SCIENCE POLICY

Rationale

Teaching and learning are focused on meeting the four purposes of Deira Private School

We want our children to become:

Successful learners
Confident individuals
Responsible citizens
Inspired contributors

This policy is linked to all curriculum subject policies and to Planning and Assessment Policies and guides all aspects of teaching and learning in the school.

- Science is a fundamental part of everyday life and developing understanding in this area is essential for the future of our world. At Deira Private school, we believe Science encourages children to ask questions and develop an understanding of the world around them. Science at our school promotes investigation, questioning and hands-on experiences led by children's curiosity. We believe that all students should be taught essential aspects of the knowledge, methods, processes and uses of science.
- It aims to stimulate a child's curiosity in finding out why things happen in the way they do. It teaches methods of enquiry and investigation to stimulate creative thought. Children learn to ask scientific questions and begin to appreciate the way in which science will affect the future on a personal, national, and global level.

Aims

Scientific knowledge and conceptual understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that students make progress, it is also vitally important that they develop a secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Students should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider school curriculum: teachers will wish to use different contexts to maximise their children's engagement with and motivation to study science.

The nature, processes and methods of science 'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance give examples of how 'working scientifically' might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific inquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include:

- Observing over time
- Pattern seeking
- Identifying, classifying and grouping
- Comparative and fair testing (controlled investigations)
- Researching using secondary sources.
- Students should seek answers to questions through collecting, analysing and presenting data.

Spoken language

The national curriculum for science reflects the importance of spoken language in student's development across the whole curriculum –cognitively, socially and linguistically. The quality and variety of language that students hear and speak are key factors in developing their scientific vocabulary and articulating scientific concepts clearly and precisely. They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

Attainment targets

By the end of each term, students are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study

Teaching and Learning Style:

Science is an essentially practical subject and the National Curriculum stresses that children should develop the ability to:

- Know about the nature of the solar system, space Science including the earth
- Ask and answer scientific questions, predict and hypothesise
- Choosing dependent, independent and controlled variables
- Observe, measure and manipulate variables
- Interpret data to conclude results
- Evaluate the procedure by suggesting possible improvements in the methods of performing investigations
- Plan and carry out investigations, using equipment in the lab and using ICT resources
- Develop practical skills through independent planning and open-ended tasks
- Evaluate evidence, and present their conclusions clearly and accurately
- Research and experimental evidence should be connected to real-life applications

The Foundation Stage

- Science makes a significant contribution to developing a child's knowledge and understanding of the world. The Foundation Stage Profile aims to give the children knowledge and skills so they can begin the National Curriculum. Children will explore the natural world around them, making observations and drawing pictures. Investigations, scientific inquiry and exploration are essential components of learning about and with technology both digital and in the natural world.

Key Stage 1: Year 1 and Year 2

- The principal focus of science teaching in Key Stage 1 is to enable children to experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period, noticing patterns, grouping and classifying things, carrying out simple comparative tests and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done using first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos. Children should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at Key Stage 1.

Lower Key Stage 2: Year 3 and Year 4

- The principal focus of science teaching in lower Key Stage 2 is to enable children to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out. Children should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

Upper Key Stage 2: Year 5 and Year 6

- The principal focus of science teaching in upper Key Stage 2 is to enable children to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper Key Stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out fair tests and finding things out using a wide range of secondary sources of information. Children should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings. Children should read, spell and pronounce scientific vocabulary correctly.

Key Stage 3: (Year 7 - 9)

Science at Key Stage 3 builds on the knowledge, understanding and skills that pupils have developed in Key Stage 2. Most students have reached at least level 4 of the National Curriculum for science by the end of Year 6. Year 7 to 9 teachers need to be familiar with the Key Stage 2 programme of study and should assume that incoming students have already made progress. Students need to recognise, describe, use and apply key scientific ideas to explain abstract phenomena even when they appear in unfamiliar contexts. Delving into key ideas can stimulate students' curiosity and help them to make connections between different areas of science. Scientific enquiry generally links direct practical experience with key scientific ideas. In the most effective practice, the principles of scientific inquiry are not left to special 'investigative science' lessons. They are integrated into most lessons, even those that involve little or no practical work. Teachers capitalise on chances in any lesson to encourage pupils to reflect, however briefly, on the evidence that supports scientific interpretations. For example, they ask pupils: 'How do you think they might have measured that?' or: 'How could you check those figures?'

This Key Stage is a preparation for GCSE, General Certificate of Secondary Education.

In variety of ways the outcomes can be achieved:

- Provide a challenge to enhance critical thinking through research and open-ended independent tasks.
- Regular opportunities to develop scientific language, mental and visualisation skills through oral work and modelling.
- Project-based learning
- Incorporating STEAM in Science lessons
- Using learning menus to provide a wide range of choices

- Opportunities for students to use and apply their understanding of key scientific ideas, either on their own or with others, with varying degrees of support.
- Empower students to self-evaluate, plan, challenge and set targets for themselves.
- 3D/2D Simulation.

Science curriculum planning

- The Head of Department will plan The Long Term and the Medium term plan or for the department beforehand. The subject planner is responsible for writing the daily lesson plans for each lesson (short-term plans). Each individual teacher uses external & internal assessment data to further personalise the plans to suit the needs of the students in his/her class. These plans list the specific learning objectives and expected outcomes of each lesson. The class teacher keeps these individual plans, and s/he and the science subject leader discuss these weekly. Teachers to consistently personalise Science lesson plans by triangulation of data (CAT4, PTS, internal data). Ensure consistency in provision for all groups of students including SEND and G&T in lessons.

  Collins reference books and their online platform are also utilised for planning, teaching, and learning.

Personalisation of Learning in Science

Based on the results of students' assessments, teachers can differentiate. Students will be grouped according to their ability into three – Spicy, Medium and Mild.

All children will be provided with the opportunity for extension or reinforcement appropriate to their ability. Generally, no more than three levels of work will be offered to each year group but, at the teacher's discretion, further extension work could be given. Those children who are more or less able than the norm will be given an activity more appropriate to their ability, on a daily basis.

Based on their CAT 4 results, they could also have different multiple intelligences like Kinesthetics Learner, Visual Learner, Audio Learner, etc. Students may also have identified special educational needs, or English Language needs or maybe Gifted or Talented.

Work for pupils will be pitched at appropriate and differing levels by means of various strategies, and in accordance with their developmental needs, including:

- clear objectives and differentiated outcomes
- learning menus/choice boards
- use of sensory activities
- open-ended questions
- appropriate differentiated resources
- teacher/TA/LSA/buddy support
- a range of class/individual management techniques

Science and Inclusion

Children with Special Educational Needs will be monitored by our SEN Co-ordinator ensuring that these children follow the National Curriculum Programmes of Study through work schemes that promote the child's development and self-esteem. We establish a classroom climate where all students feel that they can contribute and which secures their motivation and concentration. We strive hard to meet the needs of those students with special educational needs, those with special gifts and talents, and those learning English as an additional language.

The needs of pupils are constantly changing and all pupils at the school are involved in the "process" of inclusion. For all pupils this means having access to achieve the age related expectations from the National Curriculum and the full range of opportunities and activities available to all children in the school. It also means having the opportunity to work alongside peers in groups and adults other than teachers if needed, to visit the local community and to share activities with other children from other schools. For very few students with very high special needs, there may be modification in age related expectations as advised by the inclusion team.

In addition to this the more able/ gifted and talented children must get full extension, enrichment and if needed acceleration to enable them to maximise their achievements.

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GLOW Programme

Each student in this programme has their Individual Learning Plans with set targets. The students in this programme attend GLOW'D classes with modified curriculum below their ARE.

Merint Programme

The students under the programme are pulled out from regular classes. However, they are offered a developmental domain of Science supervised by the Inclusion teachers.

Attitudes and Attributes

At DePS, ‘Attitudes and Attributes’ programme is having a positive effect on student relationships. Some assessment of students’ personal and social development occurs through monitoring their participation in the “Attitudes and Attributes” programme.
Teachers should utilise it to maintain strong students' personal and social development across the school.

Extension and Enrichment Programme in Science

A student rides to school on a bus, and in that instance alone, there are many examples of technology based on the scientific method. The school bus is a product of many areas of science and technology, including mechanical engineering and innovation. The systems of roads, lights, sidewalks and other infrastructure are carefully designed by civil engineers and planners. The Enrichment programme caters for the development of critical thinking skills and provides opportunities for children to think beyond. Science Eco Club, Investigations and resources that link astrobiology to the science curriculum, Science Park, Coursera, STEAM and PBL will be created as an inclusive, community spirit within the school.

Each year group covers National Curriculum objectives specific to their classes during their Science teaching. Science is taught as a discrete lesson and as part of cross-curricular themes when appropriate. Science has links with other areas of the curriculum including UAE-STand Humanities, English, Mathematics, Art and ICT.
Teachers also use a wide range of resources, including the school environment to enhance and enrich the children’s learning.

Cross curricular links
English

Science contributes significantly to the teaching of English in our school by actively promoting the skills of reading, writing, speaking and listening. The children develop oral skills in science lessons through discussions (for example of the environment) and through recounting their observations of scientific experiments. They develop their writing skills through writing reports and biographies of scientists and by writing projects, creating and presenting plays based on the scientific concept.

Mathematics

Science contributes to the teaching of mathematics in a number of ways. Our teaching increases the ability to discern a numerical pattern as well as to use rational and creative thinking to solve numerically.Through working on investigations they learn to estimate and predict. They develop accuracy in their observation and recording of events. Many of their answers and conclusions include numbers. Students' experience of scientific enquiry can be identified only if they communicate ideas using conventional diagrams, charts and graphs

Personal, social and health education (PSHE/Moral Education)

Science makes a significant contribution to the teaching of PSHE and Moral Education. This is mainly in two areas. Firstly, the subject matter lends itself to raising matters of citizenship and social welfare. For example, children study the way people recycle material and how environments are changed for better or worse. Secondly, the subject gives children numerous opportunities to debate and discuss. They can organise campaigns on matters of concern to them, such as helping the poor or homeless. Science thus promotes the concept of positive citizenship.

Science and ICT

Use of ICT helps to research evidence for unknown or partially known phenomena. Software is used to animate and model scientific concepts, and to allow children to investigate processes which it would be impracticable to do directly in the classroom. Children use ICT to record, present and interpret data, to review, modify and evaluate their work, and to improve its presentation. Children learn how to find, select, and analyse information on the Internet and on other media.

IDTU (Interdisciplinary Thematic Unit) Projects are given in the middle of the term. This is designed to assess problem solving, creativity and critical thinking of the students. It covers different skills from different subjects.

Science and Innovation

- Access to e-learning portals and **online simulation** for all students that excite curiosity and invite interaction using different platforms.
- Incorporating hands-on education in curriculum emphasising specifically on critical thinking skills central to "good science"–questioning, investigating, forming hypotheses, interpreting data, analysing, developing conclusions, and solving problems.
- Implementation of STEM/STREAM/ coding education across school through platforms like **LEGO Education**
- Enhancing immersive learning through **AR/VR** as innovative digital solutions.
- Classroom set up that fosters curiosity and investigation to develop higher order thinking.
- Formative assessment is not limited to written tasks but should be extended to hands on and verbal assessments as well to cater to all forms of Multiple Intelligence.

- Innovation in lesson planning to cater the ability of Multiple intelligence and individual need in each student through Learning Menus.

Assessment for learning

Assessment, recording and reporting are important elements of our science teaching.

Assessment for Learning (Formative assessments) Formative assessments include diagnostic testing which includes a range of formal and informal assessment procedures conducted by teachers during the learning process in order to modify teaching and learning activities to improve student attainment. Some examples of formative assessments are classroom observations, questioning, discussions, learning menu, mind maps/ graphic organiser, peer and self-assessments with the help of rubrics, presentations, think –pair share, quizzes etc. Following which schemes of work will be reviewed and incorporated in planning to ensure focused intervention (whole class/ individual) is put in action for immediate impact. Formative assessments will empower students to identify their strengths and areas of development and help them plan next steps accordingly.
The assessments are monitored every six weeks and the Target Trackers are used to understand the progress of the child during six weeks.

Assessment of Learning (Summative assessment) The goal of summative assessment is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

Summative Assessment (End-of-Term Test) is administered termly to check attainment of students after a term. This is composed of topics taught for the whole term. The number of marks are divided into skills

Key International Benchmark Tests (GL Education)

The following benchmark are carried out at school as per KHDA guidelines and tests results are analysed and used to inform action points:

- CAT4 (Cognitive Abilities Test)
  CAT4 is an adaptive assessment of developed abilities in areas known to make a difference to learning and achievement – namely verbal, non-verbal, quantitative and spatial reasoning – and provides you with an accurate analysis of potential student achievement.
- PTs (Progress Tests)
  Measuring attainment in English, maths and science, these assessments are done at the end of the year to measure attainment as well as progress from data each year-on-year. Reports are set against national averages so you can reliably compare your results with those of schools across the country.
- PASS (Pupil Attitudes to Self and School - a Survey)

PASS takes the guesswork out of understanding why pupils may be reluctant, disengaged or even disruptive learners by sensitively exploring social and emotional wellbeing. It also provides interventions and guidance so you can start to address issues immediately.

- TIMSS (Trends in International Mathematics and Science Study)
  A major purpose of TIMSS is to provide important background information that can be used to improve teaching and learning in mathematics and science.

Monitoring and review

The Head of Science is responsible to monitor the standards of students' work and the quality of teaching in science. The Head of Science is also responsible for supporting colleagues in their teaching, for being informed about current developments in the subject, and for providing a strategic lead and direction for science in the school. The Head of Science has allocated time for fulfilling the vital task of reviewing samples of students' work and visiting classes to observe science teaching.

This policy is reviewed annually by the Head of department and SLT and with the feedback from school staff and students and based on the implications from the data both based on International Benchmark and Internal Assessments.

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