KEMENTERIAN
PENDIDIKAN
MALAYSIA

KURIKULUM STANDARD SEKOLAH RENDAH

Sains

Dokumen Standard Kurikulum dan Pentaksiran

Tahun 4

(EDISI BAHASA INGGERIS)

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(Edisi Bahasa Inggeris)

Bahagian Pembangunan Kurikulum
APRIL 2018

Terbitan 2018

CONTENT

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 hidup 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.

SHAZALI BIN AHMAD
Pengarah
Bahagian Pembangunan Kurikulum
Kementerian Pendidikan Malaysia

INTRODUCTION

Science Standards-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 revolving around the 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, 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, making decisions and solving problems in real life. These subjects also provide opportunities for pupils who are inclined in science to pursue their studies in the fields of Science, Technology, Engineering and Mathematics (STEM) at tertiary level.

The benchmarking of 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. To achieve this aspiration, we need to foster critical, creative and competent citizens who practise the culture of science and technology.

AIMS

Science Standards-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 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 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 enable 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.

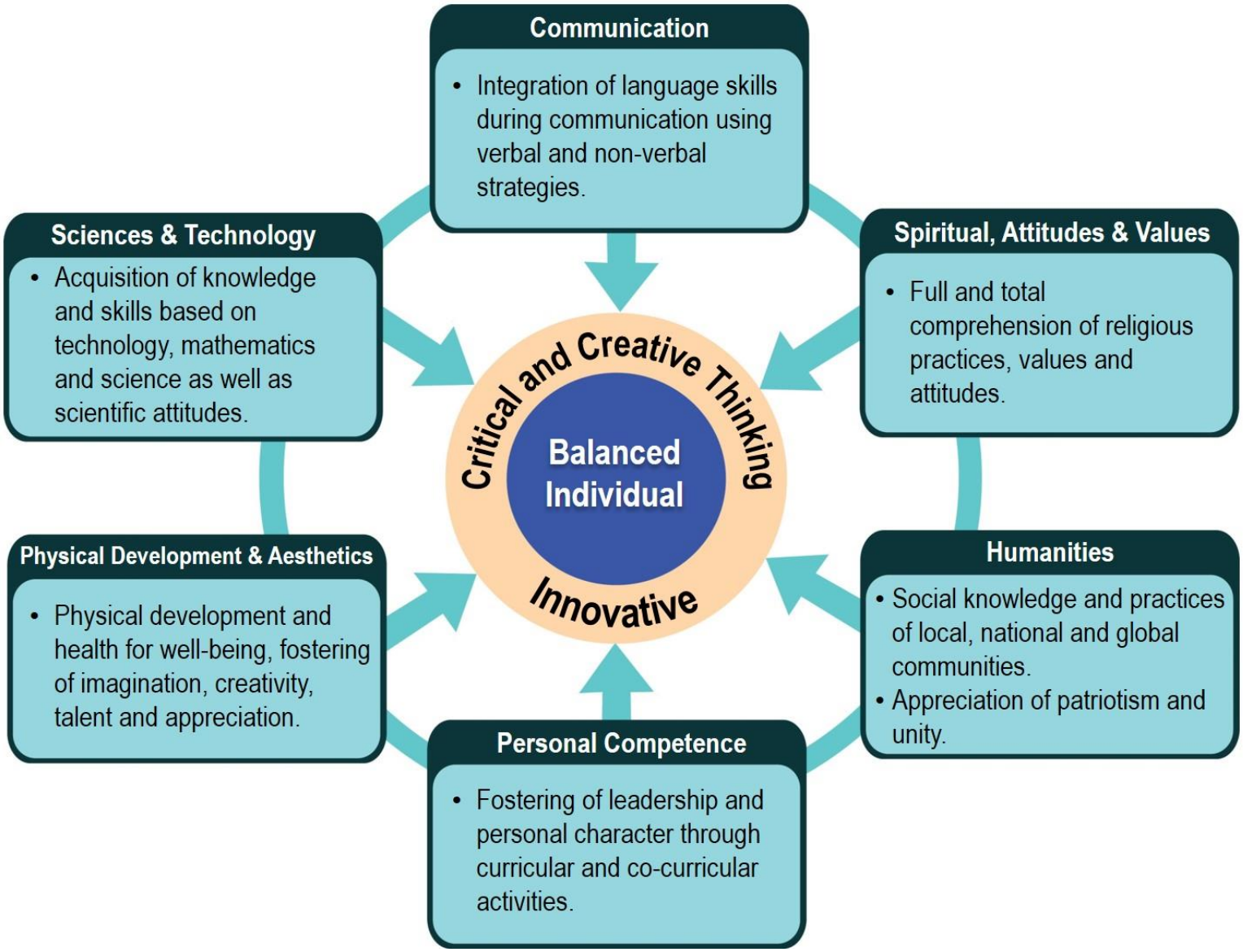

Figure 1: The Framework of Standard-based Curriculum for Primary School

FOCUS

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

KSSR Science is developed based on the 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.

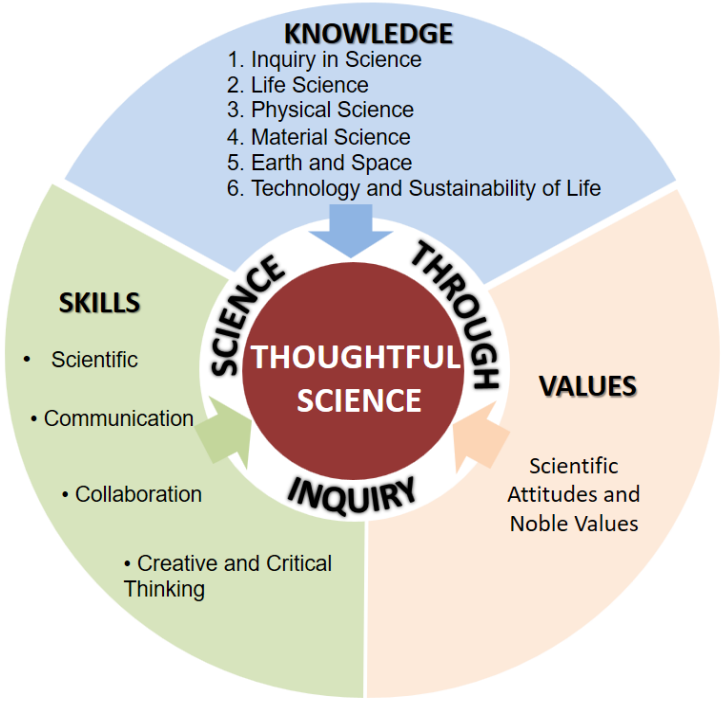

Figure 2: The Conceptual Framework for Science Curriculum

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 competency 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 categorized 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 criteria such as characteristics, features, qualities and elements of a concept or an object.

CRITICAL THINKING SKILLS	DESCRIPTION
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.

CRITICAL THINKING SKILLS	DESCRIPTION
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 matters for 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 Hypothesis	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.

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).

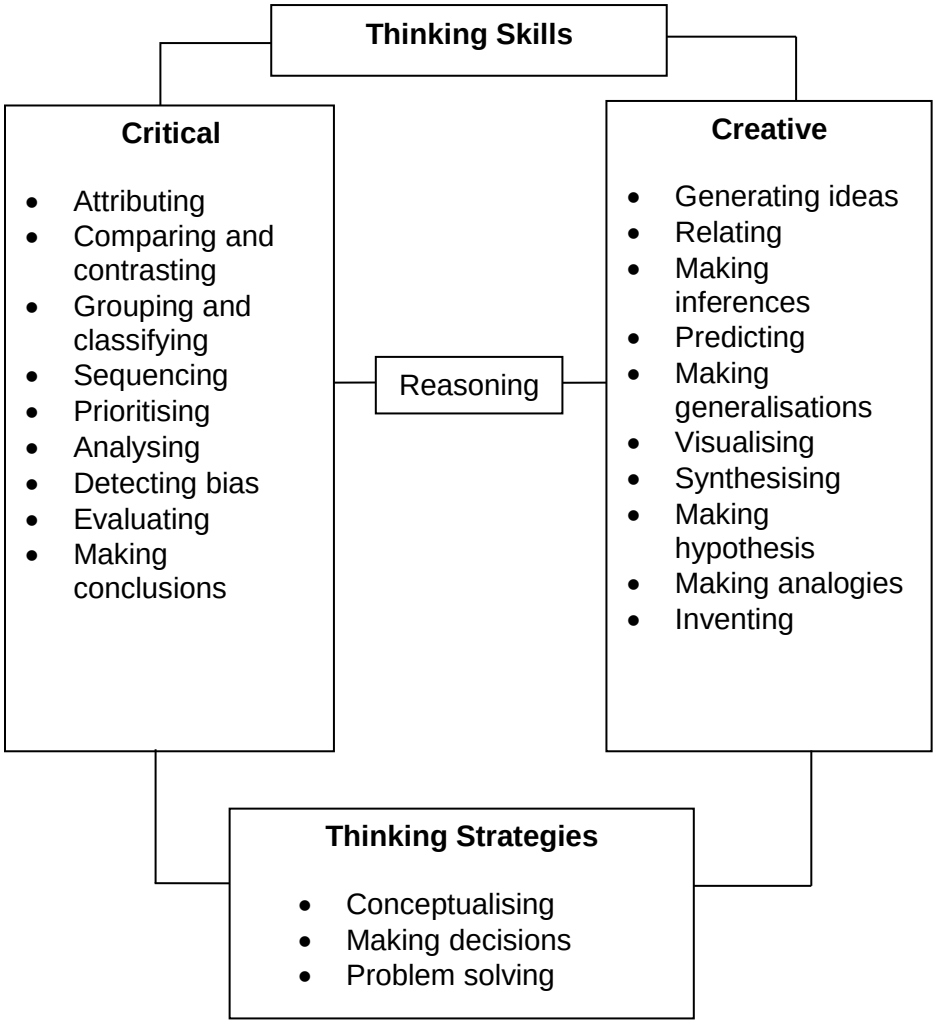

Figure 3: TSTS Model in Science

Mastery of 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 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

Science Process Skills (SPS) 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 SPSis as shown in Table 4.

Table 4: Science Process Skills

SCIENCE PROCESS SKILLS	THINKING SKILLS
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 similarities and differences.
Measuring and Using Numbers	Making quantitative observations using numbers and tools with standard units. Measurement makes observations more precise.

SCIENCE PROCESS SKILLS	THINKING SKILLS
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.
Communicating	Using word or graphic symbol 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.
Interpreting Data	Giving rational explanations about an object, event or pattern from the collected data.

SCIENCE PROCESS SKILLS	THINKING SKILLS
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 constant.
Making Hypothesis	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.
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 correctly;
- Clean science apparatus 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 (T&L) 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 Science Process Skills requires pupils to master the relevant thinking skills. The thinking skills that are related to each science process skill 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
Measuring and Using Numbers	Relating Comparing and contrasting
Making Inferences	Relating Comparing and contrasting Analysing Making Inferences

SCIENCE PROCESS SKILLS	THINKING SKILLS
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
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 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 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 categories given 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.

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 in the correct standard unit, using the right technique, and record in a complete and systematic way. • Change the basic units correctly. • Use the correct derivative units.	• Demonstrate how measurements are taken using the correct tool, correct standard unit, right technique and record in a table systematically and completely. • Use more complex derivative units in the right manner.
4	Making inferences	Give a reasonable explanation for an observation.	Conclude the initial conclusion 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.

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.	Pupils can analyse trends/ flows/ simple developments based on the data obtained to predict the future state of an object or phenomenon.	• Pupils can analyse trends/ flows/ simple developments based on the data obtained to predict the future state of an object or phenomenon. • Prediction 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 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.

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 the following:

- 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 systematical;
- 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 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. 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 Content Standard (CS) and Learning Standard (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.

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

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.

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 (T&L) strategies in the Science curriculum emphasise on thoughtful learning. Thoughtful learning can involve various learning approaches such as inquiry, constructivism, contextual learning, mastery learning, problem or project-based learning and STEM. Activities in thoughtful learning should be able to trigger critical and creative thinking among pupils, which are not routine activities. Pupils should be explicitly aware of the thinking skills and thinking strategies that are being applied in their learning.

Pupils should be challenged with higher order questions or problems and 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 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; 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 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.

Problem/ Projects-Based Learning

Problem/ project-based learning (PBL) is a pupils-centered 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 T&L 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 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.

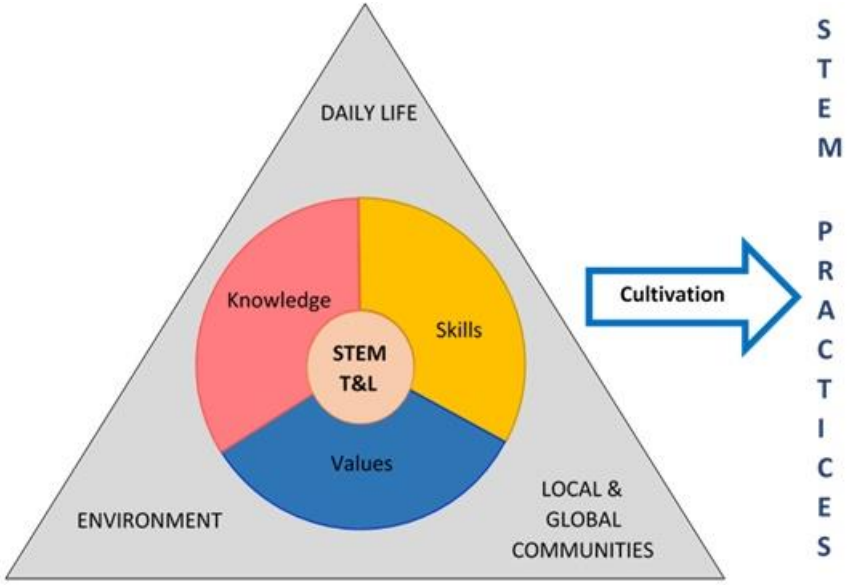

Figure 4: STEM Teaching and Learning Approach

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.
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 help pupils organize, analyze 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 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 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. 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.

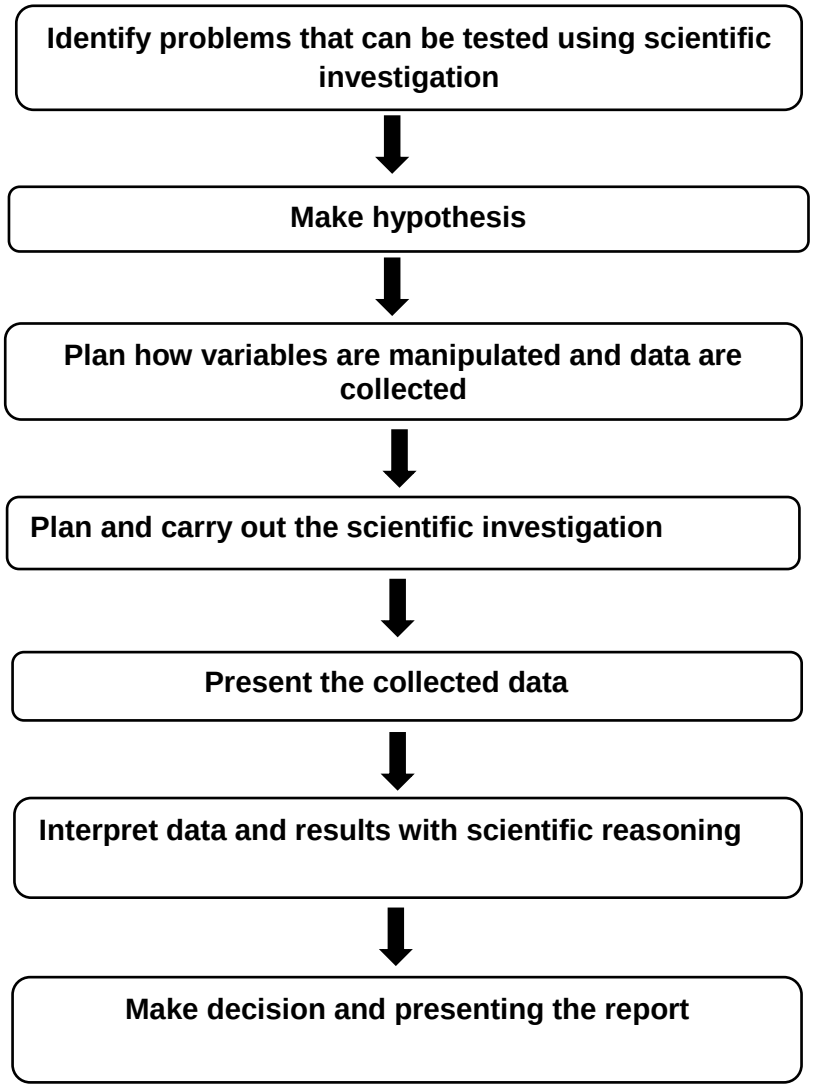

Figure 5: Steps in carrying out scientific investigations/ experiments

Simulation

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

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 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. Discussion after the visit should be held.

Application 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 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 (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.
   - 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 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.

CLASSROOM ASSESSMENT

Classroom assessment (CA) 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' mastery level.

Classroom assessment (CA) can be excuted by a teacher in formative and summative form. Formative assessment is implemented in line with the T&L process, while sumrmative 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 level of mastery 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.
- Allows pupils to show a wide range of learning ability.
- Assessing the level of mastery of pupils based on Learning Standards and Performance Standards.
- Take further action for remedial and enrichment.

Science Performance Standards for Primary School

Class room 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: Description of Performance Level of Knowledge and Skills for Science Subject

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the science knowledge and scientific skills.
2	**Understand** the science knowledge and scientific skills as well as explain their understanding.
3	**Apply** science knowledge and scientific skills to perform tasks.
4	**Analyse** science knowledge and scientific skills to **solve problems or perform tasks.**
5	**Evaluate** the science knowledge and scientific skills to **solve problems or perform tasks.**
6	**Invent** using science knowledge and scientific skills to **solve problems** and **make decision** or perform tasks 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 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 curiosity.
3	Interest, curiosity, honest and accurate in recording data.
4	Interest, curiosity, honest and accurate in recording data, willing to try and systematic.
5	Interest, curiosity, honest and accurate in recording data, willing to try, systematic, cooperative, diligent and perseverance in completing task.
6	Interest, curiosity, honest and accurate in recording data, willing to try, systematic, cooperative, diligent and perseverance 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 provide a value to the pupil's performance level 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 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 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 KSSR Primary School Science.

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the science knowledge and scientific skills as well as show interest in science.
2	**Understand** the science knowledge and scientific skills as well as explain their understanding to show interest and curiosity.
3	**Apply** the science knowledge and scientific skills to solve problems or perform tasks honestly and record data accurately.
4	**Analyse** the science knowledge and scientific skills to **solve problems** or **perform tasks** systematically and willing to try.
5	**Evaluate** the science knowledge and scientific skills to **solve problems or perform tasks as well as make decision,** honest and accurate in recording data, willing to try, systematic, cooperative, diligent and perseverant.
6	**Invent** using science 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

KSSR Science emphasises on the mastery of knowledge, skills and values that are suitable to the pupils' abilities. Implimentation science curriculum is based on present effective circular (SPI) The minimum time allocated for Science Level II is 64 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: 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.

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 II science process skills focuses on twelve skills such as observing, classifying, measuring and using numbers, making inferences, predicting, controlling variables, communicating, using space-time relationship, interpreting data, defining operationaly, making hypothesis and experimenting. 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 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: beathing, excretion and defecation, human respond to stimuli, skeletal system, blood circulatory system, relationship between body systems, habits and consequences that interfere with life processes, reproductive system and nervous system. Animals: breathing organs, vertebrates, survival of the species and the food relationship between living things and interactions between animals. Plants: plants respond to stimuli, photosynthesis, survival of the species, plants dispersal, interaction between plants, preservation and conservation
	Microorganisms: Life process and effects of microorganisms.
Physical Science	Properties of light, sound, sources and forms of energy, renewable and non-renewable energy, electricity, heat, temperature, force, friction, air pressure and speed.
Materials Science	Natural materials, properties of materials, rusting, state of matter, changes in state of matter, natural water cycle, food spoilage, food preservation and waste material.

Table 13: Content of KSSR Science Level II

THEME	SCOPE
Earth and Space	Gravity on Earth, rotation and revolution of the earth around the sun, phases of the Moon, constellations, eclipse and galaxies
Technology and Sustainability of Life	Lever, simple and complex machine, the usage of tools in life, stability and strength of the objects and structure, 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 the phenomena 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 investigations that lead to acquiring the science process skills such as: (i) Experimenting to determine the factors that affect the size and shape of shadows. (ii) Making conclusion on parts of plants that respond to stimuli.
		2	Describe the science process skills.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 1.1.5 Predict by making reasonable assumptions about 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, event or trend found in the data to make an explanation.	3	Apply the science process skills.	
		4	Analyse the science process skills to solve problems or to perform a task.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 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 variable in the investigation have been determined. 1.1.11 Make a hypothesis by making a general statement that can be tested based on the relationship between the variables in the investigation. 1.1.12 Experiment by using the basic science process skills to collect and interpret data, summarise to prove the hypothesis and write a report.	5	Evaluate the science process skills to solve a problem or to perform a task.	
		6	Design an experiment to solve a problem systematically and be responsible to oneself, peers and the environment.	

THEME

LIFE SCIENCE

TOPIC

2.0 HUMAN
3.0 ANIMAL
4.0 PLANT

2.0 HUMAN				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
2.1 Breathing Process	Pupils are able to: 2.1.1 Identify the organs involved in the breathing process. 2.1.2 Describe the breathing process in terms of air passage and exchange of gases in the lungs through observation by using various media. 2.1.3 Differentiate the content of oxygen and carbon dioxide during inhalation and exhalation. 2.1.4 Describe the chest movement during inhalation and exhalation by carrying out activities. 2.1.5 Make generalisation that the rate of breathing depends on the types of activities carried out.	1	Label the organs involved during the breathing process.	Notes: Inhaled air contains more oxygen compared to exhaled air. Exhaled air contains more carbon dioxide compared to inhaled air. Rate of breathing can be observed through chest movement in one minute.
		2	Explain the breathing process in terms of air passage.	
		3	Make generalisation on the chest movement during the breathing process.	
		4	Differentiate the content of oxygen and carbon dioxide during the breathing process.	
		5	Conclude that the rate of breathing depends on the types of activities.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	Pupils are able to: 2.1.6 Explain the observations on human breathing through written or verbal forms, sketches or ICT in a creative way.	6	Communicate creatively and innovatively on situations which give good and bad effects on human breathing and provide suggestions to keep the lungs healthy	Notes: Situations that affect breathing such as being in recreational parks, polluted air, congested areas, and being around smokers.

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
2.2 Excretion and Defecation	Pupils are able to: 2.2.1 State the meaning of excretion and defecation. 2.2.2 Identify the organs and products of excretion. 2.2.3 Make inferences on the importance to rid products of excretion and defecation. 2.2.4 Explain the observations on human excretion and defecation through written or verbal forms, sketches or ICT in a creative way.	1	State the meaning of defecation.	Notes: Organs and products of excretion are: (i) Kidneys excrete urine. (ii) Skin excretes sweat. (iii) Lungs release carbon dioxide and water vapour.
		2	List the products of excretion and defecation.	
		3	Describe excretion and defecation.	
		4	Match the organs with the products of excretion using graphic organisers.	
		5	Provide reasoning on the importance of excretion and defecation in human.	
		6	Communicate creatively and innovatively good practices to ensure excretion and defecation are not disrupted.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
2.3 Humans Respond to Stimuli	Pupils are able to: 2.3.1 State that humans respond when the sensory organs receive stimuli. 2.3.2 Explain with examples humans respond to stimuli in daily life. 2.3.3 Make inferences on the importance of human response to stimuli. 2.3.4 Explain habits that disrupt the process of human response to stimuli. 2.3.5 Explain the observations on human response to stimuli through written or verbal forms, sketches or ICT in a creative way.	1	State the sensory organs of human.	Notes: Examples of responses to stimuli: (i) Eyes close as light is shone directly at them. (ii) Hand moves away spontaneously as it touches hot or sharp objects. (iii) Body shivers in extreme cold.
		2	State that humans respond to stimuli.	
		3	Match a stimulus to its response(s) in a situation.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
		4	Give examples on how humans respond to stimuli.	
		5	Summarise the importance of humans response to stimuli.	
		6	Communicate creatively and innovatively concerning habits that should be avoided to prevent damage to the sensory organs and present the findings.	

3.0 ANIMAL				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
3.1 Breathing Organs of Animals	Pupils are able to : 3.1.1 Identify the breathing organs of animals. 3.1.2 Classify animals according to their breathing organs. 3.1.3 Make generalisation that some animals have more than one breathing organ. 3.1.4 Explain the observations about the breathing organs of animals through written or verbal forms, sketches or ICT in a creative way.	1	Label the breathing organs of animals.	Notes: Examples of animals' breathing organs: (i) Lungs: cat, bird, crocodile, frog and whale. (ii) Gills: fish, tadpole, crab and prawn. (iii) Moist skin: frog and worm. (iv) Spiracle: cockroach, grasshopper, butterfly and caterpillar.
		2	List the examples of vertebrates and invertebrates.	
		3	Give examples of specific charateristics for each class of vertebrates.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
3.2 Vertebrates	Pupils are able to: 3.2.1 State the meaning of vertebrates and invertebrates. 3.2.2 Give examples of vertebrates and invertebrates. 3.2.3 Classify vertebrates based on specific characteristics for mammals, reptiles, amphibians, birds and fish. 3.2.4 Explain the observations about vertebrates through written or verbal forms, sketches or ICT in a creative way.	4	Classify vertebrates based on their specific charateristics.	Notes: Classes of vertebrates (animals with backbone) consist of mammals, reptiles, amphibians, birds and fish.
		5	Summarise that some animals have more than one breathing organ.	
		6	Communicate creatively and innovatively on the breathing organs of animals and classify vertebrates and their specific charateristics to each class and present the findings.	

4.0 PLANT				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
4.1 Plants respond to stimuli	Pupils are able to: 4.1.1 State that plants respond to stimuli through observation using various media. 4.1.2 Relate parts of plants that respond to different types of stimuli. 4.1.3 Conclude that parts of plants respond to stimuli by carrying out investigations. 4.1.4 Explain the observations on responses of plants to stimuli through written or verbal forms, sketches or ICT in a creative way.	1	State parts of plants that respond to stimuli.	Notes: Parts of plants that respond to stimuli such as: (i) Roots respond to water. (ii) Roots respond to gravity. (iii) Shoots respond to light. (iv) Leaves of some plants respond to touch.
		2	Describe the process of photosynthesis.	
		3	Explain with examples the responses of parts of plants to stimuli.	

<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="3">4.2 Photosynthesis</td><td rowspan="3">Pupils are able to:

4.2.1 State the meaning of photosynthesis.

4.2.2 List the needs of plants for the process of photosynthesis.

4.2.3 State the products of photosynthesis through observations using various media.

4.2.4 Provide reasoning on the importance of photosynthesis for living things.

4.2.5 Explain the observations on photosynthesis through written or verbal forms, sketches or ICT in a creative way.</td><td>4</td><td>Provide reasoning on the importance of photosynthesis for living things.</td><td rowspan="3">Notes:

Photosynthesis is a process where plants produce their own food.

Products of photosynthesis are starch and oxygen.

Suggested activity:
Simulate the process of photosynthesis using ICT.</td></tr>
<tr><td>5</td><td>Test the hypothesis that plants respond to stimuli.</td></tr>
<tr><td>6</td><td>Communicate creatively and innovatively on the importance of plants' responses that help photosynthesis.</td></tr>
</table>

THEME

PHYSICAL SCIENCE

TOPIC

5.0 PROPERTIES OF LIGHT
6.0 SOUND
7.0 ENERGY

5.0 PROPERTIES OF LIGHT				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
5.1 Light Travels In a Straight Line	Pupils are able to: 5.1.1 State that light travels in a straight line by carrying out activities. 5.1.2 Compare and contrast the shadows formed when light is blocked by transparent, translucent and opaque objects by carrying out activities. 5.1.3 Carry out experiment to determine the factors that affect the size and shape of the shadow. 5.1.4 Explain the observations that light travels in a straight line through written or verbal forms, sketches or ICT in a creative way.	1	State that light travels in a straight line, can be reflected and refracted.	
		2	Sketch a ray diagram to show reflection of light from a mirror.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
5.2 Reflection of Light	Pupils are able to: 5.2.1 State that light can be reflected by carrying out activities. 5.2.2 Describe the uses of reflection of light in daily life. 5.2.3 Draw a ray diagram to show the reflection of light from a mirror.	3	Give examples of situations in daily life that show light travels in a straight line, can be reflected and refracted.	Notes: Applications of reflection of light in daily life such as periscope, mirror and others.
	5.2.4 Explain the observations of reflection of light through written or verbal forms, sketches or ICT in a creative way.	4	Provide reasoning on the importance of properties of light in daily life.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
5.3 Refraction of Light	Pupils are able to: 5.3.1 State that light can be refracted, through observation using various media. 5.3.2 Explain through examples that light can be refracted by carrying out activities. 5.3.3 Describe the formation of rainbow by carrying out activities. 5.3.4 Explain the observations on refraction of light through written or verbal forms, sketches or ICT in a creative way.	5	Conclude the factors that affect the size and shape of the shadow.	Notes: Situations or phenomena that show refraction of light such as: (i) Position of a coin in water. (ii) Shape of a pencil in a glass of water.
		6	Communicate creatively and innovatively on innovations of device that apply properties of light to solve problems in daily life.	

6.0 SOUND				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
6.1 Sound	Pupils are able to: 6.1.1 State that sound is produced by vibrations, by carrying out activities. 6.1.2 Describe that sound travels in all directions. 6.1.3 Give examples of phenomenon that show sound can be reflected in daily life. 6.1.4 Describe the sound that is useful and harmful in daily life. 6.1.5 Generate ideas to solve problems in reducing sound pollution.	1	List ways to produce sound.	Notes: Sound can be produced by blowing, knocking, plucking, bowing and clapping. Examples of reflection of sound are echo, sonar and ultrasonic.
		2	State that sound is produced by vibrations.	
		3	Make generalisation that sound travels in all directions.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	6.1.6 Explain the observation of sound through written or verbal forms, sketches or ICT in a creative way.	4	Explain through examples the phenomena that show sound can be reflected.	
		5	Solve problems to reduce sound pollution in daily life.	
		6	Communicate creatively and innovatively on the effects of sound in daily life and present the findings.	

7.0 ENERGY				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
7.1 Sources and Forms of Energy	Pupils are able to: 7.1.1 State the meaning of energy. 7.1.2 Describe various sources of energy through observation using various media. 7.1.3 Explain with examples the various forms of energy. 7.1.4 Explain through examples the transformation of energy in daily life. 7.1.5 Make generalisation that energy cannot be created or destroyed but can be transformed. 7.1.6 Explain the observations on the sources and forms of energy through written or verbal forms, sketches or ICT in a creative way.	1	List the sources and forms of energy.	Notes: Forms of energy such as solar energy, heat energy, chemical energy, electrical energy, kinetic energy, sound energy, potential energy, light energy and nuclear energy.
		2	Describe renewable and non-renewable energy sources.	
		3	Explain with examples the tranformation of energy.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
7.2 Renewable and Non-renewable Energy Sources	Pupils are able to: 7.2.1 Explain with examples renewable and non-renewable energy sources through observation using various media. 7.2.2 Generate ideas on the importance of using energy wisely. 7.2.3 Explain the observations on renewable and non-renewable energy sources through written or verbal forms, sketches or ICT in a creative way.	4	Provide reasoning on the importance of saving energy for sustainability of energy sources.	Notes: Renewable energy sources can be generated continuously. Non-renewable energy sources are limited and cannot be generated continuously. Renewable energy has the potential to be the future source of energy.
		5	Carry out activities to prove the transformation of energy that occurs in daily life.	
		6	Communicate creatively and innovatively on innovations in the use of energy resources in the future.	

THEME

MATERIALS SCIENCE

TOPIC

8.0 MATERIAL

<table>
<tr><th colspan="5">8.0 MATERIAL</th></tr>
<tr><th rowspan="2" colspan="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 colspan="2" rowspan="3">8.1 Basic Sources of Materials</td><td rowspan="3">Pupils are able to :

8.1.1 Explain through examples the basic sources of materials used to make objects.

8.1.2 Classify objects based on basic sources.

8.1.3 Explain the observations on the basic sources of materials through written or verbal forms, sketches or ICT in a creative way.</td><td>1</td><td>Match materials to their basic sources.</td><td rowspan="3">Notes:

<table><tr><th>Basic source</th><th>Material</th><th>Example of objects</th></tr><tr><td rowspan="3">Plant</td><td>wood</td><td>table</td></tr><tr><td>cotton</td><td>clothes</td></tr><tr><td>rubber</td><td>tyre</td></tr><tr><td rowspan="3">Animal</td><td>skin</td><td>handbag</td></tr><tr><td>wool</td><td>sweater</td></tr><tr><td>silk</td><td>shawl</td></tr><tr><td rowspan="2">Rocks</td><td>metal</td><td>nail</td></tr><tr><td>soil</td><td>mirror glass</td></tr><tr><td rowspan="2">Petroleum</td><td>plastic</td><td>pail</td></tr><tr><td>synthetic cloth</td><td>umbrella</td></tr></table></td></tr>
<tr><td>2</td><td>Characterise objects based on type of materials and basic sources.</td></tr>
<tr><td>3</td><td>Classify objects based on materials or basic sources.</td></tr>
</table>

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
8.2 Properties of Materials	Pupils are able to: 8.2.1 Describe the properties of materials by carrying out activities. 8.2.2 Create an object by applying the knowledge of properties of materials. 8.2.3 Provide reasoning on the types of materials chosen in creating the object. 8.2.4 Explain the observations on the properties of materials through written or verbal forms, sketches or ICT in a creative way..	4	Make generalisation on the properties of materials by carrying out investigation.	Notes: Properties of materials such as: (i) Water absorbent and waterproof. (ii) Float and sink. (iii) Conduct electricity (iv) Ability to allow light to pass through. (v) Conduct heat. (vi) Elasticity.
		5	Make inferences on the materials used for each part of the object.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
		6	Create an object by applying the knowledge of the properties of the materials and present it in a creative and innovative way.	

THEME

EARTH AND SPACE

TOPIC

9.0 EARTH

9.0 EARTH				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
9.1 Gravity of Earth	Pupils are able to: 9.1.1 Describe the gravitational pull of Earth based on observation by carrying out activities. 9.1.2 Make generalisation that all objects on Earth remain in their positions, by carrying out activities. 9.1.3 Explain the observations on gravity of Earth through written or verbal forms, sketches or ICT in a creative way.	1	State that the Earth rotates on its axis and at the same time revolves around the Sun in its orbit.	Notes : Gravitational pull of Earth is a force that pulls objects towards the Earth. The effects of gravitional pull of Earth: (i) objects fall freely. (ii) objects remain in their position. Objects on Earth remain in their position and this can be demonstrated using a globe.
		2	Explain the gravitational pull of Earth.	
		3	Describe the effects of rotation of the Earth.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
9.2 Rotation and Revolution of Earth	Pupils are able to: 9.2.1 State that the Earth rotates on its axis and at the same time revolves around the Sun in its orbit. 9.2.2 Describe the rotation and revolution of the Earth in terms of direction and duration by carrying out activities. 9.2.3 Describe the effects of the rotation of the Earth on its axis by carrying out activities. 9.2.4 Explain the observations on the rotation and revolution of the Earth through written or verbal forms, sketches or ICT in a creative way.	4	Provide reasoning on the importance of the gravitational pull on the Earth.	Notes: The effects of Earth's rotation on its axis: (i) Occurrence of day and night; (ii) The Sun seems to change its position; (iii) Changes in length and direction of the shadow. Suggested activity: Encourage the use of ICT to view the rotation and revolution of the Earth.
		5	Summarise the rotation and revolution of the Earth using graphic organisers.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
		6	Communicate creatively and innovatively on other effects of the rotation and revolution of the Earth.	

THEME

TECHNOLOGY AND SUSTAINABILITY OF LIFE

TOPIC

10.0 MACHINES

<table>
<tr><th colspan="5">10.0 Machines</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">10.1 Lever</td><td rowspan="3">Pupils are able to:

10.1.1 Identify the load, fulcrum and force on the lever by carrying out activities.

10.1.2 Make generalisation on the relationship between the distance of load from fulcrum with the required force.

10.1.3 Explain the observations about the lever through written or verbal forms, sketches or ICT in a creative way.</td><td>1</td><td>Give examples for each type of simple machines.</td><td rowspan="3">Notes :

The design of a model consisting of various simple machines and its functions explained.

Suggested activity:

Encourage the use of ICT to observe the relationship between the distance of load from fulcrum with the force.</td></tr>
<tr><td>2</td><td>Describe the simple machines found in a complex machine.</td></tr>
<tr><td>3</td><td>Make generalisation on the relationship between the distance of load from fulcrum with the required force.</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="3">10.2 Simple Machines and Complex Machines</td><td rowspan="3">Pupils are able to:

10.2.1 Explain with examples the types and uses of simple machines by carrying out activities.

10.2.2 Solve problems using two or more simple machines.

10.2.3 Summarise the meaning of complex machines.

10.2.4 Explain the observations of the simple and complex machines through written or verbal forms, sketches or ICT in a creative way.</td><td>4</td><td>Generate ideas to solve problems involving the use of machines.</td><td rowspan="3">Notes :

Types of simple machines are lever, gear, pulley, wheel and axle, wedge, screw and inclined plane.

Examples of problems in daily life such as lifting and moving heavy loads.

The complex machine consists of a combination of more than one simple machine.</td></tr>
<tr><td>5</td><td>Communicate to show the importance of inventing sustainable machines.</td></tr>
<tr><td>6</td><td>Design a model of complex machine and present it creatively and innovatively.</td></tr>
</table>

PANEL OF WRITERS

1.	Dr. Rusilawati binti Othman	Curriculum Development Division
2.	Hajah Zainon binti Abd Majid	Curriculum Development Division
3.	Kamarul Azlan bin Ahmad	Curriculum Development Division
4.	Kumutha a/p Krishnamoorthy	Curriculum Development Division
5.	Nuraini binti Abu Bakar	Curriculum Development Division
6.	Wan Noorhayati binti Wan Zainulddin	Curriculum Development Division
7.	Enchum binti Ibrahim	IPG Kampus Ipoh, Perak
8.	Fathaiyah binti Abdullah	IPG Kampus Raja Melewar, Negeri Sembilan
9.	Makrof bin Md Daud	IPG Kampus Perempuan Melayu, Melaka
10.	Mohd Azizi bin Yahaya	IPG Kampus Perempuan Melayu, Melaka
11.	Dr. Tay Chong Seng	IPG Kampus Tun Hussein Onn, Johor
12.	Adonie binti Adnan	SK Bandar Sunway Semenyih, Selangor
13.	Aszoura binti Muhamed Salleh	SK Dato Abu Bakar Baginda, Selangor
14.	Magdalina binti Chuaidi	SK Bukit raja, Selangor
15.	Mazlaily binti Zakaria	SK Seri Kelana, Negeri Sembilan
16.	Noorul Aisyah binti Abdul Ghafar	SK Kajang, Selangor
17.	Nor Azlan bin Halias	SK Bandar Rinching, Selangor
18.	Norhaslinda binti Rahmat	SK Batu Sembilan, Selangor
19.	Puspa a/p Ramiah	SK Bukit Maluri, Wilayah Persekutuan
20.	Puteri Hanizah binti Megat Amaddin	SK Melekek, Melaka
21.	Rais bin Abdul Aziz	SK Batu Lanchang, Pulau Pinang
22.	Siti Aminah binti Ahmad	SK Batu Belah, Selangor

23.	Siti Hawa binti Yaacob	SK Kemuning, Melaka
24.	Siti Rozita binti Yahya	SK Ulu Semenyih, Selangor
25.	Siti Roha binti Abd. Karim	SK Kayu Ara Pasong, Johor
26.	Suzlipah binti Sanusi	SK Seri Permai, Pulau Pinang
27.	Thenmoly a/p Rajan	SJKT Vivekananda, Wilayah Persekutuan
28.	Zuliana binti Zam Zam	SK Putrajaya Presint 9(2), Wilayah Putrajaya

CONTRIBUTORS

1.	Prof. Madya Dr.Rohaida binti Mohd Saat	Universiti Malaya
2.	Prof. Madya Dr.Tajulariffin bin Sulaiman	Universiti Putra Malaysia
3.	Mohd Nazrul bin Husain	Jabatan Pendidikan Negeri Selangor
4.	Farid bin Jamburi	SK Simpang Renggam, Johor
5.	Fatul Muin binti Azizan	SK Kuala Ketil, Kedah
6.	Hafiz Zakin bin Hamdan	SMK Seri Perak, Perak
7.	Hayati binti Saad	SK Jati, Perak
8.	Komathi a/p Letchamanan	SJKT Tun Sambanthan, Perak
9.	Lye Soon Fung	SJKC Chi Ming, Johor
10.	Nantha Kumar a/l Sivaperumal	SJKT Pusat Telok Datok, Selangor
11.	Nurhatizah binti Zulrahman	SK Kantan Permai, Selangor
12.	Nuruhaslin binti Zainol	SK Putrajaya Presint 9(2). Wilayah Putrajaya
13.	Tan Chee Yan	SJKC Subang, Selangor
14.	Zalina binti Ariffin	SK Bandar Rinching, Selangor

PANEL OF TRANSLATORS

1.	Kanakambal a/p Velusamy	IPG Kampus Ipoh, Perak
2.	Tam Suet Yet	ELTC Seremban , Negeri Sembilan
3.	Mohd Munir bin Baharom	JPN Johor Bahru
4.	Flora Crispina Nathan	PPD Petaling Perdana, Selangor
5.	Krishna Kumar a/l Santhanam	PPW Sentul, Wilayah Persekutuan
6.	Nurul Shima binti Qutubudin	PPW Sentul, Wilayah Persekutuan
7.	Rajaspare a/p Rengasamy	PPD Petaling Perdana, Selangor
8.	Rohana binti Abd Wahab	PPD Jasin, Melaka
9.	Anis Izyani binti Ali	SK Convent, Johor
10.	Arni binti Mansor	SK Batang, Melaka
11.	Azalida binti Tajudin	SK Selandar, Melaka
17.	Kavitha a/p Maslamany	SK Taman Dato Harun (2), Selangor
12.	Muhamad Hafizuddin bin Mat Zaki	Sk Taman Bukit Dahlia, Johor
13.	Noor Laily binti Mohamad	SK Sungai Tukang Sidin, Melaka
14.	Sangeetha a/p Paramasivan	SK Seksyen 17 Shah Alam, Selangor
15.	Shavita a/p Aiyathurai	SK Dumpar Muar Johor
16.	Teh Malihah binti Hussain	SK Simpang Empat, Perak

ACKNOWLEDGEMENT

Advisors

Shazali bin Ahmad	-	Director
Datin Dr. Ng Soo Boon	-	Deputy Director (STEM)
Dr. Mohamed bin Abu Bakar	-	Deputy Director (Humanities)

Editorial Advisors

Mohamed Zaki bin Abd. Ghani	-	Head of Sector
Haji Naza Idris bin Saadon	-	Head of Sector
Mahyudin bin Ahmad	-	Head of Sector
Dr. Rusilawati binti Othman	-	Head of Sector
Mohd Faudzan bin Hamzah	-	Head of Sector
Fazlinah binti Said	-	Head of Sector
Mohamed Salim bin Taufix Rashidi	-	Head of Sector
Haji Sofian Azmi bin TajulArus	-	Head of Sector
Paizah binti Zakaria	-	Head of Sector
Hajah Norashikin binti Hashim	-	Head of Sector

Publication Technical and Specification Coordinators

Saripah Faridah Binti Syed Khalid
Nur Fadia Binti Mohamed Radzuan
Mohamad Zaiful bin Zainal Abidin

Graphic Designer

Siti Zulikha Binti Zelkepli

This curriculum document is published in Bahasa Melayu and English language. If there is any conflict or inconsistency between the Bahasa Melayu version and the English version, the Bahasa Melayu version shall, to the extent of the conflict or inconsistency, prevail.

Bahagian Pembangunan Kurikulum
Kementerian Pendidikan Malaysia
Aras 4-8 Blok E9, Kompleks Kerajaan Parcel E,
62604 Putrajaya.
Tel: 03-8884 2000 Fax: 03-8888 9917
http://bpk.moe.gov.my