KEMENTERIAN PENDIDIKAN MALAYSIA

KURIKULUM STANDARD SEKOLAH RENDAH

Sains

Dokumen Standard Kurikulum dan Pentaksiran

Tahun 6
(EDISI BAHASA INGGERIS)

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Bahagian Pembangunan Kurikulum
2021

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 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.

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Sumber: Peraturan-Peraturan Pendidikan (Kurikulum Kebangsaan) 1997

[PU(A)531/97.]

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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)

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.

HAJI AZMAN BIN HAJI ADNAN
Pengarah
Bahagian Pembangunan Kurikulum
Kementerian Pendidikan Malaysia

INTRODUCTION

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

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

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

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

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

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

AIMS

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

OBJECTIVES

Science KSSR enables pupils to achieve the following objectives:

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

6. Demonstrating responsive attitudes towards preserving the environment to face challenges at local, national and global levels.

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

KSSR is designed based on six strands, which are Communication; Spiritual, Attitudes and Values; Humanity; Personal Competence; Physical Development and Aesthetics; and Science and Technology. The six strands are the main domain which support each other and are integrated with critical, creative and innovative thinking. This integration aims to develop the human capital who treasures noble values based on religion, is knowledgeable, is competent and is able to think critically, creatively and innovatively as illustrated in Figure 1. Science Curriculum is designed based on six strands of KSSR Framework.
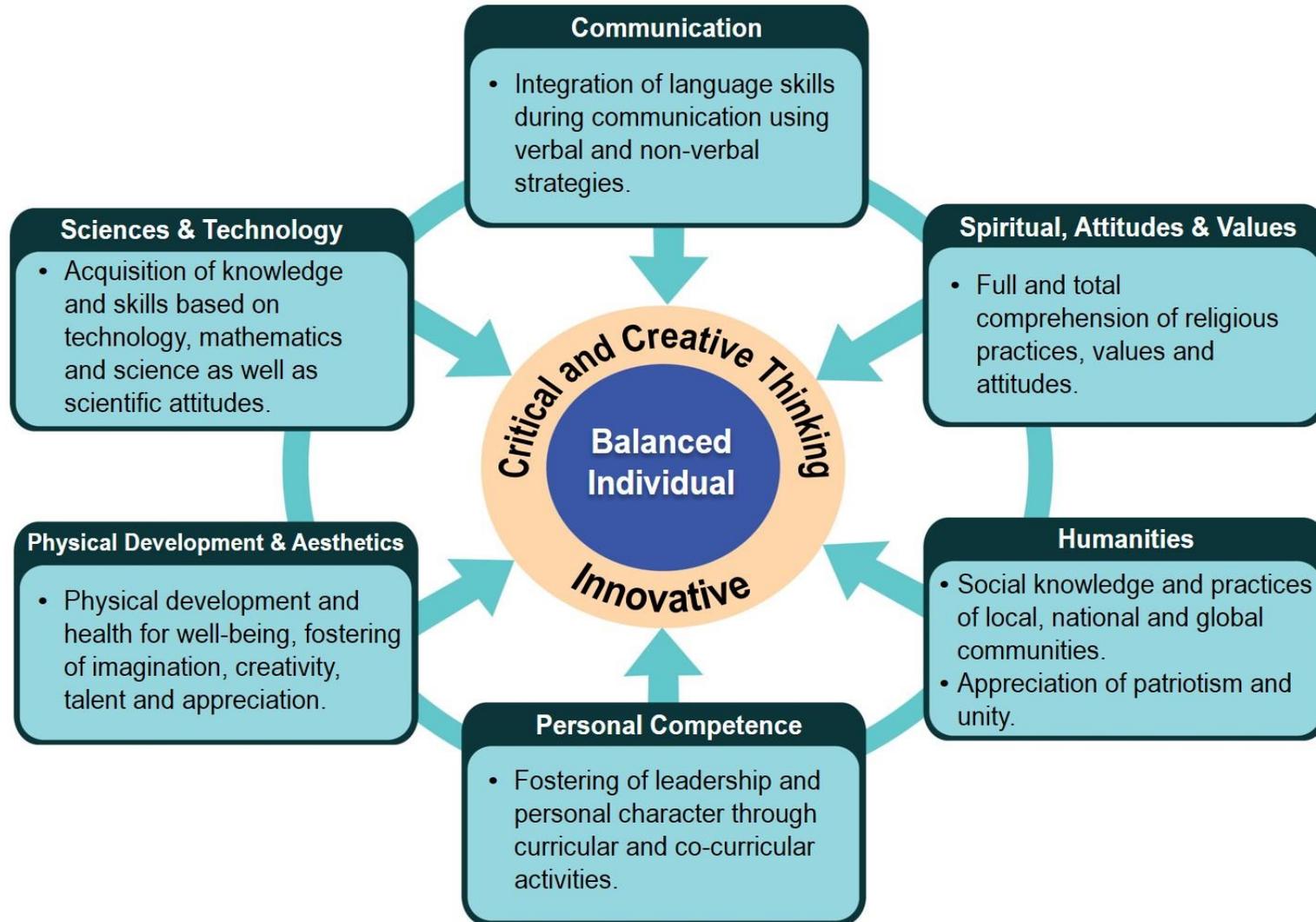
Figure1: Framework **of** the Standard-Based Curriculum for Primary School

FOCUS

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

Science KSSR is developed based on 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.

KNOWLEDGE
1. Inquiry in Science
2. Life Science
3. Physical Science
4. Material Science
5. Earth and Space
6. Technology and Sustainability of Life

SKILLS
- Scientific
- Communication
- Collaboration
- Creative and Critical Thinking

VALUES
Scientific Attitudes and Noble Values

THOUGHTFUL SCIENCE

SCIENCE THROUGH INQUIRY
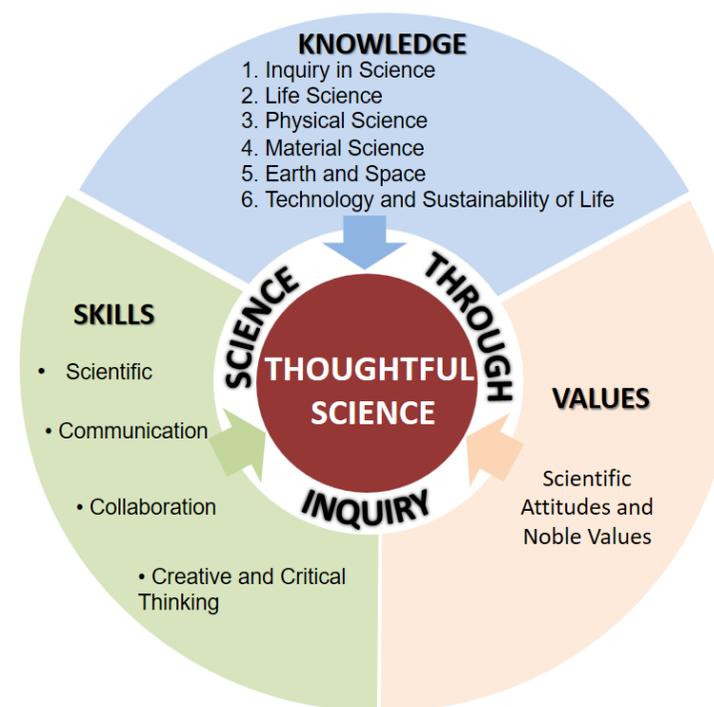
Figure 2: The Conceptual Framework for Science Curriculum

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.
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 or 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.

CREATIVE THINKING SKILLS	DESCRIPTION
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 statement, drawing and artefact.

CREATIVE THINKING SKILLS	DESCRIPTION
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.
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 solution 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).

Thinking Skills

Critical

- Attributing
- Comparing and contrasting
- Grouping and classifying
- Sequencing
- Prioritising
- Analysing
- Detecting bias
- Evaluating
- Making conclusions

Reasoning

Creative

- Generating ideas
- Relating
- Making inferences
- Predicting
- Making generalisations
- Visualising
- Synthesising
- Making hypothesis
- Making analogies
- Inventing

Thinking Strategies

- Conceptualising
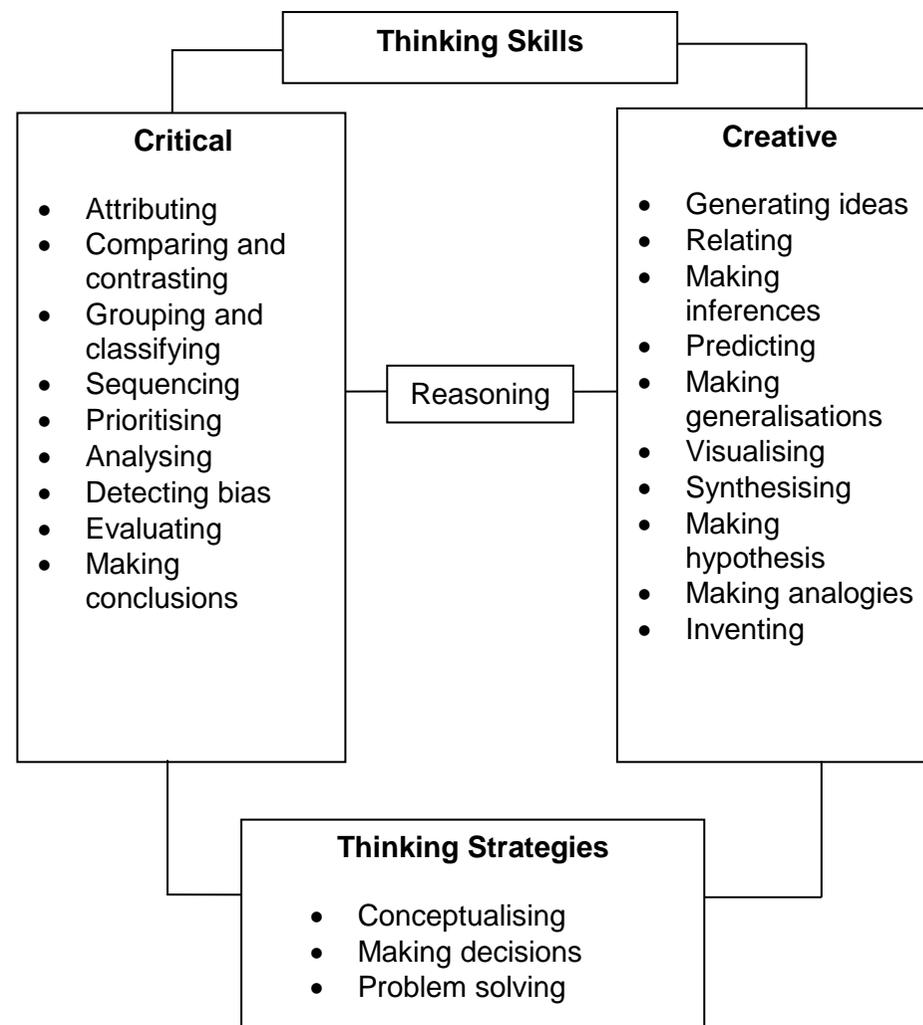- Making decisions
- Problem solving

Figure 3: TSTS Model in Science

9

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

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

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

Scientific Skills

Science KSSR emphasises on inquiry method and problem solving. In the process of inquiry and solving 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. It is a mental processes that enhance creative, analytical and systematic thinking. Mastery of SPS 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	THINKING SKILLS
Observing	Using the sense of sight, hearing, touch, taste or smell to gather information about objects and phenomena.
Classifying	Through observations to group objects or phenomena according to similarities and differences.

SCIENCE PROCESS SKILLS	THINKING SKILLS
Measuring and Using Numbers	Making quantitative observations using numbers and tools with standard units. Measurement makes observations more precise.
Making Inferences	Using data collection and previous 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.

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

SCIENCE PROCESS SKILLS	THINKING SKILLS
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 science specimens correctly and carefully;
- Sketch specimens, substances and apparatus 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 as well as to ensure the safety of the users. Rules of the science laboratory or science room should be disclosed to pupils so that the concept of compliance with the rules of the science laboratory or science room can be cultivated.

Relationship between Science Process Skills and Thinking Skills

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

Table 5: Relationship between Science Process Skills and Thinking Skills

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

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

SCIENCE PROCESS SKILLS	THINKING SKILLS
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

13

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 intended learning standard is written by integrating acquisition of knowledge with mastery of thinking skills and scientific skills. Thus in teaching and learning, teachers need to emphasise the mastery of skills with acquisition of knowledge as well as inculcation of scientific attitudes and noble values.

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

Science Process Skills Standards

Science Process Skills Standards for each level of schooling are general suggestions that must be achieved by pupils. Each statement refers to the minimum standard that must be achieved according to their level of schooling and operational cognitive development. SPS at primary school level are explicitly stated as learning standards that must be mastered as a foundation before they further their studies at secondary level. Performance standards for SPS in primary schools are stated in detail in order to assist teachers to determine the development of the mastered skills. The suggested science process skills 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 proficiently for making observations.	• Make qualitative and quantitative observations to make generalisations based on a pattern or sequence of an object or phenomenon. • Present further findings based on observations of objects or phenomena analytically and specifically.
2	Classifying	Collect/ isolate evidences/ data/ objects/ phenomena based on the observed characteristics.	Compare/ identify similarities and differences based on common characteristics.	Compare/ identify similarities and differences to determine the selection criteria to categorise evidences/ data/ objects/ the phenomenon being studied.	Identify characteristics used to differentiate, collect, select and explain in more detail about the object or phenomenon being studied.

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

16

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

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

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

Scientific Attitudes and Noble Values

Positive attitudes and values can be nurtured in pupils through the science learning experience. The nurtured 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 means to understand nature;
- Appreciating and practising clean and healthy living; and
- Being thankful to God.

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

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

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

21st CENTURY SKILLS

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

Table 7: Pupils' Profile

PUPIL PROFILE	DESCRIPTION
Resilient	Able to face and overcome difficulties and challenges with wisdom, confidence, tolerance and empathy.
Communicator	Able to voice out and express their thoughts, ideas and information confidently and creatively in verbal and written form, using a variety of media and technology.

PUPIL PROFILE	DESCRIPTION
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.

PUPIL PROFILE	DESCRIPTION
Patriotic	Portray love, support and respect towards the country.

HIGHER ORDER THINKING SKILLS

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

Table 8: Thinking levels in HOTS

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

THINKING 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 logically 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 in the form of reasoning, inquiry learning, problem solving and projects. Teachers and pupils need to use thinking tools such as thinking maps and mind maps as well as high level questioning to encourage pupils to think.

TEACHING AND LEARNING STRATEGIES

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

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

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

Inquiry Approach

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

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

Constructivism

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

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

Contextual Learning

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

Mastery learning

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

Problem/ Project-Based Learning

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

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

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

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

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

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

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

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

Figure 4: STEM Teaching and Learning Approach

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

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

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

Scientific Investigation/ Experiment

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

In the implementation of Science curriculum, pupils should be given the opportunities to design their own scientific investigations/experiments besides being guided to carry them out. This involves drafting their own experimental method, identifying the data that can be measured, analysing data and presenting the results of their scientific investigations/experiments.
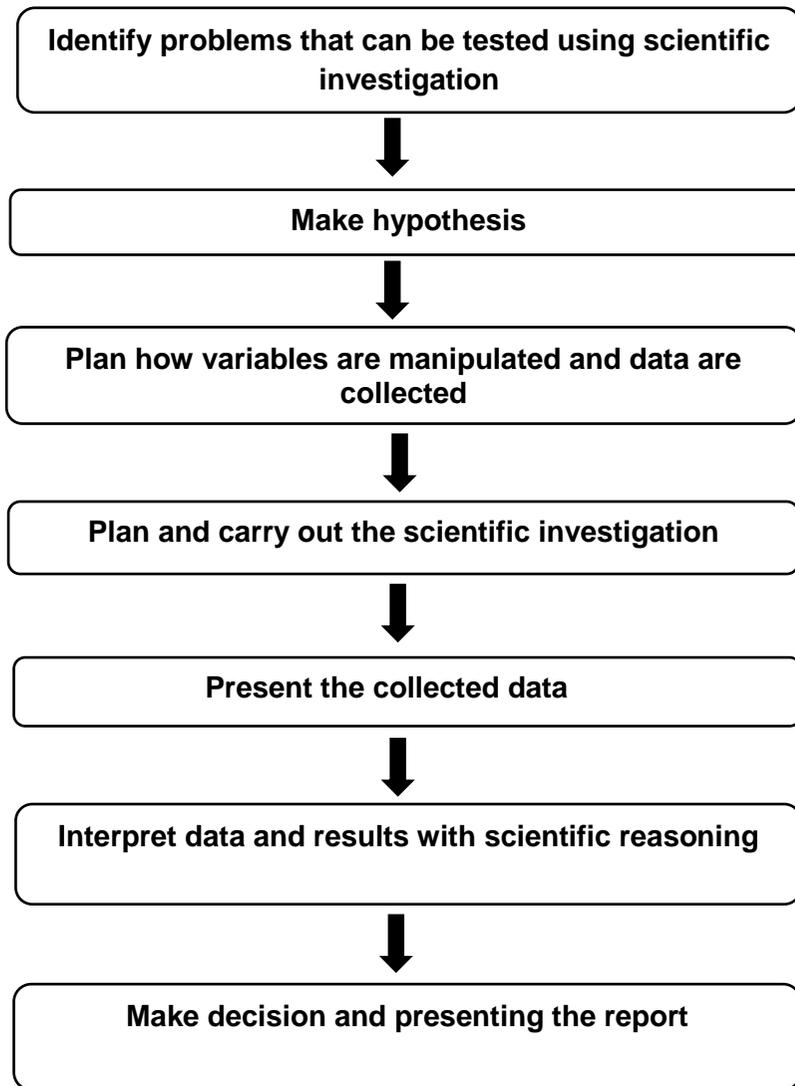
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┌──────────────────────────────────────────┐
│  Identify problems that can be tested      │
│     using scientific investigation         │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│              Make hypothesis               │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│  Plan how variables are manipulated and    │
│           data are collected               │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│  Plan and carry out the scientific         │
│           investigation                    │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│         Present the collected data         │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│  Interpret data and results with           │
│        scientific reasoning                │
└──────────────────────────────────────────┘
                    ↓
┌──────────────────────────────────────────┐
│  Make decision and presenting the report   │
└──────────────────────────────────────────┘
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Figure 5: Steps in carrying out scientific investigations/
experiments

Simulation

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

Project

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

Visits and Use of External Resources

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

Application of Technology

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

CROSS-CURRICULAR ELEMENTS

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

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

2. **Environmental Sustainability Awareness**

- Awareness towards the love for the environment in the pupils' lives needs to be nurtured through the teaching and learning process in all subjects.

- Knowledge and awareness of the importance of the environment and global sustainability is important to shape pupils' ethics in appreciating nature.

3. **Noble Values**

- Noble values are emphasised in all subjects to ensure that pupils are aware of its importance and practise them.

- Noble values include the aspects of spirituality, humanity and citizenship which will be practiced in pupils' daily life.

4. **Science and Technology**

- The increase of interest in science and technology will help to improve scientific and technological literacy among pupils.

- The use of technology in teaching can help and contribute to efficient and effective learning.

- The integration of science and technology in the teaching and learning process covers four areas, namely:

  i. The knowledge of science and technology (facts, principles, concepts related to science and technology);

  ii. Scientific skills (process of thought and specific manipulative skills);

  iii. Scientific attitudes (such as accuracy, honesty, security); and

  iv. The use of technology in teaching and learning activities.

5. **Patriotism**

- Patriotism can be nurtured through all subjects, co-curricular activities and community services.

- Patriotism can produce pupils who have the spirit of patriotism and pride as Malaysians.

6. **Creativity and Innovation**

- Creativity is the ability to use imagination in gathering, extracting and generating ideas or creating something new or authentic using a combination of existing ideas.

- Innovation is the application of creativity through the modification, rectification and practice of ideas.

- Creativity and innovation are always inter-connected. Therefore, there is a need to ensure that human capital development is able to meet the challenges of the 21st century.

- Elements of creativity and innovation should be integrated in the teaching and learning.

7. **Entrepreneurship**

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

- Entrepreneurial attributes can be ingrained in teaching and learning through activities that could foster attitudes such as diligence, honesty, trustworthiness and responsibility as well as developing creative minds and innovative ideas to spur the market.

8. **Information and Communication Technology Skills**

- Information and communication technology (ICT) elements are incorporated in the lessons to ensure pupils are able to apply and strengthen their basic knowledge and skills in ICT.

- The application of ICT in the lesson does not only motivate pupils to be creative but stimulates interesting and fun teaching and learning as well as improve the quality of learning.

- ICT should be integrated in the lessons based on appropriate topics to be taught to further enhance pupils' understanding of the subject content.

- One of the emphases in ICT is the computational thinking that can be applied in all subjects. Computational thinking is a skill that uses logical reasoning concept, algorithms, decomposition, pattern recognition, scaling and evaluation in computer-aided problem solving process.

9. **Global Sustainability**

- The element of Global Sustainability aims to develop pupils with sustainable thinking highly responsive attitude to the environment in their daily lives with the application of knowledge, skills, and values acquired through the elements of the Sustainable Consumption and Production, Global Citizenship and Solidarity.

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

- This element is taught directly and indirectly in related subjects.

10. **Financial education**

- Application of financial education elements aims at shaping the future generation that is capable of making right financial decisions, ethical practice and financial management skills to manage the financial affairs responsibly.

- The Elements of financial education can be applied in teaching and learning directly or indirectly. Direct application is done through the titles that contain explicit financial elements such as the calculation of simple interest and compound interest. Indirect application is integrated through other titles across the curriculum. Exposure to financial management in real life is important to provide pupils with the knowledge, skills and values that can be applied effectively and meaningfully.

CLASSROOM ASSESSMENT

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

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

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

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

Science Performance Standard for Primary School

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

Table 9: Description of Performance Level of Knowledge and Skills

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

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

35

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

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

Overall Performance Level for Science

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

Table 11: Description of Overall Performance Level for Science
KSSR

PERFORMANCE LEVEL	DESCRIPTOR
1	**Recall** the knowledge and scientific skills as well as show interest in science.
2	**Understand** the knowledge and scientific skills as well as explain their understanding to show interest and curiosity.
3	**Apply** the knowledge and scientific skills to solve problems or perform tasks honestly and record data accurately.
4	**Analyse** the knowledge and scientific skills to **solve problems** or **perform tasks** systematically and dare to try.

PERFORMANCE LEVEL	DESCRIPTOR
5	**Evaluate** the knowledge and scientific skills to **solve problems** or **perform tasks** as well as **make decision,** honest and accurate in recording data, dare to try, systematic, cooperative, diligent and perseverant.
6	**Create** using knowledge and scientific skills to **solve problems** and **make decision** or **perform tasks** systematically, cooperative, diligent, perseverant, be responsible to oneself, peers and the environment, courteous and become a role model.

CONTENT ORGANISATION

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

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

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

Table 12: Description of Content Standard, Learning Standard and Performance Standard

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 an indicator that certain topics have been mastered by pupils.

38

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

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

Table 13: Content of Science KSSR Level II

THEME	SCOPE
Inquiry in Science	Science process skills
Life Science	Human: breathing, excretion and defecation, respond to stimuli, skeletal system, blood circulatory system, relationship between body systems, reproductive system and nervous system.
	Animals: breathing organs, vertebrates, survival of the species and interaction among animals.
	Plants: respond to stimuli, photosynthesis, survival of the species, seeds dispersal, interaction among plants, preservation and conservation.
	Microorganisms.

Table 13: Content of KSSR Science Level II

THEME	SCOPE
Physical Science	Properties of light, sound, sources and forms of energy, renewable and non-renewable energy, sources of electrical energy, series and parallel circuit, safety precautions in handling electrical appliances and conservation of electricity, heat and temperature, force and its effects, frictional force, air pressure and speed of objects.
Material Science	Basic sources of materials, properties of materials, rusting, states of matter, changes in states of matter, natural water cycle, food spoilage, food preservation and waste management.
Earth and Space	Gravity of Earth, rotation and revolution of the Earth, phases of the Moon, constellations, phenomena of eclipses and the Milky Way galaxy.
Technology and Sustainability of Life	Lever, simple machines and complex machines, uses of tools in life, stability and strength of objects and structures, the advantages and disadvantages of technology.

INQUIRY IN SCIENCE

1.0   SCIENTIFIC SKILLS

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

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

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	1.1.9 Define operationally by describing an interpretation of a task carried out and observed in a situation according to determined aspects. 1.1.10 Control variables by determining the responding and constant variables after the manipulated variable in an 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 an 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 environment.	

LIFE SCIENCE

2.0 HUMAN

3.0 MICROORGANISMS

4.0 INTERACTION AMONG LIVING THINGS

5.0 PRESERVATION AND CONSERVATION

2.0 HUMAN				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
2.1 Human Reproduction	Pupils are able to: 2.1.1 Describe the functions of male and female reproductive organs. 2.1.2 Explain the process of human fertilisation until the baby is born. 2.1.3 Provide reasoning on the importance of reproduction to human. 2.1.4 Explain the observations of human reproduction through written or verbal forms, sketches or ICT in a creative way.	1	Identify male and female reproductive organs.	Notes: Reproductive organs: (i) Testis (ii) Penis (iii) Vagina (iv) Ovary (v) Fallopian tube (vi) Uterus
		2	State the main part of the central nervous system.	
		3	Describe the functions of male and female reproductive organs.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
2.2 Nervous System	Pupils are able to: 2.2.1 Identify the types of human nervous system. 2.2.2 Describe the central nervous system and its functions. 2.2.3 State the functions of peripheral nervous system. 2.2.4 Predict the condition that occurs if the peripheral nervous system does not function. 2.2.5 Generate ideas on ways to take care of the nervous system. 2.2.6 Explain the observations of the nervous system through written or verbal forms, sketches or ICT in a creative way.	4	Provide reasoning on the importance of the reproductive system to human.	Notes: The nervous system consists of central nervous system and peripheral nervous system. The main parts of central nervous system are the brain and spinal cord. Ways to care of the nervous system such as: (i) Wear helmet when riding a bike. (ii) Carry out daily activities with correct posture.
		5	Summarise the importance of taking care of the nervous system towards the well-being of human life.	
		6	Communicate creatively and innovatively on the reproductive system and the nervous system and present their findings.	

3.0 MICROORGANISMS				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
3.1 Life Processes and Effects of Microorganisms	Pupils are able to: 3.1.1 Explain with examples the types of microorganisms. 3.1.2 Make generalisation on the meaning of microorganisms. 3.1.3 Describe the life processes of microorganisms by carrying out investigations. 3.1.4 Carry out experiments to determine the factors that affect the growth of microorganisms.	1	State the types and examples of microorganisms.	Notes: Safety precautions need to be considered when handling the microorganisms. The types of microorganisms are fungi, protozoa, algae, bacteria and virus. Suggested activities: Carry out investigations by using suitable microorganisms to understand the life processes of microorganisms such as breathing, growing and moving.
		2	Describe that microorganisms undergo life processes.	
		3	Explain the harmful effects of microorganisms.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	3.1.5 Describe the effects of microorganisms in daily life. 3.1.6 Explain the observations of microorganisms through written or verbal forms, sketches or ICT in a creative way.	4	Explain with examples the uses of microorganisms.	Notes: Factors of the growth of microorganisms: (i) Temperature (ii) Nutrient (iii) Acidity (iv) Water (v) Air
		5	Conclude the factors that affect the growth of microorganisms.	
		6	Communicate creatively and innovatively on life processes of microorganisms and their effects and present their findings.	

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4.0 INTERACTION AMONG LIVING THINGS				
CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
4.1 Interaction among Animals	Pupils are able to: 4.1.1 Describe the types of interaction among living things. 4.1.2 Explain with examples the factors of competition among animals of intraspecies and interspecies. 4.1.3 Explain through examples the types of symbiosis among animals. 4.1.4 Explain the observations of interaction among animals through written or verbal forms, sketches or ICT in a creative way.	1	State the meaning of interaction among living things.	Notes: Types of interaction among animals are prey-predator, competition and symbiosis. Symbiosis among animals are mutualism, commensalism and parasitism.
		2	List the factors of competition among animals.	
		3	Make generalisation on the factors of competition among plants.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
4.2 Interaction among Plants	Pupils are able to: 4.2.1 Describe the factors of competition among plants by carrying out investigations. 4.2.2 Explain through examples the types of symbiosis among plants. 4.2.3 Explain the observations of interaction among plants through written or verbal forms, sketches or ICT in a creative way.	4	Explain through examples the types of symbiosis among plants and animals.	Notes: Types of interaction among plants are competition and symbiosis. Symbiosis among plants are commensalism and parasitism. Importance of interaction among living things to ecosystem such as: (i) Survival of species (ii) Control the population of living things in a habitat. (iii) Maintain the natural resources. (iv) Restore the balance of nature.
		5	Summarise the interaction among animals and the interaction among plants.	
		6	Communicate creatively and innovatively on the importance of interaction among living things to the ecosystem.	

5.0 PRESERVATION AND CONSERVATION				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
5.1 Preservation and Conservation for the Balance of Nature.	Pupils are able to: 5.1.1 State the meaning of preservation and conservation of animals and plants. 5.1.2 Generate ideas on ways of preservation and conservation of animals and plants. 5.1.3 Explain with examples the extinct animals.	1	State the examples of extinct animals.	
.	5.1.4 Explain through examples the animals and plants that are facing the threat of extinction. 5.1.5 Describe the factors that cause the threat of extinction to animals and plants.	2	Describe the plants and animals that are facing the threat of extinction.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	5.1.6 Generate ideas on the effects of preservation and conservation of animals and plants that are facing the threat of extinction. 5.1.7 Explain the observations of preservation and conservation through written or verbal forms, sketches or ICT in a creative way.	3	Describe the factors that cause the threat of extinction to animals and plants.	
		4	Explain through examples the ways of preservation and conservation of animals and plants.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
		5	Provide reasoning on preservation and conservation of animals and plants.	
		6	Communicate creatively and innovatively on the role of oneself in the effort to preserve and conserve the nature for sustainability.	

PHYSICAL SCIENCE

6.0   FORCE
7.0   SPEED

6.0 FORCE				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
6.1 Force and its Effects	Pupils are able to: 6.1.1 State the meaning of force by carrying out activities. 6.1.2 Explain with examples the effects of force by carrying out activities. 6.1.3 Explain the observations of force and its effects through written or verbal forms, sketches or ICT in a creative way.	1	State the meaning of force.	Notes: Force is a pull or a push which acts upon an object. Effects of force: i) Changes the shape of an object. ii) Changes the direction of an object. iii) Changes the speed of an object. iv) Moves a stationary object. v) Stops a moving object.
		2	Describe the effects of force.	
		3	Explain with examples the frictional force.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
6.2 Frictional Force	Pupils are able to: 6.2.1 State the meaning of frictional force by carrying out activities. 6.2.2 Describe the effects of frictional force. 6.2.3 Carry out experiments to determine the factors that affect the frictional force. 6.2.4 Generate ideas to solve problems on frictional force in daily life. 6.2.5 Explain the observations of frictional force through written or verbal forms, sketches or ICT in a creative way.	4	Conclude the factors that affect frictional force.	Notes: Frictional force occurs when two surfaces are in contact. Factors that affect frictional force are: (i) Mass of an object (ii) Type of surface
		5	Solve problems by applying knowledge on appropriate ways to increase and decrease frictional force.	
		6	Communicate creatively and innovatively on the application of frictional force in technology.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
6.3 Air Pressure	Pupils are able to: 6.3.1 Describe the existence of air pressure in surrounding by carrying out activities. 6.3.2 Relate air pressure with level of height. 6.3.3 Explain through examples the application of air pressure in daily life. 6.3.4 Explain the observations of air pressure through written or verbal forms, sketches or ICT in a creative way.	1	State the existence of air pressure.	Notes: Air pressure is caused by collisions of air particles on the surface of an object. Air pressure at the peak of a mountain is lower than air pressure at the foot of a mountain. Suggested activities: Observations on the existence of air pressure through activities such as: (i) A cup of water covered with a hard cardboard is turned upside down. (ii) A bottle of water is closed tightly and punched with holes at the bottom of the bottle.
		2	Describe the application of air pressure in daily life.	
		3	Explain with examples the relationship between height and air pressure.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
		4	Provide reasoning on the importance of air pressure in daily life.	Notes: Examples of problems in daily life such as clogged sink.
		5	Solve problems by applying knowledge of air pressure in daily life.	
		6	Design a model by applying the knowledge of air pressure and present it creatively and innovatively.	

		PERFORMANCE STANDARD		
7.0 SPEED				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE LEVEL**	**DESCRIPTOR**	**REMARKS**
7.1 Speed of Objects	Pupils are able to: 7.1.1 State the units of speed. 7.1.2 Carry out experiments to determine the relationship between speed, distance and time. 7.1.3 Solve problems related to speed using formula. 7.1.4 Define operationally the speed by carrying out activities. 7.1.5 Explain the observations of speed through written or verbal forms, sketches or ICT in a creative way.	1	Arrange the examples of vehicles according to the speed.	Notes: Units of speed: i) kilometre per hour (km/h) ii) metre per second (m/s) iii) centimetre per second (cm/s) Suggested activity: Carry out an experiment using a trolley or a toy car on a ramp to determine the relationship between speed, distance and time.
		2	State the units of speed.	
		3	Calculate to determine the speed, distance or time using formula.	
		4	Conclude the relationship between speed, distance and time.	
		5	Interpret data using space-time relationship by analysing the graph of a moving object.	
		6	Define operationally the speed by carrying out an activity.	

MATERIAL SCIENCE

8.0   FOOD PRESERVATION TECHNOLOGY

9.0   WASTE MATERIAL

8.0 FOOD PRESERVATION TECHNOLOGY				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
8.1 Food Spoilage	Pupils are able to: 8.1.1 Explain with examples the characteristics of spoilt food. 8.1.2 State that food spoilage is caused by the action of microorganisms. 8.1.3 Explain the observations of food spoilage through written or verbal forms, sketches or ICT in a creative way.	1	List the characteristics of spoilt food.	
		2	State the purpose of food preservation.	
		3	Explain with examples the methods of preservation and relate them with factors of the microorganisms' growth.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
8.2 Food Preservation	Pupils are able to: 8.2.1 Describe the purpose of food preservation. 8.2.2 Relate the methods of food preservation with the factors that affect the growth of microorganisms. 8.2.3 Carry out food preservation projects on a type of food using various methods. 8.2.4 Summarise that some food can be preserved using more than one preservation methods. 8.2.5 Make generalisation that some food can be preserved by combining more than one preservation methods.	4	Provide reasoning on the importance of food preservation technology.	Notes: The purpose of food preservation is to prevent or slow down the life processes of microorganisms. Food preservation methods such as drying, boiling, cooling, vacuum packing, pickling, freezing, canning, bottling, pasteurising, salting, smoking and waxing. Example of combined preservation methods for salted fish: salting, drying and vacuum packing.
		5	Summarise that some food can be preserved by combining more than one preservation methods for longer shelf-life.	
		6	Communicate creatively and innovatively on the role of food preservation technology for sustainable life.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	8.2.6 Describe the importance of food preservation technology to fulfill the needs of food supply. 8.2.7 Explain the observations of food preservation through written or verbal forms, sketches or ICT in a creative way.			Notes: The importance of food preservation technology such as preparing food supply during off-season, long lasting, avoid wastage and easy storage .

9.0 WASTE MATERIAL				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
9.1 Waste Management	Pupils are able to: 9.1.1 Identify waste materials based on the types of materials. 9.1.2 State the meaning of biodegradable and non-biodegradable waste materials. 9.1.3 Classify the waste materials into biodegradable and non-biodegradable materials. 9.1.4 Provide reasoning on the usage of biodegradable and non-biodegradable waste materials wisely.	1	State the examples of waste materials.	Notes: Examples of waste materials such as glass, paper, plastic, metal, toxic waste, leftover food and faeces. Suggested activities: (i) Produce organic fertiliser. (ii) Record and analyse waste materials discarded by oneself and plan ways to reduce them. (iii) Conduct 5R projects (Reuse, Reduce, Recycle, Repair and Refuse).
		2	Classify the waste materials into biodegradable and non-biodegradable materials.	
		3	Explain through examples the proper ways of waste management.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	9.1.5 Describe proper ways of waste management for sustainable life. 9.1.6 Explain the observations of waste management through written or verbal forms, sketches or ICT in a creative way.	4	Summarise the uses of biodegradable and non-biodegradable waste materials wisely.	
		5	Generate ideas on the effects of improper waste disposal.	
		6	Communicate creatively and innovatively one's role in managing waste materials in the environment for a sustainable life.	

THEME

EARTH AND SPACE

TOPIC

10.0 ECLIPSE

11.0 GALAXY

10.0 ECLIPSE

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
10.1 Eclipse of the Moon and Eclipse of the Sun Phenomena	Pupils are able to: 10.1.1 Describe eclipse of the Moon phenomenon based on the position of the Moon, the Earth and the Sun by carrying out a simulation. 10.1.2 Describe eclipse of the Sun phenomenon based on the position of the Moon, the Earth and the Sun by carrying out a simulation. 10.1.3 Relate eclipse of the Moon and eclipse of the Sun phenomena with the properties of light. 10.1.4 Predict the condition on the Earth during the occurrence of eclipse of the Moon and eclipse of the Sun. 10.1.5 Explain the observations of eclipse of the Moon and eclipse of the Sun phenomena through written or verbal forms, sketches or ICT in a creative way.	1	State the position of the Moon, the Earth and the Sun of an eclipse phenomenon.	Notes: Safety precaution that needs to be considered while making observation on eclipse of the Sun is to avoid looking directly at eclipse of the Sun with naked eyes.
		2	Describe the Milky Way galaxy.	
		3	Explain the eclipse phenomena.	

11.0 GALAXY				

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE STANDARD		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
11.1 The Milky Way Galaxy	Pupil are able to: 11.1.1 State the meaning of galaxy. 11.1.2 Describe the Milky Way galaxy. 11.1.3 Summarise that the Solar System is in the Milky Way galaxy. 11.1.4 Carry out a simulation to show the size of the Solar System in the Milky Way galaxy and amaze with God's creation.	4	Sketch diagrams to show eclipse of the Sun and eclipse of the Moon phenomena.	Notes : Galaxy consists of millions of stars, gases and dust. Suggested activities : Show videos/pictures of the Milky Way galaxy.
		5	Summarise that the size of the Solar System is very small compared to the Milky Way galaxy by carrying out a simulation.	

69

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE LEVEL		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	11.1.5 Explain the observations of galaxies through written or verbal forms, sketches or ICT in a creative way.	6	Communicate creatively and innovatively on the types of galaxies in the universe and present their findings	

TECHNOLOGY AND SUSTAINABILITY OF LIFE

12.0   STABILITY AND STRENGTH
13.0   TECHNOLOGY

12.0 STABILITY AND STRENGTH				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
12.1 Stability and Strength of Objects and Structures	Pupils are able to: 12.1.1 Describe the meaning of stability and strength by carrying out activities. 12.1.2 Explain with examples the structures that are strong and stable. 12.1.3 Carry out experiments to determine the factors that affect the stability of an object.	1	Give examples of strong and stable structures.	Notes: Factors that affect the stability are base area and height (centre of gravity). Factors that affect the strength are type of material and shape of a structure. Suggested activity: Create a strong and stable model structure using waste materials.
		2	State the meaning of stability and strength.	
		3	Describe the factors that affect the stability and the strength of a structure.	

CONTENT STANDARD	LEARNING STANDARD	PERFORMANCE LEVEL		REMARKS
		PERFORMANCE LEVEL	DESCRIPTOR	
	12.1.4 Carry out experiments to determine the factors that affect the strength of a structure. 12.1.5 Generate ideas on the importance of strong and stable structures for sustainable life. 12.1.6 Create a strong and stable model structure using suitable recyclable materials. 12.1.7 Explain the observations of stability and strength of objects and structures through written or verbal forms, sketches or ICT in a creative way.	4	Summarise the importance of strong and stable structures for sustainable life.	
		5	Create a strong and stable model structure.	
		6	Communicate creatively and innovatively on the strength and stability of the built model and give suggestions to improve it.	

13.0 TECHNOLOGY				
CONTENT STANDARD	**LEARNING STANDARD**	**PERFORMANCE STANDARD**		**REMARKS**
		PERFORMANCE LEVEL	**DESCRIPTOR**	
13.1 Advantages and Disadvantages of Technology	Pupils are able to: 13.1.1 State the meaning of technology and its importance. 13.1.2 Describe the development of technology in various fields. 13.1.3 Explain through examples the advantages and disadvantages of technology in daily life. 13.1.4 Explain the observations of advantages and disadvantages of technology through written or verbal forms, sketches or ICT in a creative way.	1	State the meaning of technology.	Notes: Technology is one of the applications of science knowledge to overcome human limitations. Development of technology in various fields such as agriculture, medicine, transportation, construction and communication.
		2	Give examples of appliances that make life easier.	
		3	Explain with examples the development of technology in certain fields.	
		4	Provide reasoning on the importance of technology to human.	
		5	Relate the effects of the uses of technology with sustainable life.	
		6	Communicate creatively and innovatively on the need of future technology in certain fields.	

PANEL OF WRITERS

1.	Dr. Rusilawati binti Othman	Bahagian Pembangunan Kurikulum
2.	Hajah Zainon binti Abd Majid	Bahagian Pembangunan Kurikulum
3.	Kamarul Azlan bin Ahmad	Bahagian Pembangunan Kurikulum
4.	Kumutha a/p Krishnamoorthy	Bahagian Pembangunan Kurikulum
5.	Nuraini binti Abu Bakar	Bahagian Pembangunan Kurikulum
6.	Dr. Tay Chong Seng	IPG Kampus Temenggong Ibrahim, Johor
7.	Fathaiyah binti Abdullah	IPG Kampus Raja Melewar, Negeri Sembilan
8.	Makrof bin Md Daud	IPG Kampus Perempuan Melayu, Melaka
9.	Asah binti Tambol	SK Kantan Permai, Selangor
10.	Aszoura binti Muhamed Salleh	SK Dato Abu Bakar Baginda, Selangor
11.	Balachandran a/l Kandasamy	SK Bandar Sunway, Petaling Jaya, Selangor
12.	Devi a/p Govindasamy	SK Taman Selayang (2), Selangor
13.	Fatul Muin bin Azizan	SK Kuala Ketil, Kedah
14.	Fazlinah binti Ali	SK Sungai Sumun, Perak
15.	Mazlaily binti Zakaria	SK Seri Kelana, Negeri Sembilan
16.	Mohd Azizi bin Alias	SK Sungai Kantan, Selangor
17.	Noorul Aisyah binti Abdul Ghafar	SK Kajang, Selangor
18.	Nor Heslee bin Mat	SK Seri Bandar, Melaka
19.	Normala Rohaiza binti Hassan	SK Sungai Marong, Pahang
20.	Puspa a/p Ramiah	SK Bukit Maluri, WP Kuala Lumpur
21.	Puteri Hanizah binti Megat Amaddin	SK Melekek, Melaka
22.	Siti Aminah binti Ahmad	SK Sungai Binjai, Selangor

23.	Siti Hawa binti Yaacob	SK Kemuning, Melaka
24.	Teh Malihah binti Hussain	SK Simpang Empat, Perak
25.	Thenmoly a/p Rajan	SJKT Vivekananda, WP Kuala Lumpur
26.	Umi Kalsum binti Ali	SK Jerantut Jaya, Pahang

CONTRIBUTORS

1.	Prof. Madya Dr.Rohaida binti Mohd Saat	Universiti Malaya
2.	Prof. Madya Dr.Tajulariffin bin Sulaiman	Universiti Putra Malaysia
3.	Enchum binti Ibrahim	IPG Kampus Ipoh, Perak
4.	Anggammah a/p Supramaniam	SJKT Rawang, Selangor
5.	Chong Mui Jing	SJKC Serdang Baru 1, Selangor
6.	Elaiyaraja a/l Moorthy	SJKT Ladang Temerloh, Perak
7.	Hafiz Zaki bin Hamdan	SMK Seri Perak, Perak
8.	Nalini a/p Murugaiyah	SK Taman Universiti, Selangor
9.	Rosidah binti Sahlan	SK Taman MIdah, Selangor
10.	Roslan bin Yusof	SMK Raja Muda Musa, Perak
11.	Sarawanan a/l Karuppiah	SJKT Ladang Middleton, Negeri Sembilan
12.	Tan Chee Yan	SJKC Subang, Selangor

PANEL OF TRANSLATORS

Anon Sham binti Che Din	Bahagian Pembangunan Kurikulum
Ros Amisha binti Shabudin	IPG Ilmu Khas, WP Kuala Lumpur
Nor Izni binti Mohd Hassan	English Language Teaching Centre, Negeri Sembilan
Balachandran a/l Kandasamy	SK Bandar Sunway, Selangor
Kamalakannan a/l Letchmanan	SK Puchong Jaya 2, Selangor
Kavitha a/p Maslamany	SK Taman Dato' Harun (2), Selangor
Khalilah binti Kamaruddin	SK Saujana Impian, Selangor
Manimaran a/l Subban	SK Batu Muda, WP Kuala Lumpur
Mohd Sofie bin Mohd Yusoff	SK Jalan 3, Bandar Baru Bangi, Selangor
Noorhaslinda binti Abd Ariff	SK Convent (2) Bukit Nanas, WP Kuala Lumpur
Nurizwa binti Pahrurrazi	SK Sikamat, Negeri Sembilan
Puteri Hanizah binti Megat Amaddin	SK Lendu, Melaka
Rosnita binti Abu Bakar	SK Malim, Melaka
Sadariah binti Abu Sohot	SK Convent Kajang, Selangor
Sangeetha a/p Paramasivan	SK Seksyen 17, Selangor
Siti Rozita binti Yahya	SK Bandar Sunway Semenyih, Selangor
Thenmoly a/p Rajan	SJKT Vivekananda, WP Kuala Lumpur
Vadsala a/p Vadivalu	SK Bandar Tun Hussein Onn (2), Selangor
Vanaja Devi a/p Govindasamy	SK Assunta 1, Selangor
Wan Mohd Akmal bin Wan Mansor	SK Putrajaya Presint 18 (1), Selangor

ACKNOWLEDGMENT

Advisors (April 2019)

Dr. Mohamed bin Abu Bakar   -   Director

Datin Dr. Ng Soo Boon   -   Deputy Director (STEM)

Editorial Advisors (April 2019)

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

Isnazhana binti Ismail
Mior Syazril bin Mohamed Sapawi
Siti Zulikha binti Zelkepli

Publication Technical and Specification Coordinators (2019)

Saripah Faridah binti Syed Khalid
Nur Fadia binti Mohamed Radzuan
Mohamad Zaiful bin Zainal Abidin
Siti Zulikha binti Zelkepli