KEMENTERIAN PENDIDIKAN MALAYSIA

KURIKULUM STANDARD SEKOLAH RENDAH

Sains

Dokumen Standard Kurikulum dan Pentaksiran

TAHUN 2

(EDISI BAHASA INGGERIS)

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(Edisi Bahasa Inggeris)

Bahagian Pembangunan Kurikulum

April 2016

Terbitan 2016

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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 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 kurikulum 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 dalam dokumen kurikulum telah mengubah landskap 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. SARIAH BINTI ABD. JALIL
Pengarah
Bahagian Pembangunan Kurikulum

INTRODUCTION

Science Standard-based Curriculum for Primary School (KSSR) is designed to develop science literacy by providing a basic knowledge of science for pupils to become science literate. It comprises understanding the basic science concepts revolved around pupils with which they will be able to pursue Science education at secondary level.

The science curriculum for primary schools aims to produce individuals who are intellectually, spiritually, emotionally and physically balanced as articulated in the National Education Philosophy. Hence, Standard Curriculum and Assessment Document (DSKP) is designed by integrating 21st Century Skills to enable pupils to compete globally.

Knowledge, skill and values are inculcated in the primary school Science curriculum to bring a meaningful learning to the pupils. Pupils' cognitive level and surroundings are acknowledged so that the importance to learn Science can be nurtured since the immediate stage of schooling.

Science subject at secondary level is designed to produce pupils who are science literate, innovative, and able to apply scientific knowledge, making decisions and solving problems in real life. The subject also provides opportunities to pupils who have a distinctive interest in Science to pursue their studies in the fields of Science, Technology, Engineering and Mathematics (STEM) at tertiary level.

The Benchmarking of Science Curriculum has been done aligned with high performance countries in international assessments so as to ascertain that the Science Curriculum is relevant and equivalent to other countries in the world.

In competing to be a developed country, Malaysia needs to establish a community which are scientific, progressive, innovative, and prudent that do not only benefit the latest technologies but can contribute to the future establishment of scientific and technological civilisation. To achieve this aspiration, we need to foster critical, creative and competent citizens who practise the culture of science and technology.

AIMS

Science Standard-based Curriculum for Primary Schools (KSSR) is designed to instil interest and develop pupils' creativity through experiences and investigations as to acquire science knowledge, scientific skills, thinking skills, scientific attitudes and noble values.

OBJECTIVES

KSSR Science aims to enable pupils to achieve the following objectives:

1. Using the inquiry approach to fulfil their curiosity about the world around them.
2. Applying scientific skills and thinking skills critically and creatively.
3. Acquiring knowledge on science facts and concepts.
4. Applying knowledge critically, creatively and analytically in making decisions, innovating and solving problems.
5. Practising scientific attitudes and noble values.
6. Play a role in preserving the environment.

FRAMEWORK OF THE STANDARD-BASED CURRICULUM FOR PRIMARY SCHOOL

KSSR is designed based on six strands, which are Communication; Spiritual, Attitudes and Values; Humanity; Personal Development; 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, knowledgeable, competent, and who is able to think in a critical, creative and innovative manner as illustrated in Figure 1. Science Curriculum is designed based on six strands of KSSR Framework.

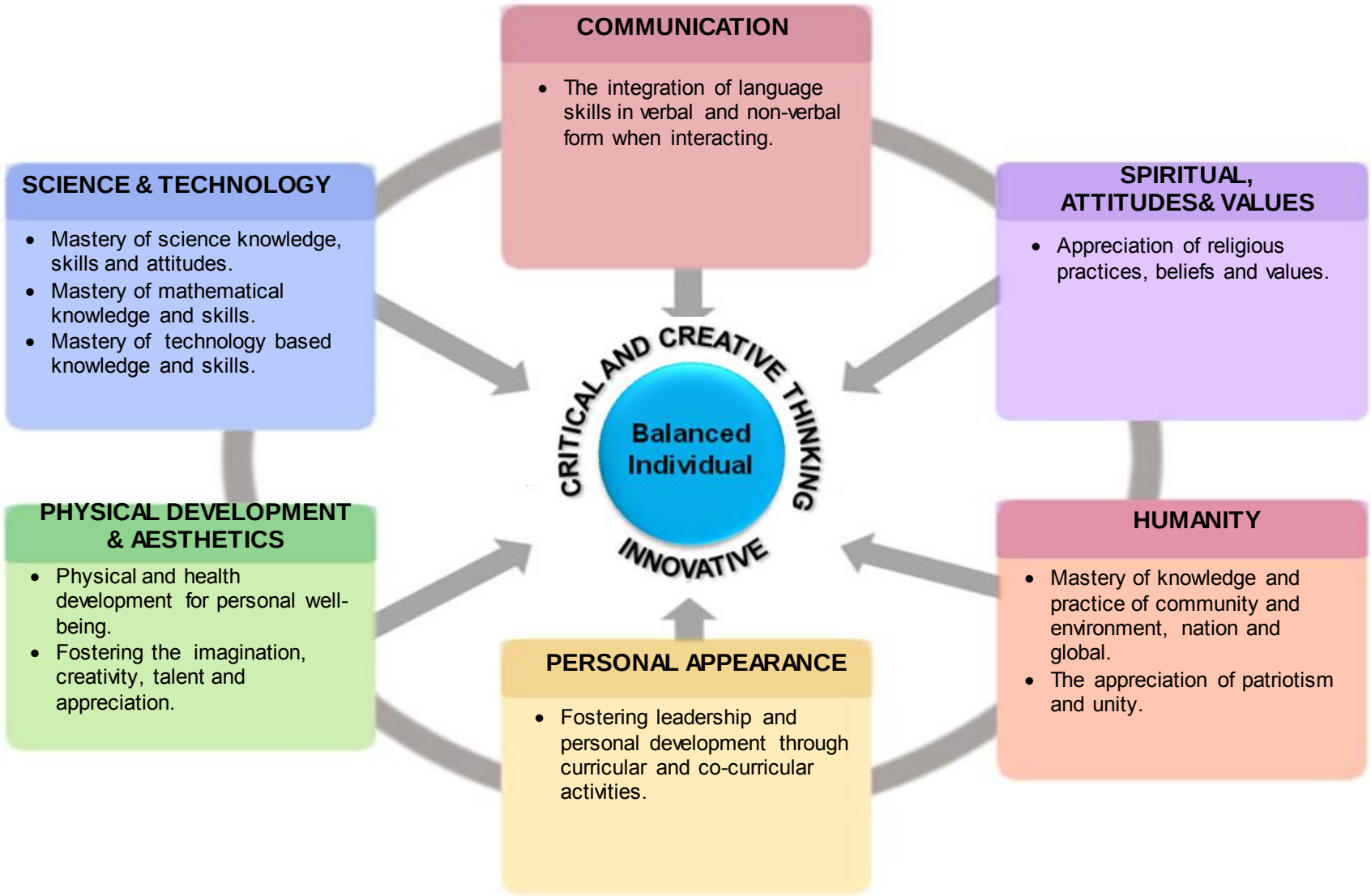

Figure 1: The Framework of Standard-based Curriculum for Primary School

FOCUS

Science subject for primary school focuses on thoughtful learning involved 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. This group of pupils that undergo this curriculum will become the human resources in the field of science and technology, who will contribute towards national development.

KSSR Science is developed based on the three domains which are 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.

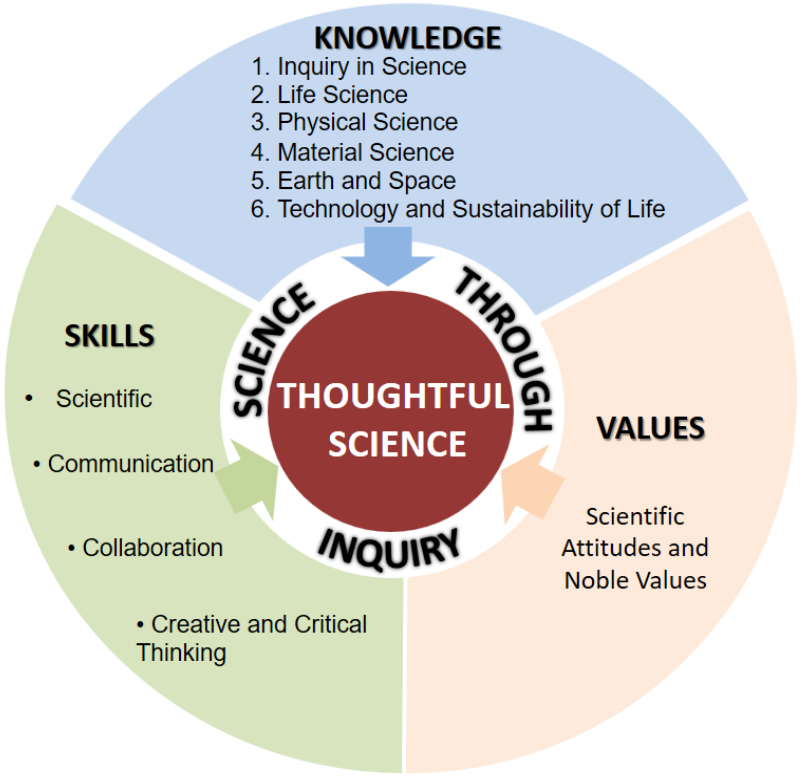

Figure 2: The Conceptual Framework for Science Curriculum

Thoughtful Science

Thoughtful science refers to the quality of pupils intended to be produced by the national science education system. A thoughtful science pupil is one who can understand scientific ideas and is able to communicate using scientific language. Therefore, pupils will be able to evaluate as well as to 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 21st century needs, which the country's competency 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 instigate and encourage pupils as to enable them to conceptualise, solve problems and make decisions. Thus, thinking skills are inculcated indirectly among pupils.

Thinking skills can be categorized into critical and creative thinking. A pupil who thinks critically always evaluates ideas systematically before accepting them. A pupil who thinks creatively is highly imaginative, able to generate genuine ideas, and innovate existing ideas and products.

Thinking strategy is a higher level of thinking process that involves several steps and each step involves 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 as shown in Table 1.

Table 1: Critical Thinking Skills

CRITICAL THINKING SKILLS	DESCRIPTION
Attributing	Identifying 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 common characteristics or features.

CRITICAL THINKING SKILLS	DESCRIPTION
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 urgency.
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 their knowledge, experiences, skills and values, and giving justifications.
Making Conclusions	Making a statement about the outcome of an investigation based on a hypothesis or strengthening something based on an investigation.

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	Making initial conclusions that are reasonable, that may be true or false using previous knowledge and data to explain events or observations.
Predicting	Making forecast about events based on observations and previous experiences or collected data.
Making Generalisations	Making a general statement about certain matter based on a group of observations on samples or some information from that group.

CREATIVE THINKING SKILLS	DESCRIPTION
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 or artefact.
Making Hypotheses	Making a general statement about the relationship between the manipulative and responding variables that is assumed to be true 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.
Inventing	Producing something new or modifying something already in existence to overcome problems in a systematic manner.

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
Conceptualising	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 in a systematic manner for situations that are uncertain or challenging or unanticipated difficulties.

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).

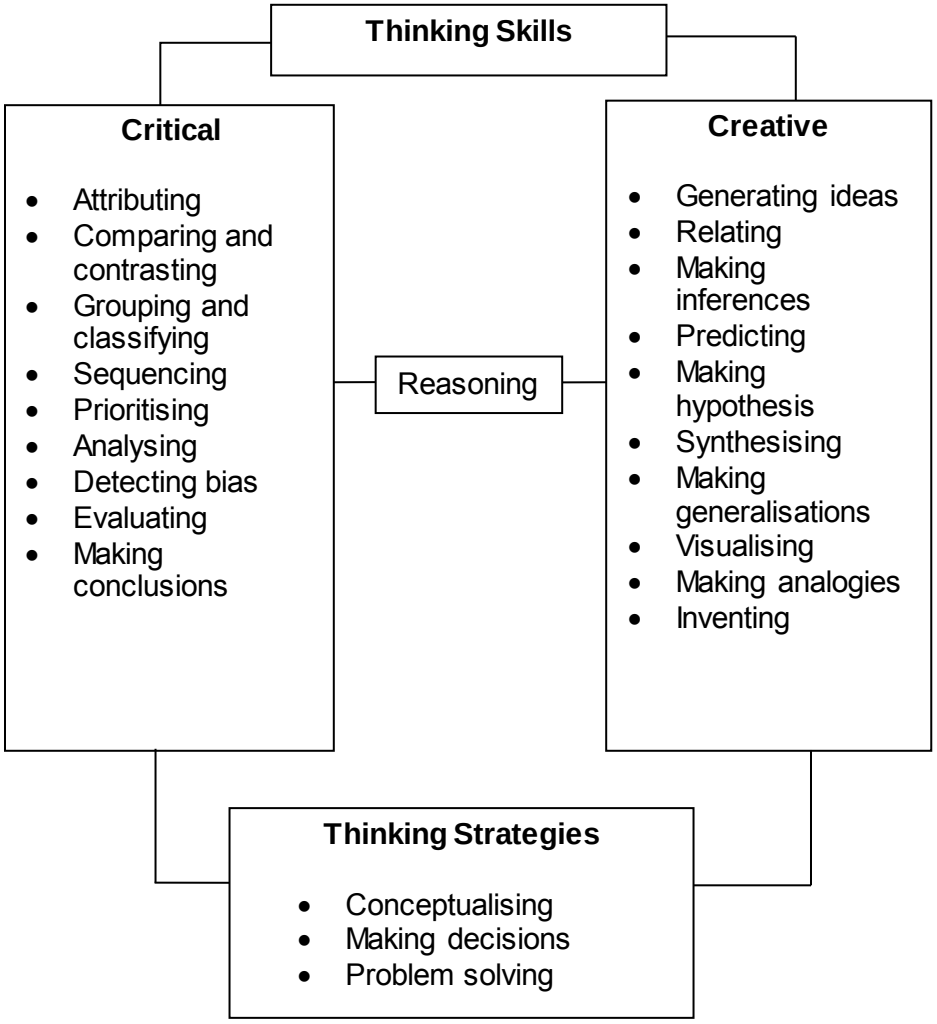

Figure 3: TSTS Model in Science

Mastery of 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.
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 emphasises on inquiry method and problem solving. In the process of inquiry and solving problem, 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 (SPS)

Science Process Skills are skills that are required to find solutions to problems or make decisions systematically. They are mental processes that enhance critical, creative, analytical and systematic thinking. Mastery of Science Process Skills together with suitable attitudes and knowledge ensure pupils to think effectively. Description of each SPS is as 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	Using observations to group objects or phenomena according to similar characteristics.
Measuring and Using Numbers	Making quantitative observations using numbers or tools with standard units or tools standardised with reference units.
Making Inferences	Making initial conclusions that are reasonable, that may be true or false to explain events or observations.
Predicting	Making forecast about events based on observations and previous experiences or collected data.
Communicating	Accepting, choosing, arranging, and presenting information or ideas in the form of writing, verbal, tables, graphs, figures or models.
Using Space- Time Relationship	Describing changes in parameters such as location, direction, shape, size, volume, weight and mass with time.
Interpreting Data	Giving rational explanations about an object, event or pattern derived from collected data.
Defining Operationally	Defining concepts by describing what must be done and what should be observed.
Controlling Variables	Identifying manipulated variables, responding variables and fixed 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 the same.
Making Hypotheses	Making a general statement about the relationship between the manipulative and responding variables that is assumed to be true to explain an observation or event. The statement can be tested to determine its validity.
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 specimens, apparatus and substances accurately.
- Clean science apparatus correctly.
- Store science apparatus and substances correctly and safely.

Relationship between Science Process Skills and Thinking Skills

The mastery of Science Process Skills requires pupils to master the relevant thinking skills. The thinking skills that are related to each science process skill is as 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
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 hypotheses	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 emphasises on thoughtful learning based on thinking skills and scientific skills. In this curriculum, the 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 integrate the mastery of skills together with acquisition of knowledge and the inculcation of scientific attitudes and noble values.

Implementation of SPS in science explicitly encompass 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. Science process skills at primary school level are stated explicitly as learning standards that should be mastered as a foundation before they further their studies at secondary level. Performance standards for science process skills in primary schools are elaborated to ease teachers to determine the development of the mastered skills. The suggested science process standards from primary to secondary schools are as 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 senses to make observations about the phenomena or changes that occur.	Use all the senses 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 complex equipment suitable 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 categories formed 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 the object or phenomenon being studied in further detail.
3	Measuring and using numbers	Measure with the correct instrument and in the correct standard unit.	Measure with the correct instrument and in the correct standard unit using the right technique.	• Measure with the correct instrument and in the correct standard unit, using the right technique, and record in a complete and systematic way. • Change the base units correctly • Use the correct derived units.	• Demonstrate how measurements are taken using the correct instrument and in the correct standard unit, using the right technique; and make a systematic and complete record in a table. • Use more complex derived units in the right manner.

NO	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1 - 3)	LEVEL 2 (YEAR 4 - 6)	LEVEL 3 (FORM 1 - 3)	LEVEL 4 (FORM 4 - 5)
4	Making inferences	Give a reasonable explanation for observations.	Conclude the initial grounds for an observation reasonably 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 using measurements made for an investigation.
5	Predicting	Describe a possible outcome for an event or data.	Make a reasonable assumption of an event based on observations, past experiences or data.	Students can analyse trends/ flows/ simple developments based on the data obtained to predict the future state of an object or phenomenon.	• Students can analyse trends/ flows/ simple developments based on the data obtained to predict the future state of an object or phenomenon. • Forecasts made can also 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 data observed in various forms such as simple graphics, pictures or tables.	Able to present the results of an experiment or data observed in various forms such as graphics, pictures or tables that are more complex to show how the patterns are related.
7	Use time-space relationships		Arrange occurrences of a phenomenon or an event in chronological order.	• Arrange occurrences of a phenomenon or an event in chronological order. • Interpret and explain the meaning of mathematical relationships.	Use, analyse and interpret numbers and numerical relationships efficiently when solving problems and conducting investigations.

NO	SCIENCE PROCESS SKILLS	LEVEL 1 (YEAR 1 - 3)	LEVEL 2 (YEAR 4 - 6)	LEVEL 3 (FORM 1 - 3)	LEVEL 4 (FORM 4 - 5)
8	Interpreting data		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	Define operationally		Describe an interpretation of what is carried out and observed in a situation according to particular specifications.	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.
10	Controlling variables		Determine the responding and constant variable after the manipulated variable is determined in an investigation.	Determine all variables i.e. responding variable, manipulated variable and constant variable.	Change the constant variable to the manipulated variable and state the new responding variable.
11	Making a hypotheses		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 expected results of the scientific investigation designed.
12	Experimenting		Conduct an experiment, collect data, interpret the data and summarise to prove the hypothesis and make a report.	Make a hypothesis, select appropriate apparatus, design the method, conduct an experiment, collect data, carry out analysis on the data, make a conclusion and prepare a report.	Identify new problems and design an experiment to test the hypothesis of these 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 the following:

- Having interest and curiosity towards the environment;
- Being honest and accurate in recording and validating data;
- Being diligent and persevere
- Being responsible about the safety of themselves, others and the environment;
- Having critical and analytical thinking;
- Being flexible and open-minded;
- Being kind-hearted and caring;
- Being objective;
- Being systematic and ethical;
- Being cooperative;
- Being fair;
- 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 mean 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 (CS) including the learning standards (LS) 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. 21st century skills aim to produce globally competitive pupils with the characteristics stated in the

pupils' profile as shown in Table 7. The 21st century skills among pupils can be acquired by mastering the CS and LS.

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 perspective, 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.
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

THINGKING 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.
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 (T&L) strategies in the Science curriculum emphasise on thoughtful learning. Thoughtful learning is a process of acquisition and mastery of knowledge and skills that will help pupils to optimise development of their minds.

Thoughtful learning can initiate various learning approaches such as inquiry, constructivism, contextual learning and mastery learning. Activities in thoughtful learning should be able to initiate critical and creative thinking among pupils which are not routines. Pupils should be aware of the thinking skills and thinking strategies explicitly that are being applied in their learning.

T&L should be planned holistically using various strategies to achieve several LS depending on suitability and learning needs, in accordance with pupils' abilities and learning styles. A teacher should go through all LS and performance standards in the related cluster before starting a lesson.

Teachers are encouraged to plan activities by carrying out investigations and experiments to generate ideas critically, creatively and innovatively by using technologies as a medium to achieve LS effectively. Pupils-centred teaching and learning requires active involvement of pupils which integrates the acquisition of knowledge, mastery of skills, inculcation of noble values and scientific attitudes to enhance their understanding.

Pupils should be challenged with higher order questions or problems and be required to solve problems critically and creatively.

Science curriculum should be able to nurture and strengthen patriotism elements among pupils. For instance, pupils will learn the diversity and uniqueness of country's natural resources and increase their love for the country in the topic preservation and conservation of ecosystem.

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 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 an ideology 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.
- 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 to 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-learning process.

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

STEM approach is the T&L 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.

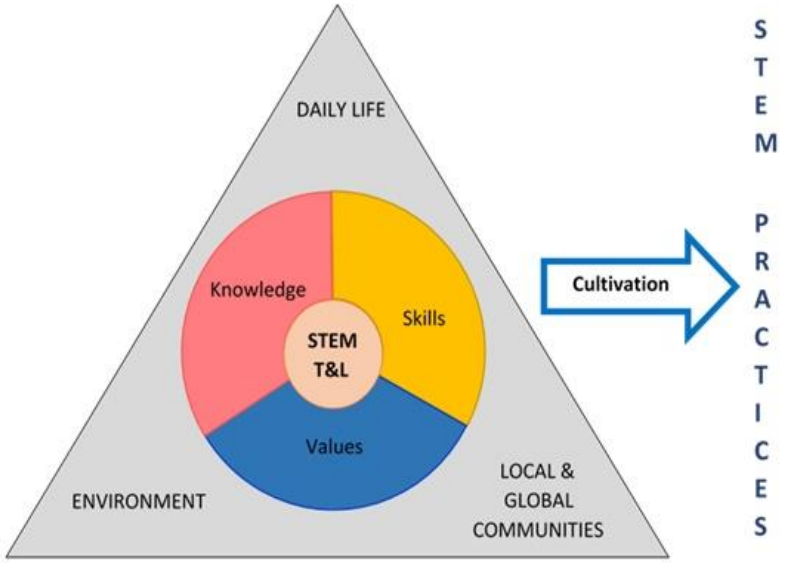

Figure 4: STEM Teaching and Learning Approach

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. Analyzing and interpreting data,
5. Using mathematical thinking and computational thinking,
6. Developing explanation and designing solutions,
7. Engaging in argument and discussions based on evidences, and
8. Acquiring information, evaluating and communicating about the information.

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 T&L 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 by using thinking skills, science process skills, and manipulative skills. Inquiry approach must be used while conducting scientific investigations/experiments. Science laboratory/science room is necessary for all scientific investigation/experiment. In general, Figure 5 shows the procedure when conducting scientific investigations/experiments.

In the implementation of Science curriculum, pupils should be given the opportunities to design their own 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 experiments.

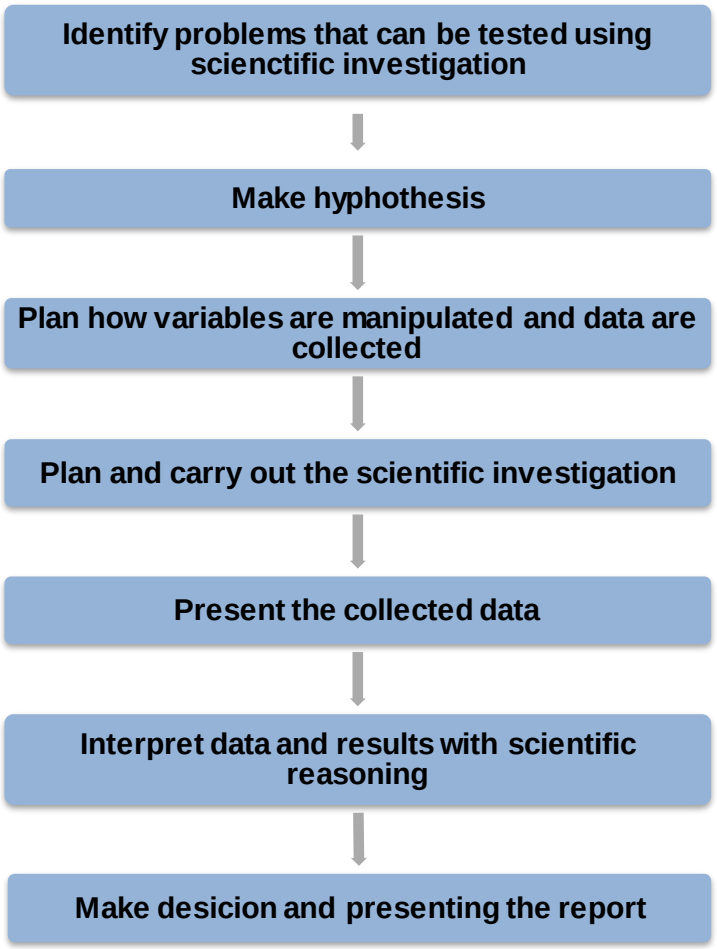

Figure 5: Steps in Carrying Out Scientific Investigations/ Experiments

Simulation is an activity that resembles the actual situation. Simulations can be carried out through role-play, games or use of models. In 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-based Learning

An activity carried out by pupils to achieve a certain aim based on collaborative learning. A project takes a long time and exceeds formal teaching hours to be completed. The outcome of the project such as reports, artefacts and scrap books 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. Discussion after the visit should be held.

Use of Technology

Technology is a highly potential tool 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 valuable 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.

ELEMENTS ACROSS THE CURRICULUM

Elements Across the Curriculum (EMK) 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 EMK are as follows:

1. Language

- The use of proper language of instruction should be emphasized 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 emphasized 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 national and global 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 classrooms.

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 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 The incorporation of entrepreneurship elements aims to develop attributes and entrepreneurial habits that will become a culture among the pupils.

- Entrepreneurial attributes can be ingraned 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 to the market.

8. Information and Communication Technology Skills (ICT)

- Information and communication technology 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.

9. Global Sustainability

- The element 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.
- Elements of Global Sustainability is important in preparing pupils to face challenges and current issues at the local, national and global levels.
- These elements are 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.

SCHOOL ASSESSMENT

School Assessment is a part of assessment approach which is a process that is planned, executed and reported by the teacher to gather information on pupils' development. This is an ongoing process implemented by the teacher formally and informally to determine pupils' performance level. School assessment should be executed holistically based on inclusive, authentic and localised principles. School Assessment provides valuable feedback to administrators, teachers, parents and pupils to plan further actions towards increasing the pupils' learning development.

School assessment can be executed by the teacher formatively and summatively. Formative assessment is carried out during teaching and learning process while summative assessment is carried out at the end of a lesson unit, term, semester or year. Teacher needs to plan, construct items, administer, check, record and report pupils' performance level of the subject taught based on the Standard Curriculum and Assessment Document (DSKP).

The main purpose of formative assessment is to monitor the pupil's learning. Therefore, it is important for teachers to design a valid, reliable and authentic assessment instruments. Information gathered through formative assessment should assist teachers to determine pupil's strengths and weaknesses in achieving the content standard for a subject and not to compare the achievement of one pupil to another. It should assist teachers in adapting teaching and learning based on the needs of their pupils.

A comprehensive assessment should be well planned and carried out continuously as part of the activities in classrooms. Teachers' effort in implementing a holistic assessment assists to improve pupils' weaknesses, forming a conducive and balanced learning ecosystem.

Summative assessment is to evaluate pupils' learning based on several content standards of a subject in a period of time.

In order to ensure the assessment could assist pupils to increase their potentials and performances, teachers should use assessment strategies that have these following characteristics:

- various forms
- fair to all pupils
- consider various cognitive levels
- enable pupils to exhibit a variety of learning abilities

- consider the knowledge and skills learnt by pupils and assess the level of their understanding.

Assessment of Content Standards for each cluster is carried out using the Performance Standard as the teacher's reference to determine pupils' achievement in mastering a particular Content Standard. Performance Standards are hierarchically arranged from Level 1 to Level 6 representing the lowest to the highest standards of achievement. Pupils' achievement must be recorded in the assessment form.

Science Performance Standards for Primary School

School assessment for science 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 science process skills 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: General Statement to Interpret the Performance Level of Knowledge and Skills for Science Subject

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the basic knowledge and skills in Science.
2	**Understand** the science knowledge and skills as well as explain their understanding.
3	**Apply** science knowledge and skills to perform simple tasks.
4	**Analyse** science knowledge and skills in the context of **problem solving.**
5	**Evaluate** the science knowledge and skills in the context of **problem solving and making decision** to perform a task.
6	**Inventing** using science knowledge and skills in the context of **problem solving and making decision** or in performing the tasks in a new situation creatively and innovatively.

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 daily life. Assessment of scientific attitudes and noble values for primary school Science are carried out by referring to Table 10.

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

PERFORMANCE LEVEL	DESCRIPTOR
1	Interest
2	Interest and curiosity
3	Interest, curiosity, honesty and accuracy in recording data
4	Interest, curiosity, honesty and accuracy in recording data, dare to try and systematic
5	Interest, curiosity, honesty and accuracy in recording data, dare to try, systematic, cooperation, diligence and perseverance in completing task
6	Interest, curiosity, honesty and accuracy in recording data, dare to try, systematic, cooperation, diligence and perseverance in completing task, courtesy and responsibility for oneself, friends and environment.

Overall Performance Level

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

Table 11: Description of Overall Performance Level

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the basic knowledge and skills in Science, and show interest.
2	**Understand** the science knowledge and skills, as well as explain their understanding and show curiosity.

PERFORMANCE LEVEL	DESCRIPTOR
3	**Apply** science knowledge and skills to perform simple tasks honestly and record data accurately.
4	**Analyse** science knowledge and skills in the context of **problem solving** systematically and dare to try.
5	**Evaluate** the science knowledge and skills in the context of **problem solving and making decision** to perform a task cooperatively, diligently and persistently.
6	**Inventing** using science knowledge and skills in the context of **problem solving and making decision** or in performing tasks in a new situation creatively and innovatively, and be responsible to own self, peers and environment with a high integrity.

CONTENT ORGANISATION

KSSR Science emphasises on the mastery of knowledge, skills and values that are suitable to the pupils' abilities. The minimum time allocated for Science Level I is 48 hours per year. This curriculum consists of three main columns which are Content Standards (CS), Learning Standards (LS) and Performance Standards (PS). The meaning of CS, LS and PS are in Table 12.

Table 12: Organisation of the DSKP

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.

There is a column for notes in the DSKP. This column consists suggested localised activities and notes as guidance. Additional activities also can be carried out according to creativity and needs to achieve the Learning Standards.

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

The scope for Level I science process skills focuses on six skills i.e. observing, classifying, measuring and using numbers, making inferences, predicting and communicating. science process skills can be inculcated using the knowledge content in the learning standards or independently. It should be repeated throughout the year to provide opportunities to pupils to improve and enhance mastery of the intended skills. The scope of knowledge for Level I is shown in Table 13.

Table 13: Content of Science Level I

THEME	SCOPE
Inquiry in Science	Science process skills , manipulative skills and rules of the science room
Life Science	Living and non-living things Human: basic need of living things, senses, reproduction and growth, teeth, food classes, digestion. Animals: parts of body, reproduction and growth, eating habits. Plants: parts of plants, growth and reproduction.
Physical Science	Magnets, bright and dark, electrical circuits, area and volume measurements, object or materials which are more or less dense than water.
Materials Science	Ability of materials to absorb water, mixture, acid and alkaline.
Earth and Space	Surfaces of the Earth, soils, water, air, solar system.
Technology and Sustainability of Life	Construction of basic shape block, built up set, pulley.

INQUIRY IN SCIENCE

<table>
<tr><th colspan="5">1.0 SCIENTIFIC SKILLS</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">NOTES</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="4">1.1 Science Process Skills</td><td rowspan="4">Pupils are able to:

1.1.1 Observe</td><td>1</td><td>State all the senses involved in making the observations on the phenomena or changes that occur.</td><td rowspan="4">Suggested activities:

Carry out activities that can lead to the acquire skills such as:
(i) Observing the bulb in the circuit.
(ii) Observing the changes of materials when immersed in water.</td></tr>
<tr><td>2</td><td>Describe all the senses used in making the observations on the phenomena or changes that occur.</td></tr>
<tr><td>3</td><td>Use all the senses involved in making the observations on the phenomena or changes that occur.</td></tr>
<tr><td>4</td><td>Use all the senses involved and appropriate tools if necesesary in making qualitative observations to explain the phenomena or changes that occur.</td></tr>
</table>

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
		5	Use all the senses involved and appropriate tools if necesesary in making qualitative and quantitative observations to explain the phenomena or changes that occur.	
		6	Use all the senses involved and appropriate tools if necesesary in making qualitative and quantitative observations to explain the phenomena or changes that occur systematically.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 1.1.2 Classify	1	State the characteristics of objects or phenomena.	Suggested activities: Carry out activities that can lead to the acquire skills such as: (i) Classify animals according to the way they reproduce. (ii) Classify objects according to their ability to light up bulb in a circuit.
		2	Describe the characteristics of objects or phenomena by stating the similarities and differences	
		3	Separate and group the objects or phenomena according to its similarities and differences.	
		4	Separate and group the objects or phenomena by stating its similarities and differences.	
		5	Separate and group the objects or phenomena according to its similarities and differences and able to use other characteristics to separate/isolate and group.	
		6	Separate and group the objects or phenomena according to its similarities and differences until to the final stage by stating the characterisctics used.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 1.1.3 Measure and use numbers	1	Choose appropriate tools to measure a quantity.	Suggested activities: Carry out activities that can lead to the acquire skills such as: (i) Record the changes of height of a growing plant. (ii) Measure own body weight and peer's.
		2	Describe the use of tools and appropriate ways to measure a quantity.	
		3	Measure using appropriate tools and standard unit with correct techniques.	
		4	Measure using appropriate tools and standard unit with correct techniques and record in a table.	
		5	Make justification on the appropriate tools and standard units used in the activity.	
		6	Demonstrate how to measure using tools, standard units with correct techniques, record systematically, creatively and inovatively in a table.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 1.1.4 Communicate	1	State the information gathered.	Suggested activities: Carry out activities that can lead to the acquire skills such as: (i) Design a poster on how to keep the cleanliness of river. (ii) Record the number of leaves on a growing plant using a suitable form.
		2	Record information or ideas in any forms.	
		3	Record information or ideas in suitable form.	
		4	Record information or ideas in suitable form and present it systematically.	
		5	Record information or ideas in more than one suitable form and present it systematically.	
		6	Produce a creative and innovative presentation based on the information or ideas recorded systematically and able to give feedback.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
1.2 Manipulative Skills	Pupils are able to: 1.2.1 Use and handle science apparatus and substances correctly. 1.2.2 Handle specimens correctly and carefully. 1.2.3 Sketch specimens, apparatus and science substances correctly. 1.2.4 Clean science apparatus correctly. 1.2.5 Store science apparatus and substances correctly and safely.	1	List the apparatus, science substances and specimens required for an activity.	Suggested activities: Assessments are carried out during pupils' learning activities such as: (i) Germinating seeds. (ii) Dissolving sugar in water
		2	Describe the use of apparatus, science substances and specimens required for an activity.	
		3	Using and handling apparatus, science substances and specimens required for an activity with the correct method.	
		4	Using, handling, sketching, cleaning and storing the apparatus, science substances and specimens used in an activity with the correct method.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
		5	Using, handling, sketching, cleaning and storing the apparatus, science substances and specimens used in an activity with the correct methods, systematically and sparingly.	
		6	Using, handling, sketching, cleaning and storing the apparatus, science substances and specimens used in an activity with the correct methods, systematically, sparingly and be an example to others.	

2.0 SCIENCE ROOM RULES				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
2.1 Science room rules	Pupils are able to: 2.1.1 Adhere to science room rules	1	State science room rules.	Suggested activities: Assessments are carried out through observations before, during and after using the science room.
		2	Explain science room rules.	
		3	Apply science room rules.	
		4	Provide reasoning on the importance to adhere science room rules.	
		5	Generate ideas of action that need to be taken if there is any violation of rules.	
		6	Practise compliance concept of science room rules in daily life as a culture.	

LIFE SCIENCE

3.0 HUMAN				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
3.1 Reproduction and growth in human	Pupils are able to: 3.1.1 State how humans reproduce. 3.1.2 Describe changes in size, height and weight in an individual since birth. 3.1.3 Make generalization that growths among individuals are different by carrying out activities. 3.1.4 Describe that offsprings inherit features from their parents or ancestors. 3.1.5 Give examples of features inherited by the offsprings from their parents or ancestors such as skin colour, iris colour and hair type.	1	State that human reproduce by giving birth.	Suggested activities: Discussion on changes of an individual based on pictures from infant to adult in terms of increase in: (i) size; (ii) height; and (iii) weight. Use pictures to match the offspring with the mother / father / family members. Compare and contrast the size of palms, soles, height and weight among classmates.
		2	Describe changes in an individual since birth.	
		3	Explain through examples the features that offsprings inherited from their parents or ancestors.	
		4	Make generalization that inherited features in an individual are from ancestors based on family tree.	
		5	Conclude that the growth of individuals of the same age are different.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	3.1.6 Explain observations about growth and heredity using sketches, ICT, in written or verbal form.	6	Communicate creatively and innovatively to predict the features inherited by the offspring that can be seen in their parents.	Suggested activities: Display a picture of a man and a woman with clear features such as curly hair iris colour, skin colour, hair colour and height. Pupils make predictions about features that may be inherited by the couple's offspring and give explanations. Note: Discussion of heredity, family tree is not necessarily based on the pupil's own family.

4.0 ANIMALS				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
4.1 Reproduction and growth in animals	Pupils are able to: 4.1.1 State how animals reproduce. 4.1.2 Classify animals according to the way they reproduce. 4.1.3 Explain with examples animals that lay many eggs and animals that lay less egg. 4.1.4 Explain with examples animals that give birth to many young and animals that give birth to less young. 4.1.5 Record the changes in the animals' growth by observing their life cycles.	1	State animals that lay eggs and animals that give birth.	Suggested activities: Observe a video on animals' reproduction. Observe the life cycles of animals such as frog, butterfly, mosquito and cow. Match the pictures of the young with their parents.
		2	Classify animals according to the way they reproduce.	
		3	Make generalization the way animals reproduce in term of the number of eggs and young.	
		4	Interpret data on the changes in growth that occur in the life cycle of animals.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	4.1.6 Explain with examples young animals that look like their parents and animals which do not look like their parents. 4.1.7 Explain observations about reproduction and growth in animals using sketches, ICT, in written or verbal form.	5	Conclude from the observations that some animals look like their parents and some do not look like their parents.	
		6	Communicate creatively and innovatively to explain the various ways animals protect their eggs or care for their young and provide reasoning.	

5.0 PLANTS				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
5.1 Growth of Plants	Pupils are able to: 5.1.1 State the importance of plants to humans and animals. 5.1.2 State the basic needs for the seeds to germinate. 5.1.3 Record changes in plant's growth by observing the actual seeds from germination stage. 5.1.4 Arrange in sequence the stages in a plant's growth. 5.1.5 Conclude the basic needs for a plant's growth by carrying out investigations. .	1	State examples the importance of plants to humans and animals.	Note: (i) growth in plant has several stages e.g. fruit, germination of seed, young plant, bear flowers, bear fruit in a coconut tree. (ii) soil or fertilizer provides nutrients to help growth of plants. (iii) disruption in plant growth stage will cause shortage in food sources (plants and animals)
		2	Describe that water, air and suitable temperature are required for germination of seeds.	
		3	Record changes in plant's growth such as the number of leaves, circumference of stem, size of leaf or height of plant by observing real plants.	
		4	Arrange in sequence the stages of a plant's growth and give explanation.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	5.1.6 Explain observations about life process of plants using sketches, ICT, in written or verbal form.	5	Summarize that water, nutrients, air and sunlight are needed for a plant to grow.	
		6	Communicate about the prediction of what will happen to human or animals if the stages in plant's growth is disrupted.	

PHYSICAL SCIENCE

6.0 LIGHT AND DARK				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
6.1 Light and dark	Pupils are able to: 6.1.1 State sources of light. 6.1.2 Differentiate the activities carried out in light and dark situation. 6.1.3 Explain how shadow is formed by carrying out activities. 6.1.4 Compare and contrast the clarity of shadows when light is blocked by different objects by carrying out investigations. 6.1.5 Create a shadow game.	1	Identify the sources of light.	Suggested activities: Use a black box that consists of a few objects. Pupil picks an object from the box in light and dark situation. Differentiate the clarity of shadow (clear, less clear, no shadow) using different objects such as A4 paper, tracing paper, plastic and transparency film.
		2	Explain how shadow is formed.	
		3	Compare activities that are carried out in light and dark conditions.	
		4	Make conclusion about the sharpness of shadows formed.	
		5	Provide reasoning on the importance of light to human.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	6.1.6 Explain observations about light and dark using sketches, ICT, in written or verbal form.	6	Create a shadow game and explain how the shadow is formed.	

7.0 ELECTRIC				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**NOTES**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
7.1 Electric circuit	Pupils are able to: 7.1.1 Identify components in an electric circuit i.e. dry cell, bulb and switch. 7.1.2 Explain functions of the components in a complete electric circuit. 7.1.3 Build a complete electric circuit using dry cell, bulb, switch and connecting wires. 7.1.4 Predict why bulb does not light up in a circuit. 7.1.5 Record whether a bulb will light up when the switch is replaced with other objects or materials by carrying out investigations. 7.1.6 Make generalization of objects that can light up a bulb in a circuit are conductors and objects that cannot light up a bulb are insulators.	1	State components found in an electric circuit.	Suggested activities: Testing ability of bulb to light up using various objects or materials such as pencil, nails, eraser, coins, paper clips and lemon juice. From these activities, pupils make generalization about conductors and insulators. Note: Give opportunities for pupils to use the motor, buzzer and others besides the bulb.
		2	Explain functions of the components in an electric circuit.	
		3	Build a complete electric circuit with components provided.	
		4	Provide reasoning when bulbs do not light up in a circuit.	
		5	Summarize that objects which can light up bulb in a circuit are conductors and objects that cannot light up a bulb are insulators.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
	7.1.7 Explain observations about electric circuit using sketches, ICT, in written or verbal form.	6	Produce and present a function circuit using other objects to replace the bulb.	

MATERIAL SCIENCE

<table>
<tr><th colspan="5">8.0 MIXTURE</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">NOTES</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="5">8.1 Mixture</td><td rowspan="5">Pupils are able to:

8.1.1 Describe methods to separate a mixture of various materials or objects.

8.1.2 Provide reasoning about the method used to separate a mixture of various materials or objects.

8.1.3 Identify materials that can dissolve and cannot dissolve in water by carrying out investigations.

8.1.4 Summarize how materials can be dissolved more quickly by carrying out investigations.

8.1.5 Explain observations about mixtures using sketches, ICT, in written or verbal form.</td><td>1</td><td>State examples of materials which dissolve and do not dissolve in water.</td><td rowspan="5">Note:

Examples of mixtures such as peanuts, dried leaves and flour.

Examples of methods to separate mixtures such as using sieve or magnet.

Examples of mixture such as sand or stone of various sizes, sand and salt and limestone mixed with water are given as problems for pupils to solve.</td></tr>
<tr><td>2</td><td>Describe methods to separate a mixture.</td></tr>
<tr><td>3</td><td>Separate a mixture of various materials or objects.</td></tr>
<tr><td>4</td><td>Explain through an example why the method is used to separate a mixture.</td></tr>
<tr><td>5</td><td>Summarize how materials can be dissolved more quickly.</td></tr>
</table>

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
		6	Solve problem by carry out a project to separate a mixture to obtain the original materials in a faster and more effective way.	Method to dissolve materials faster in water by stirring and using small sized materials.

EARTH AND SPACE

<table>
<tr><th colspan="5">9.0 EARTH</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">NOTES</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="6">9.1 Water</td><td rowspan="6">Pupils are able to:

9.1.1 State natural sources of water such as rain, rivers, lakes, seas and springs.

9.1.2 State direction of water flow by carrying out activities.

9.1.3 Make generalisation on natural direction of water flow such as in rivers and waterfalls through observation using various media.

9.1.4 Arrange in sequence the natural water cycle.

9.1.5 Explain observations about water cycle using sketches, ICT, in written or verbal form.</td><td>1</td><td>List natural sources of water.</td><td rowspan="6">Suggested activities:

Discussion on water flow such as puddles, bathing water and flood based on experience and observation on the environment.

Observations on movement of water in a tray when one end is slightly tilted.

Note:
Water cycle is stated as water from the river or sea turning into water vapour. Water vapour then form clouds. Clouds then produce rain which flows back to rivers or seas.</td></tr>
<tr><td>2</td><td>Describe the direction of water flow from high to low place.</td></tr>
<tr><td>3</td><td>Make generalisation the natural direction of water flow on earth.</td></tr>
<tr><td>4</td><td>Arrange in sequence and label the natural water cycle.</td></tr>
<tr><td>5</td><td>Generate ideas on environmental effect if the water flow is interrupted.</td></tr>
<tr><td>6</td><td>Communicate on the role of human in maintaining clean source of water and water flow.</td></tr>
</table>

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		NOTES
		PERFORMANCE LEVEL	DESCRIPTOR	
9.2 Air	Pupils are able to: 9.2.1 State that air is around us. 9.2.2 State that air consists of gases such as oxygen and carbon dioxide. 9.2.3 Describe that moving air is wind. 9.2.4 Generate ideas on the effects of air movement in everyday life. 9.2.5 Create a tool or model by applying knowledge that demonstrates usage of air movement. 9.2.6 Explain observations about air using sketches, ICT, in written or verbal form.	1	State living things need air to breathe.	Suggested activities: A video showing living things in water, in the soil and the surroundings. Note: Examples of model such as windmill and sailboat
		2	Give example of gases in the air.	
		3	Describe that air cannot be seen but can be felt when it moves.	
		4	Explain through example that air is everywhere including in water and soil.	
		5	Generate ideas on the advantages and disadvantages of moving air.	
		6	Create a model by applying knowledge of moving air.	

TECHNOLOGY AND SUSTAINABILITY OF LIFE

<table>
<tr><th colspan="5">10.0 TECHNOLOGY</th></tr>
<tr><th rowspan="2">CONTENT STANDARD</th><th rowspan="2">LEARNING STANDARD</th><th colspan="2">PERFORMANCE STANDARD</th><th rowspan="2">NOTES</th></tr>
<tr><th>PERFORMANCE LEVEL</th><th>DESCRIPTOR</th></tr>
<tr><td rowspan="6">10.1 Building set</td><td rowspan="6">Pupils are able to:

10.1.1 Choose a structure to build from the building set.

10.1.2 Identify the building components according to the illustrated manual.

10.1.3 Assemble the building components according to the illustrated manual.

10.1.4 Create a new structure that is not in the illustrated manual.

10.1.5 Disassemble the built structure in sequence and store the components into a storage container.

10.1.6 Explain observations about built structure using sketches, ICT, in written or verbal form.</td><td>1</td><td>Choose the components needed for the chosen structure to build.</td><td rowspan="6">Note:

Construction set is a set of components that can build several models and have illustrated manual.

Able to describe the function of newly built structure.</td></tr>
<tr><td>2</td><td>Build the structure according to the illustrated manual.</td></tr>
<tr><td>3</td><td>Disassemble the built structure in sequence and store the components into a storage container properly.</td></tr>
<tr><td>4</td><td>Communicate to explain the built structure.</td></tr>
<tr><td>5</td><td>Evaluate the structure built by friends which comply to the illustrated manual.</td></tr>
<tr><td>6</td><td>Create a new structure and explain the creation.</td></tr>
</table>

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