ diagram to identify bones and position of joints.</td></tr>
<tr><td>2</td><td>Describe the function of each main part involved in blood circulatory system.</td></tr>
</table>

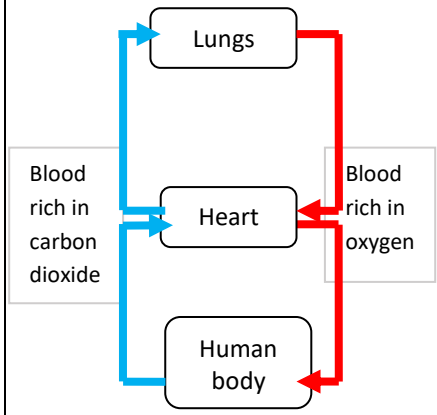
<table>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="2">2.2 Human Blood Circulatory System</td><td rowspan="2">Pupils are able to:

2.2.1 Describe the function of the main parts involved in human blood circulatory system.

2.2.2 Sketch the pathways of blood circulation; rich in oxygen and rich in carbon dioxide in human body.

2.2.3 Summarise the importance of blood circulatory system in human body.

2.2.4 Explain the observations of human blood circulatory system through written or verbal forms, sketches, ICT in a creative way.</td><td>3</td><td>Sketch the pathways of human blood circulation.</td><td rowspan="2">Notes:

Function of the main parts in blood circulatory system:
<table><tr><th>Part</th><th>Function</th></tr><tr><td>Heart</td><td>pumps blood to the lungs and whole body</td></tr><tr><td>Lungs</td><td>place for exchanging carbon dioxide with oxygen.</td></tr><tr><td>Blood Vessels</td><td>transport blood to the whole body</td></tr></table>
Block diagram of blood circulation pathways in human body:
  </td></tr>
<tr><td>4</td><td>Provide reasoning on the importance of skeletal system and blood circulatory system in human body.</td></tr>
</table>

<table>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="2">2.3 Relationship between the Systems in Human Body</td><td rowspan="2">Pupils are able to:

2.3.1 Explain through examples the relationship between the systems in human body.

2.3.2 Provide reasoning on the importance of taking care of all the systems in human body to function efficiently.

2.3.3 Generate ideas ways to protect the systems in human body to ensure a healthy life.

2.3.4 Explain the observations on the relationship between systems in human body through written or verbal forms, sketches, ICT in a creative way.</td><td>5</td><td>Generate ideas on the importance of taking care of all the systems in human body.</td><td rowspan="2">Notes:

Examples of the relationship between the systems in human body:

(i) When a person is choked by food (digestive system), the respiratory tract will be blocked (respiratory system).

(ii) When a hand’s bone is broken (skeletal system), the hand will be swollen due to blood flow distruption (blood circulatory system).

Systems in human body that can be related such as digestive system, blood circulatory system, respiratory system, and human skeletal system.</td></tr>
<tr><td>6</td><td>Communicate creatively and innovatively on the relationship between the systems in the human body.</td></tr>
</table>

3.0 ANIMAL				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
3.1 Survival of Animal Species	Pupils are able to: 3.1.1 State the meaning of survival of the species. 3.1.2 Explain with examples the characteristics and specific behaviours of animals to protect themselves from enemies. 3.1.3 Explain with examples the specific behaviours of animals to protect themselves from extreme weather. 3.1.4 Identify ways animals protect their eggs. 3.1.5 Identify ways animals ensure the survival of their youngs.	1	State the characteristics and specific behaviours of animals to ensure the survival of their species.	Notes: Survival of the species is the ability for animals and plants to maintain their species to avoid extinction. Characteristics and specific behaviours of animals to protect themselves from enemies such as: (i) Detach body part. (ii) Spurt out black ink. (iii) Have fake eyes. Encourage the use of ICT to make observations on various characteristics and specific behaviours of animals to protect themselves.
		2	Describe the characteristics and specific behaviours of animals to ensure the survival of their species.	
		3	Explain with examples the characteristics and specific behaviours of animals to ensure the survival of their species.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	3.1.6 Explain the observations on the survival of animal species through written or verbal forms, sketches, ICT in a creative way.	4	Build a graphic organiser on the characteristics and specific behaviours of animals to ensure the survival of species.	Notes: Specific characteristics of animals to protect themselves from extreme weather such as: (i) Wallow in mud: buffalo. (ii) Migrate: stork, whale. (iii) Hibernate: ground squirrel. Ways animals protect their eggs such as: (i) Hide the eggs: crocodile, lizard, butterfly. (ii) Lay slimy eggs: frog. (iii) Incubate the eggs: penguin. Ways animals ensure the survival of their young such as: (i) Carry the young in their pouch: kangaroo (ii) Carry the young in their mouth: crocodile, arowana fish. (iii) Attack when its young is disturbed: chicken, cat.
3.2 Create Animal Model	Pupils are able to: 3.2.1 Create an imaginary animal model that can protect itself from enemies and extreme weather. 3.2.2 Provide reasoning on how specific characteristics of the created imaginary animal model can protect itself from enemies and extreme weather.	5	Predict the ways other animals protect themselves based on knowledge about characteristics or specific behaviours.	
	3.2.3 Communicate on the specific characteristics of an animal to appreciate God's creation for ensuring the balance of nature. 3.2.4 Explain the observations of the imaginary animal model through written or verbal forms, sketches, ICT in a creative way.	6	Design an imaginary model of animal by applying the knowledge of specific characteristics and behaviours and provide reasoning about the characteristics.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
3.3 Food Relationship among living things	Pupils are able to: 3.3.1 State the meaning of food chain. 3.3.2 Identify producer and consumers in a food chain. 3.3.3 Summarise food relationship among living things and the photosynthesis process in term of energy transfer in a food chain. 3.3.4 State the meaning of food web. 3.3.5 Build food webs in various habitats.	1	State the main source of energy in the food relationship.	Notes: Food chain shows how energy is absorbed from the Sun by green plants to carry out photosynthesis and transferred from producer to consumers.
		2	Identify producer and consumers in a food chain.	
		3	Build a food web in a habitat.	
		4	Provide reasoning on the importance of food relationship among living things in terms of energy transfer.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	3.3.6 Predict the effect on other living things if there are population changes in the food web of a habitat. 3.3.7 Explain the observations on food relationship among living things through written or verbal forms, sketches, ICT in a creative way.	5	Predict the effect on population changes of living things in a food web.	
		6	Communicate creatively and innovatively on energy transfer in food relationship among living things and present their findings.	

4.0 PLANTS				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
4.1 Survival of Plant Species	Pupils are able to: 4.1.1 Explain with examples the specific characteristics of plants to protect themselves from enemies. 4.1.2 Explain with examples the specific characteristics of plants to adapt themselves during climate and seasonal changes. 4.1.3 Explain the observations about survival of plant species through written or verbal forms, sketches, ICT in a creative way.	1	State ways plants disperse their seeds or fruits.	
		2	Describe the specific characteristics of plants to ensure the survival of their species.	
		3	Explain with examples the specific characteristics of plants to ensure the survival of their species.	

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<tr><th colspan="2" rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td>4.2</td><td>Dispersal of Seeds</td><td rowspan="3">Pupils are able to:

4.2.1 State ways plants disperse their seeds or fruits.

4.2.2 Relate the ways of dispersal with the characteristics of seeds or fruits.

4.2.3 Predict the way of a seed dispersal based on its characteristics.

4.2.4 Explain the observations on dispersal of seeds through written or verbal forms, sketches, ICT in a creative way.</td><td>4</td><td>Build a graphic organiser to show the relationship on the characteristics of seeds with the ways of dispersal.</td><td rowspan="3">Notes:

Ways plants disperse their seeds and fruits such as:
(i) By water.
(ii) By wind.
(iii) By human and animals.
(iv) By explosive mechanism.

The importance of the survival of animal and plant species such as:
(i) Continuity of food sources for living things.
(ii) Avoid extinction.
(iii) Interdependence among various living things to maintain the balance of nature.

Pupils predict ways of dispersal learnt for other seeds.</td></tr>
<tr><td>5</td><td>Support the predictions about the way other plants protect and adapt themselves based on the knowledge of specific characteristics of plants.</td></tr>
<tr><td>6</td><td>Communicate creatively and innovatively on the importance of the survival of animal and plant species to ensure the balance of nature.</td></tr>
</table>

THEME

PHYSICAL SCIENCE

TOPIC

5.0 ELECTRIC

6.0 HEAT

5.0 ELECTRIC				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
5.1 Sources of Electrical Energy	Pupils are able to: 5.1.1 Explain with examples the sources of electrical energy.	1	Give examples sources of electrical energy.	
5.2 Series circuit and parallel circuit	Pupils are able to: 5.2.1 Identify the arrangement of bulbs in series and parallel in a complete circuit. 5.2.2 Sketch the series and parallel circuit diagrams using symbols. 5.2.3 Compare and contrast the brightness of the bulbs in series and parallel circuits.	2	Identify series and parallel circuit based on the circuit diagram given.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	5.2.4 Carry out experiments to compare the brightness of bulbs in series or parallel circuit by changing the number of bulbs. 5.2.5 Carry out experiments to compare the brightness of bulbs in series or parallel circuit by changing the number of dry cells. 5.2.6 State the condition of bulbs when a few switches are opened or closed in a series and parallel circuit by carrying out activities. 5.2.7 Explain the observations on series and parallel circuits through written or verbal forms, sketches, ICT in a creative way.	3	Build series and parallel circuits and sketch the diagrams using symbols.	
		4	Generate ideas on the effects of mishandling electrical appliances.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
5.3 Safety precautions in handling electrical appliances and the conservation of electricity	Pupils are able to: 5.3.1 Generate ideas on the factors that affect the usage of electrical energy by carrying out activities. 5.3.2 Explain with examples the effects of mishandling electrical appliances. 5.3.3 Describe the safety precautions in handling electrical appliances 5.3.4 Explain the observations on safety precautions in handling electrical appliances and the conservation of electricity through written or verbal forms, sketches, ICT in a creative way.	5	Conclude factors that affect the brightness of the bulbs in series and parallel circuits based on the number of bulbs and dry cells.	Suggested activity: Carry out an activity to analyse the usage of electrical energy in house or school based on monthly electricity bill.
		6	Communicate creatively and innovatively on the safety precautions in handling the electrical appliances and the conservation of electricity towards sustainability of life.	

<table>
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<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="3">6.1 Heat and Temperature</td><td rowspan="3">Pupils are able to:

6.1.1 State the meaning of heat and temperature.

6.1.2 Measure temperature using the standard tool and unit with the correct techniques.

6.1.3 Use space-time relationship to observe the changes of temperature when ice is heated and determine the freezing point and boiling point of water by carrying out activities.

6.1.4 Describe the changes of water temperature when hot water is cooled down to room temperature.

6.1.5 Conclude effects on materials when they gain and lose heat by carrying out activities.</td><td>1</td><td>State the meaning of heat and temperature.</td><td rowspan="3">Notes:

Safety precautions should be taken when carrying out water heating activities.

Effects of heat on materials when they gain and lose heat such as:
(i) Materials become warmer or cooler.
(ii) Temperature of materials increase or decrease.
(iii) Materials expand or contract.

Suggested activity:

Pupils measure the temperature of water from ice to the boiling point.</td></tr>
<tr><td>2</td><td>Measure the boiling point and freezing point of water.</td></tr>
<tr><td>3</td><td>Make generalisation that materials become warmer when they gain heat and become cooler when they lose heat.</td></tr>
</table>

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<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="3"></td><td rowspan="3">6.1.6 Provide reasoning on the importance of application of expansion and contraction principle of materials in daily life.

6.1.7 Explain the observations about heat and water temperature through written or verbal forms, sketches, ICT in a creative way.</td><td>4</td><td>Explain through examples the expansion and contraction of materials in terms of gaining and losing heat.</td><td rowspan="3">Notes:

When the hot water is left to cool down, the water temperature will decrease to the surrounding temperature and will remain unchanged.

Suggested activities:

Pupils carry out activities to show the effects of expansion and contraction of materials such as:
(i) Heating the iron ball or ring.
(ii) Heating and cooling of coloured water in a conical flask fixed with glass tube.
(iii) Immersing a bottle with balloon attached on its mouth into hot water and ice .</td></tr>
<tr><td>5</td><td>Interpret data from water temperature against time graph to determine the freezing point and boiling point.</td></tr>
<tr><td>6</td><td>Communicate creatively and innovatively to solve problem by applying knowledge on the effects of gaining and losing heat.</td></tr>
</table>

THEME

MATERIAL SCIENCE

TOPIC

7.0 RUSTING
8.0 MATTER

<table>
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<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="6">7.1 Rusting Material</td><td rowspan="6">Pupils are able to:

7.1.1 State the characteristics of rusty object.

7.1.2 Make generalisation that objects made from iron can rust.

7.1.3 Carry out experiments to determine the factors that cause rusting.

7.1.4 Describe ways to prevent rusting.

7.1.5 Provide reasoning on the importance to prevent rusting.

7.1.6 Explain the observations on rusting material through written or verbal forms, sketches, ICT in a creative way.</td><td>1</td><td>Identify rusty and non-rusty objects.</td><td rowspan="6">Notes:

Characteristics of rusty object such as:
(i) Has a reddish-brown layer.
(ii) Rough surface.
(iii) Brittle.

Suggested activities:

Carry out projects to prevent rusting in school such as:
(i) Paint the tools that can rust.
(ii) Repair rusty windows by applying oil.</td></tr>
<tr><td>2</td><td>Describe rusty objects.</td></tr>
<tr><td>3</td><td>Make generalisation that objects made from iron can rust.</td></tr>
<tr><td>4</td><td>Conclude the factors that cause rusting.</td></tr>
<tr><td>5</td><td>Justify the suitable ways to prevent rusting on objects.</td></tr>
<tr><td>6</td><td>Carry out projects to prevent rusting of objects in the surrounding and provide reasoning on the method used.</td></tr>
</table>

<table>
<tr><th colspan="5">8.0 MATTER</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">REMARKS</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="3">8.1 States of Matter</td><td rowspan="3">Pupils are able to:

8.1.1 State that matter exists in the form of solid, liquid and gas.

8.1.2 Classify materials or objects based on the states of matter.

8.1.3 Characterise properties of solid, liquid and gas by carrying out activities.

8.1.4 Make generalisation that water can exist in three states of matter by carrying out activities.

8.1.5 Explain the observations on states of matter through written or verbal forms, sketches, ICT in a creative way.</td><td>1</td><td>State that matter exists in the form of solid, liquid and gas.</td><td rowspan="3">Note:

Properties of solid, liquid and gas based on mass, space occupancy, volume and shape.

Suggested activity:

Make an analogy on the arrangements of particles in solid, liquid and gas by carrying out simulation.</td></tr>
<tr><td>2</td><td>List the process of changes in states of matter for water.</td></tr>
<tr><td>3</td><td>Classify materials or objects based on the states of matter.</td></tr>
</table>

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
8.2 Changes in States of Matter for Water	Pupils are able to: 8.2.1 Describe the changes in states of matter for water by carrying out activities. 8.2.2 Explain with examples the changes in states of matter when it gains or loses heat by carrying out activities. 8.2.3 Relate the changes in states of matter for water in the formation of cloud and rain. 8.2.4 Explain the observations on changes in states of matter for water through written or verbal forms, sketches, ICT in a creative way.	4	Conclude the changes in states of matter for water in terms of gaining or losing heat.	Notes: Water can change its states through processes of freezing, melting, boiling, evaporation and condensation.
		5	Summarise the relationship between the changes in states of matter in the formation of cloud and rain.	
		6	Communicate creatively and innovatively by making an analogy to explain the arrangements of particles in solid, liquid and gas when gaining or losing heat.	

THEME

EARTH AND UNIVERSE

TOPIC

9.0 PHASES OF THE MOON AND CONSTELLATION

9.0 PHASES OF THE MOON AND CONSTELLATION				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
9.1 Phases of the Moon	Pupils are able to: 9.1.1 State that the Moon does not emit light but reflects light from the Sun. 9.1.2 Describe the rotation of the Moon on its axis and at the same time it revolves around the Earth in terms of direction and duration by carrying out a simulation. 9.1.3 Use space- time relationship to describe phases of the Moon in a complete cycle according to the Lunar calendar. 9.1.4 Explain the observations on phases of the Moon through written or verbal forms, sketches, ICT in a creative way.	1	State that the Moon does not emit light.	Notes: Phases of the moon such as new moon, crescent, half moon and full moon. Examples of constellations such as Orion, Big Dipper, Southern Cross and Scorpion.
		2	Identify the patterns and the uses of the constellations.	
		3	Explain the movement of the Moon in terms of direction and duration.	
		4	Sequence the phases of the Moon correctly by sketching.	
9.2 Constellation	Pupils are able to: 9.2.1 Identify the constellations and their shapes. 9.2.2 State the uses of the constellations. 9.2.3 Explain the observations of the constellations through written or verbal forms, sketches, ICT in a creative way.	5	Summarise the relation of phases of the Moon with events of life.	
		6	Communicate creatively and innovatively on the existence of other constellations by seeking information from various media.	

THEME

TECHNOLOGY AND SUSTAINABILITY OF LIFE

TOPIC

10.0 MACHINE

10.0 MACHINE				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
10.1 Uses of Tools in Life	Pupils are able to: 10.1.1 State the uses of a tool in surrounding. 10.1.2 Explain the simple machines' functions that combine, which enables a tool to function through observations on an actual tool. 10.1.3 Provide reasoning on the importance of combination of simple machines to ensure the tool functions well. 10.1.4 Generate ideas on the importance of features in inventing sustainable tools. 10.1.5 Explain the observations on the uses of tools in daily life through written or verbal forms, sketches, ICT in a creative way.	1	Identify simple machines in a tool.	Notes: Features of inventing sustainable tool in terms of: (i) Material suitability; (ii) Life span; (iii) Maintenance; (iv) Cost; (v) Environment friendly; (vi) Safety. Suggested activities: (i) Choose tools in the surrounding such as mechanical pencil sharpener, toy car and mechanical pencil. (ii) Assemble the tools to understand how they function.
		2	Describe the uses of a tool in daily life.	
		3	Make generalisation on the importance of combination of simple machines found in a tool.	
		4	Explain with examples the simple machines' functions that combine to ensure the tool functions well.	
		5	Provide reasoning on the importance of features in inventing a sustainable tool.	
		6	Communicate creatively and innovatively on modifications of a tool to make it more sustainable.	

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