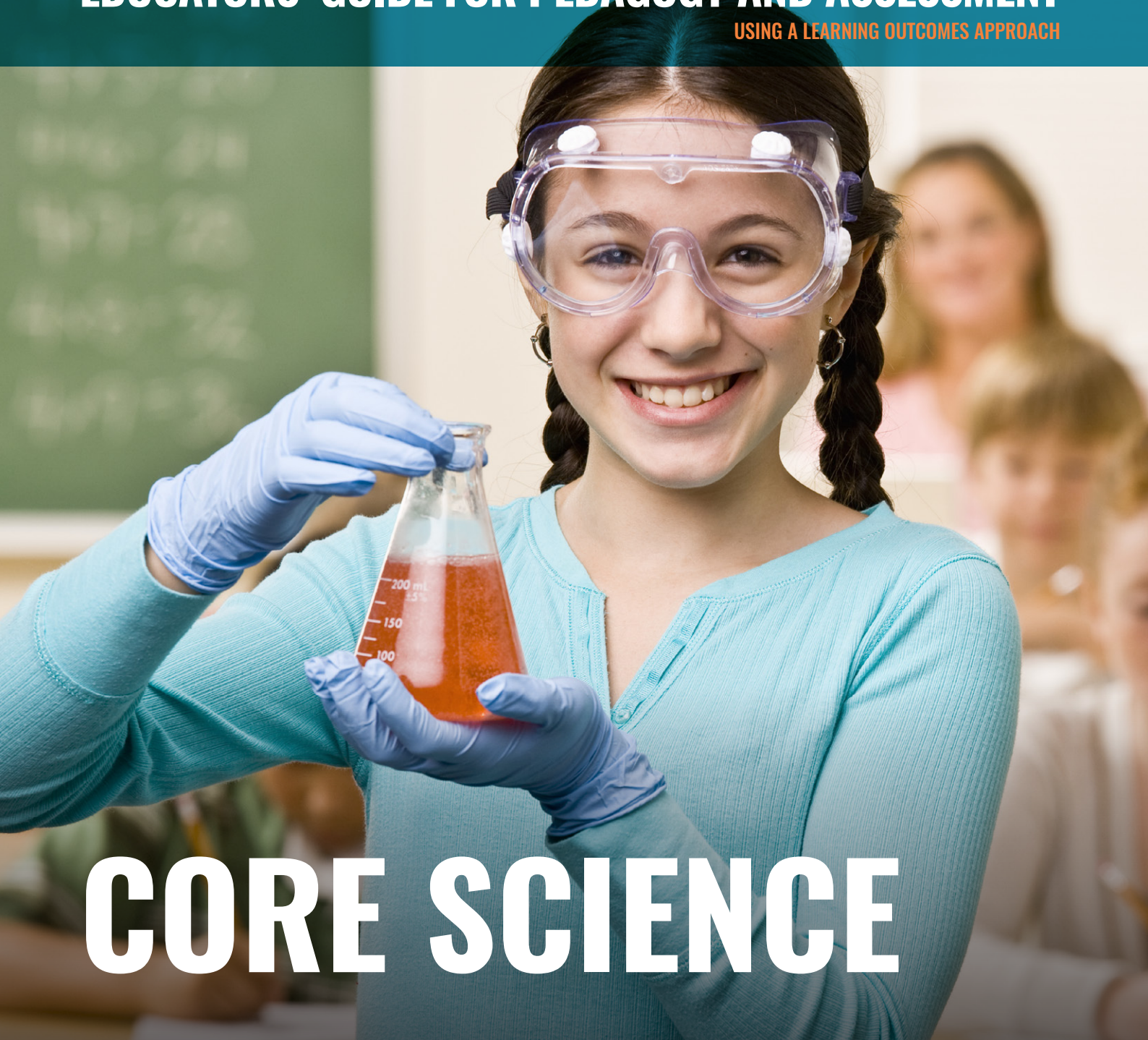


EDUCATORS' GUIDE FOR PEDAGOGY AND ASSESSMENT

USING A LEARNING OUTCOMES APPROACH



CORE SCIENCE

LEVELS **7** **8** **9** **10**



Learning
Outcomes
Framework



Learning Outcomes Framework

This document is part of the ESF1.228 Project entitled 'Design of Learning Outcomes Framework, associated Learning and Assessment programmes and related Training' implemented under the Operational Programme II – Cohesion Policy 2007-2013 and was part-financed by the European Union European Social Fund co-financing rate: 85% EU Fund; 15% National Funds.

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Directorate for Quality and Standards in Education,
Ministry for Education and Employment,
Great Siege Road, Floriana VLT 2000
Malta

Publisher: Directorate for Quality and Standards in Education

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Graphic design: Outlook Coop

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Introduction

Following the endorsement of the National Curriculum Framework (NCF) in 2012, an ambitious plan was launched with the aim of putting theory into practice. Built upon the National Minimum Curriculum (2000), it addressed the gaps in Malta's learning processes where emphasis shifted from teaching the subject to teaching the learner.

The National Minimum Curriculum framework took important policy-related documents issued by the European Commission into consideration. These included the *Key Competences for Lifelong learning – A European Reference Framework* (included in the annex of the Recommendations; 2006/962/EC); the *Strategic Framework for European Cooperation in Education and Training* (ET 2020; 2009) and *Europe 2020 – A Strategy for Smart Sustainable and Inclusive Growth* (COM (2010) 2020) which is the follow up to the *Lisbon Strategy for Growth and Jobs* (Memo 06/478/12 Dec 2006).

Against the background of Malta's historical development and on the basis of the curriculum and EU documentation the NCF seeks to provide strategic direction by rationalising the necessary changes and their implications for area/subject content, pedagogies and assessment. The NCF was presented within a lifelong learning perspective and celebrates diversity by catering for all learners at each stage of their education. It aims to introduce more equity and decentralisation in the national system. The NCF seeks to present a seamless curriculum which reflects smooth transitions, building and extending on the firm foundations in early childhood education. In essence, the NCF aims to provide a quality education for all learners, reducing the percentage of early school leavers and encouraging their enrolment in further and higher education.

The NCF proposed a Learning Outcomes Framework (LOF) as the keystone for learning and assessment throughout the years of compulsory schooling. The aim of the Learning Outcomes Framework is to free schools and learners from centrally-imposed knowledge-centric syllabi and to give them the freedom to develop programmes that fulfil the framework of knowledge, attitudes and skills-based outcomes that are considered national education entitlement of all learners in Malta. The LOF is thus intended to eventually lead to more curricular autonomy of colleges and schools so as to better address the learning needs of their learners.

A number of other local policy documents published in recent months have also contributed to the need of a learning outcomes-based approach in today's educational structures. In particular, the *Framework for the Education Strategy for Malta 2014 – 2024* (2014), *A National Literacy Strategy for All in Malta and Gozo 2014 – 2019* (2014), *A Strategic Plan for Early School Leaving in Malta 2014* (2014), *Education for All: Special Needs and Inclusive Education in Malta* (2014), *Malta National Lifelong Learning Strategy 2020* (2015) and *Respect for All Framework* (2015) all point toward the need to provide equitable opportunities for all learners to achieve educational outcomes at the end of their schooling which will enable them to participate in lifelong and adult learning, reduce the high incidence of early school leaving and ensure that all learners attain key competences in literacy, numeracy, science and technology.

The ESF 1.228 Project – *Design of Learning Outcomes Framework, Associated Learning and Assessment Programmes and Related Training* is intended to deliver this Learning Outcomes Framework approach to the educators and all relevant stakeholders within compulsory schooling. It addresses the holistic development of all learners and advocates a quality education for all as part of a coherent strategy for lifelong learning which aims to ensure that all children have the opportunity to obtain the necessary skills and attitudes to be future active citizens and to succeed at work and in society irrespective of socio-economic, cultural, racial, ethnic, religious, gender and sexual status.

The LOF will allow for flexibility in teaching and learning programmes in order to address specific needs and to build upon strengths within the context of the learning communities in different colleges and schools. This concept of flexibility is promoted throughout the entire framework. While acknowledging that out-of-school factors such as poverty and social exclusion affect learner achievement, the LOF seeks to improve learners' learning experiences by encouraging creativity, critical literacy, entrepreneurship and innovation at all levels. This will allow learners to reach their potential by connecting what they have learnt to their individual contexts. Consequently, this will help learners develop a positive attitude towards learning and a greater appreciation of its usefulness.

The move from a prescriptive content-based curriculum towards a learning outcomes approach will impact all programmes in schools and all external examinations and assessment at the end of compulsory education in Malta.

The LOF was also designed to meet the four broad education goals outlined in the *Education Strategy for Malta 2014 – 2024* (Ministry for Education and Employment, 2014), namely to:

- reduce the gaps in educational outcomes between boys and girls and between students attending different schools, decrease the number of low achievers, raise the bar in literacy, numeracy and science and technology competence and increase student achievement.
- support educational achievement of children at-risk-of-poverty and from low socio-economic status and reduce the relatively high incidence of early school-leavers.
- increase participation in lifelong learning and adult learning.
- raise levels of learner retainment and attainment in further, vocational and tertiary education and training.

The Learning and Assessment Programmes (LAPs) which were drawn up for each subject will ensure that the focus is on the learner. As such, learning activities will be geared to stimulate creativity and imagination; enable learners to make correct value judgements when editing/correcting their own work; develop learners' investigative and constructive skills by making use of different media and promote receptive skills (listening and reading) which lead to productive skills (speaking and writing). LAPs are also intended to create an atmosphere where learners develop their own problem solving skills and their ability to think and reason logically; reflect on outcomes and consequences and explore possible alternatives and apply interesting and realistic contexts that are personally meaningful to them.

With the use of LAPs, teachers will be encouraged to create situations and resources which are intrinsically interesting, culturally embedded and cognitively engaging and enable learners to connect the various types of information that they have acquired.

THE LEARNING AND ASSESSMENT PROGRAMME FOR CORE SCIENCE

This document, which is aimed at policy makers, educators and educators in the classroom, presents the Learning and Assessment Programme (LAP) for Core Science.

The LAP comprises:

- **The Learning Outcomes Framework (LOF)** - this encompasses a set of subject learning outcomes (SLOs) that set out what a learner is expected to know, understand or be able to do as a result of a process of learning. These learning outcomes are designed to be used in a range of delivery contexts and taught using different methods. They state the end result rather than describe the learning process or the learning activities.
- **Notes on Pedagogy and Assessment** - the learning outcomes are written in a way that informs pedagogy and, in conjunction with the assessment strategies related to each outcome, set a clear assessment expectation. This document sets down good practice teaching and assessment guidelines which educators may wish to take on board and adapt to meet the needs of their learners.

This document has been collaboratively developed by the Outlook Coop Learning Outcomes Framework Joint Venture comprising Outlook Coop as the lead partner, East Coast Education Ltd. and the University College London Institute of Education together with the Directorate for Quality and Standards in Education (DQSE). Mr Barry Smith (Joint Venture Technical Director), Mr Godfrey Kenely (Joint Venture Contract Director), Dr Michelle Attard Tonna (Head of Project) and Mr Gaetano Bugeja (Project Leader) directed the project experts.

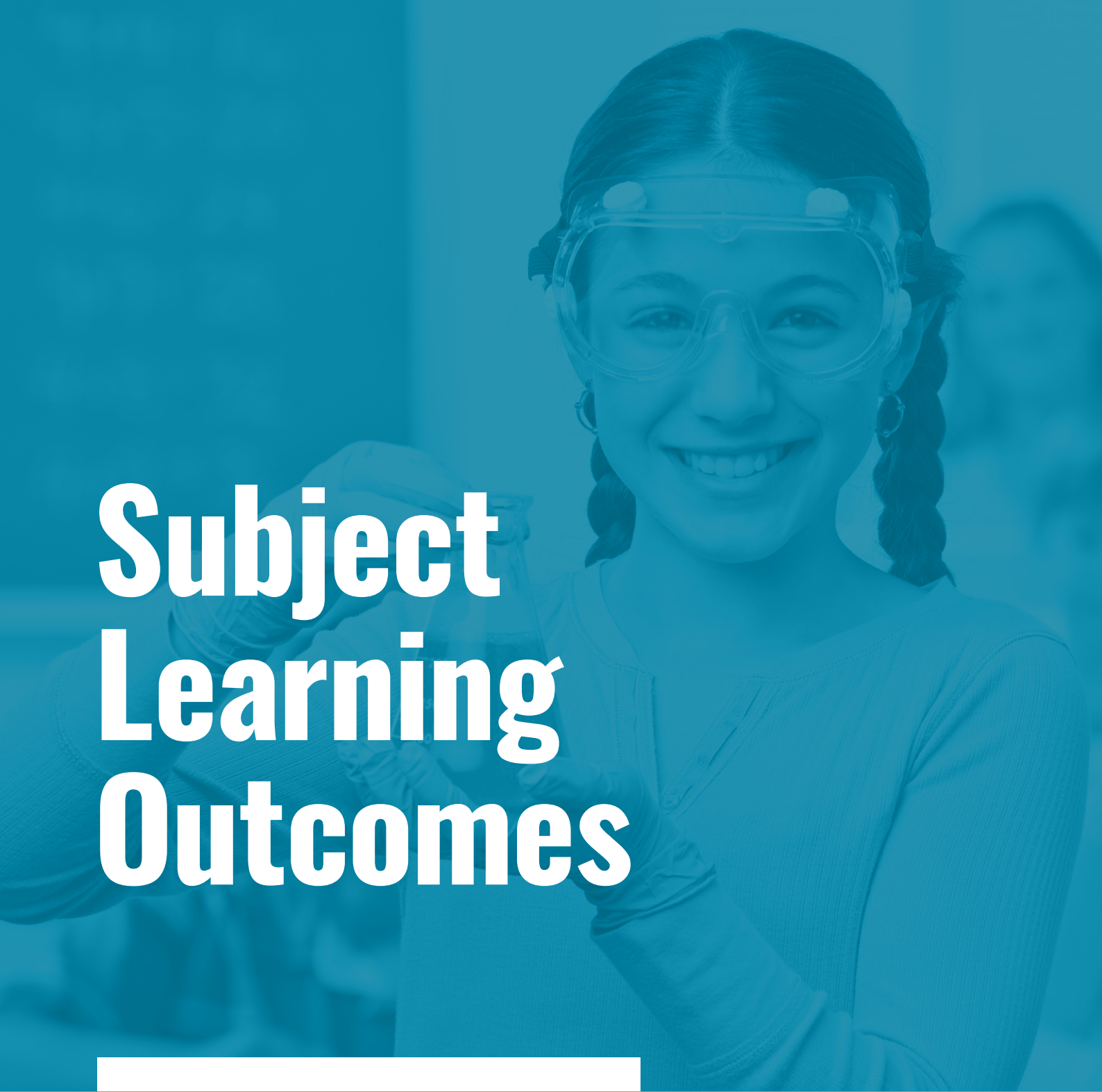
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We would also like to thank Alison Pullicino for her contribution to the document.



Subject Learning Outcomes

CORE SCIENCE

LEVELS 7 8 9 10

The Subject Learning Outcomes (SLOs) for Core Science span from Attainment Level 5 to Attainment Level 10.

Within the Learning Outcomes Framework, Level 10 is viewed as the ‘gifted and talented’ level. Outcomes within this level sit at the upper end of the ability spectrum and extend learners further.

The core concept is *better* rather than *more*. At Level 10 learners demonstrate a deeper understanding and wider application of Level 9 content which marks the end of compulsory schooling. Level 10 outcomes may draw on three main areas:





- increased sophistication of understanding of the Level 9 content
- greater learning autonomy in developing understanding and skills
- increased application and problem solving.

It should be noted that each Attainment Level can be extended further and suggestions for this will be included in the Pedagogy and Assessment section of the document.


LEVEL 5


Subject Focus: What do scientists do?

The terms ‘Science’ and ‘Core Science’ refer to the same subject, which will start from Level 5 and continue up to Level 10.




1. I can ask questions about the world around me.
 PERSONAL LEARNING
2. I can find out about a simple scientific idea.
3. I can make a prediction about a situation from a limited number of options.
4. I can carry out a simple practical investigation to identify relationships with the help of the teacher.
 PRACTICAL
5. I can record observations in a simple format.
6. I can make simple direct conclusions from my direct observations.
7. I can describe what I did and what happened by talking about it or by drawing a diagram.
8. I can observe and describe aspects of the natural and technological world.
9. I can identify some science occupations.
10. I can name and use some items of basic scientific equipment.
11. I can use simple measuring devices.
 PRACTICAL
12. I can follow written or verbal instructions related to keeping safe.
13. I can work on an experiment in a group under adult supervision.
 SOCIAL LEARNING

Subject Focus: How do we stay alive?




1. I can identify some characteristics of a living thing.
2. I can group animals in different ways.
3. I can identify common vertebrate and invertebrate animals that live on land, in water or can fly.
4. I can classify plants as living things, and can describe some of the things that plants do.
5. I can interpret a simple food chain.
6. I can care for a growing plant, ensuring it gets all the elements needed for growth.
 LEARNING TO DO
7. I can name and describe the purpose of the main parts of a plant.

8. I can identify some common plants in my local environment.
9. I can describe the main stages of human growth and development.
10. I can explain that animals are born, grow, develop, reproduce, and die.
11. I can recognise plants that are important to human beings for various purposes.
 LEARNING TO KNOW
12. I can put the different stages in the life of a flowering plant in order.




Subject Focus: How do we keep fit and healthy?

1. I can develop my own food plan made up of a balance of different food types.
 PRACTICAL
2. I can construct a food pyramid using pictures of common foodstuffs.
3. I can, through role play exercises, demonstrate some things I should do to keep myself healthy.
 LEARNING TO DO
4. I can demonstrate how proper hygiene, cooking and preserving keeps food safe.
5. I can create a poster about some of the ways that humans pollute their environment.
 COMMUNICATION




Subject Focus: How do our senses help us gather information?

1. I can name the five senses and can match each sense to its sense organ.
2. I can identify different sounds in my everyday life.
3. I can see and feel the vibrations that sounds make.
4. I can make different sounds using everyday objects and musical instruments.
 PRACTICAL
5. I can discuss the importance of light in everyday life, and what happens when there is no light.
 LISTENING AND SPEAKING
6. I can classify light sources as natural or artificial.
7. I can demonstrate that light travels in straight lines.
8. I can recognise and name colours, and experiment with colour mixing of paints.
9. I can explain when and how eyes need to be protected.
 LEARNING TO BE
10. I can identify parts of the body that are directly and indirectly involved in tasting.
11. I can identify familiar substances by way of smell.
12. I can use my sense of touch to determine how hot or cold something is.




Subject Focus: What is energy?

1. I can explain that the sun is the primary source of energy.
2. I can explain how animals obtain their nutrition by consuming plants and/or other animals.
3. I can describe how our bodies produce heat, and how we can keep warm or cool.
4. I can draw and label a simple food chain.
5. I can identify energy-saving devices and explain their importance in our daily lives.
6. I can identify ways of limiting energy use at home and school.
 PRACTICAL
7. I can describe the role of electricity in everyday life.
8. I can describe the role of power stations in producing electricity.
9. I can describe safety procedures when using electrical appliances.
 LISTENING AND SPEAKING
10. I can build a simple electric circuit and show that all parts need to be connected.
11. I can investigate which materials are conductors of electricity and which are insulators.
 PRACTICAL



Subject Focus: What are things made of?

1. I can sort things according to the different materials they are made of.
 CREATIVE LEARNING
2. I can classify matter as solid, liquid or gas.
3. I can demonstrate how water can be a solid, a liquid or a gas.
4. I can describe some properties of common materials.
 EXPRESSIVE LANGUAGE
5. I can identify purposes for which some common materials are used.
6. I can make a solution by dissolving a substance in water.
7. I can demonstrate how different materials can be mixed together to form mixtures.
 PRACTICAL


Subject Focus: How does planet Earth support life?

1. I can identify water, air, rocks soil and life forms as the constituents of our planet.
2. I can identify some different habitats which can be found on land.
 LEARNING TO DO
3. I can give examples of organisms which live in different habitats on land.
4. I can investigate the components of soil.
5. I can recognise some common plants which grow in my local area.
6. I can identify which plants are grown in Malta for food and when is the best time to grow them.
7. I can recognise and discuss the importance of saving water.
 LEARNING TO LIVE TOGETHER
8. I can identify some common examples of sea life.
9. I can talk about the various weather conditions we experience in Malta throughout the year.
10. I can observe and record changes in the weather.
11. I can investigate gravity by doing simple experiments with different objects.
 PRACTICAL
12. I can demonstrate that like poles of a magnet repel and unlike poles attract.

Subject Focus: How do things move?




1. I can show that pushes and pulls are forces.
2. I can demonstrate the effect of gravity as a force which pulls things to the earth.
3. I can find out about Isaac Newton and his gravitational theories.
 INFORMATION MANAGEMENT
4. I can show that air resistance exerts an upward push that can slow a falling object.
5. I can demonstrate that friction is a force that opposes the movement of one surface over another.
6. I can identify some simple machines, which make it easier to do work.
7. I can give examples of sports where speed is important.
 COGNITIVE LEARNING
8. I can explain that our skeleton is made up of bones and that joints and muscles help us move.
9. I can explain that our skeleton and that of other animals support, protect and help movement.

Subject Focus: What is there out in Space?



1. I can draw diagrams to compare the sun, the Earth and the moon.
 PRACTICAL
2. I can name the planets of our solar system.
3. I can describe what a star is and identify the Sun as the nearest star to Earth.
4. I can explain why sound does not travel in space, and how astronauts communicate in space.

LEVEL 6



Subject Focus: What do scientists do?

1. I can ask questions about a scientific topic being discussed in class.
2. I can find answers to simple questions on a scientific topic.
3. I can use limited scientific knowledge to predict the outcome of an experiment.
4. I can carry out a simple practical investigation - which involves up to two variables - with teacher guidance.
5. I can record observations by completing a table of results.
6. I can identify simple cause and effect relationships.
7. I can present information about work I did, and link this to direct outcomes using some key scientific terms.
8. I can explain how a scientist uses a model to explain ideas.
9. I can, through a role play exercise, act out simple stories about famous scientists.
 CREATIVE LEARNING
10. I can give examples and explain how technology and science have improved life.
11. I can present information about some science occupations.
12. I can name, use and describe the purpose of a range of basic scientific apparatus.
13. I can take basic measurements of size, mass and temperature, and express the reading using appropriate units.
 PRACTICAL
14. I can apply basic safety rules when working on an investigation.
15. I can take some decisions while working on an experiment in a group.
 SOCIAL LEARNING




Subject Focus: How do we stay alive?

1. I can list the seven characteristics of life, and explain why each is essential.
2. I can classify humans as mammals and can identify some characteristics of being a mammal.
3. I can name and give examples of the five different groups of vertebrates.
 COGNITIVE LEARNING
4. I can explain that plants need carbon dioxide and water to make food, and that they produce oxygen.
5. I can examine the structure of flowers and label a diagram of the different parts of the flower.
6. I can describe the main role of important human body systems such as digestive, circulatory, breathing, and nervous system.
7. I can describe the lifecycles of birds, insects and frogs.
8. I can investigate and give examples of the adaptations of plants to suit their environment.
9. I can present information on an endangered species, and describe how this can lead to extinction.
 COMMUNICATION


Subject Focus: How do we keep fit and healthy?

1. I can develop a story about healthy eating, identifying foods that should not be consumed in excess.
 LEARNING TO BE
2. I can list the five main nutrients the human body needs, and explain their role and the importance of fibre in a healthy diet.
3. I can find out about the effects human intervention can have on natural habitats and the organisms that live there.
 INFORMATION MANAGEMENT
4. I can explain how germs cause disease.



Subject Focus: How do our senses help us gather information?

1. I can give examples of how we use our five senses to gather information about the world around us.
2. I can demonstrate how sounds are made.
 PRACTICAL
3. I can show how sound vibrations are carried by waves through water and other materials.
 PRACTICAL
4. I can describe how the ear detects sound.
5. I can use musical instruments to explore different ways of making sounds, and how to change the pitch of sound.
6. I can explain that we see an object when it reflects light from a light source into our eyes.
7. I can explain how shadows are formed and investigate the factors that affect shadow shape and size.
8. I can investigate how a mirror changes the direction of light by reflecting it.
 PRACTICAL
9. I can use mirrors to see behind things.
10. I can build a periscope.
11. I can give examples of the importance of smell and touch in various activities, hobbies or jobs.
12. I can explore ways taste and smell can be altered by cooking.
13. I can demonstrate that the fingertips are sensitive to touch.




Subject Focus: What is energy?

1. I can describe in simple terms how a plant obtains energy.
2. I can list the inputs and outputs of photosynthesis, and explain why it is important for human life.
3. I can state what food types are good fuel for our bodies.
4. I can find out about scientists who were responsible for various electrical discoveries.
5. I can describe what life was like before electricity.
6. I can describe how Malta generates its electricity.
7. I can demonstrate the role of a switch in a circuit.
 PRACTICAL
8. I can recognise and use common circuit symbols.
9. I can demonstrate examples of different energy transformations.
10. I can name the main forms of energy; including stored, movement, heat, electrical, light and sound.
11. I can identify different types of fuel.


Subject Focus: What are things made of?

1. I can classify materials as natural or man-made.
2. I can investigate and compare the properties of different states of matter.
3. I can observe and describe examples of freezing, condensation, evaporation, melting and boiling.
4. I can use measuring instruments to measure the mass and volume of various objects.
 PRACTICAL
5. I can contrast several different materials by describing their most important properties.
6. I can describe examples of materials which are best-suited to particular uses.
7. I can investigate how some substances form suspensions, while others dissolve in water.
 INTERPERSONAL
8. I can perform simple experiments to separate some mixtures.
9. I can make some mixtures react to form new materials
10. I can observe chemical reactions and record the results.
11. I can name some acids and alkalis found in everyday life.


Subject Focus: How does planet Earth support life?

1. I can explain that our environment is a balanced system, with different parts all interrelated.
 LEARNING TO BE
2. I can explain the importance of the 3Rs: reduce, reuse and recycle.
3. I can explain how plants and animals share the same major habitat, and which kinds live in which sort of habitat in Malta.
4. I can explain what living things need from their habitat: food, water and shelter.
5. I am able to observe and name some organisms found in soil.
6. I can identify and classify a range of plants in my local area by carrying out field work.
 LEARNING TO DO
7. I can describe which plants that are important for food are not grown in Malta, and find out where they come from.
8. I can explain the difference between tap water and sea water.
9. I can identify potable water sources.
10. I can observe and describe how the sea is becoming polluted and its effect on sea life.
11. I can describe the atmosphere and name the main gases which are present.
12. I am able to distinguish between the four seasons with regard to weather conditions.
13. I can interpret basic weather charts and the symbols used.
14. I can explain the importance of gravity in retaining our atmosphere.
15. I can explain that the Earth is like a big magnet with a magnetic north and a magnetic south.
16. I can classify materials as magnetic or non-magnetic.
 PRACTICAL

Subject Focus: How do things move?

1. I can explain what a force is and give examples of different types of forces.
2. I can identify different scientists who have worked on gravitational theories.
3. I can demonstrate the effect of air resistance on differently shaped objects.
4. I can demonstrate situations in which friction produces heat.
5. I can investigate how simple machines work, and give everyday examples.
6. I can describe examples of sports where balanced forces are important.
7. I can describe and draw a diagram showing the forces acting on a person on a slide.
8. I can find out about sport-specific clothing that is worn for practical, comfort or safety reasons.
 INFORMATION MANAGEMENT
9. I can describe the function of muscles in our body, and how they are attached to our bones.
10. I can explain that the skull protects our brain, and that the rib cage protects our heart and lungs.

Subject Focus: What is there out in Space?

1. I can describe the motion of the Earth around the Sun.
2. I can research characteristics of each planet.
3. I can describe the movement of the planets around the sun.
4. I can demonstrate using drawings or a model why we have day and night.
 PRACTICAL






Subject Focus: What do Forensic Scientists do?

1. I can present examples of how forensic scientists solved real crimes.
2. I can use my observational skills to identify key items at a crime scene.


LEVEL 7

Subject Focus: What do scientists do?



The terms 'Science' and 'Core Science' refer to the same subject, which will start from Level 5 and continue up to Level 10.

1. I can formulate simple scientific questions which I can investigate in practice.
2. I can investigate a scientific topic from a book or provided resource.
-  **READING AND UNDERSTANDING**
3. I can use scientific knowledge to predict the outcome of an experiment and give a possible explanation.
4. I can identify the variables in a given investigation and carry it out with limited teacher guidance.
5. I can create a table of results and use it to present my observations.
6. I can write a simple scientific report of my experiment.
7. I can recall and follow important laboratory safety rules.
8. I can identify relationships between two properties measured in an investigation.
9. I can discuss and give scientific explanations of some common phenomena or situations.
-  **COMMUNICATING FOR DIVERSITY**
10. I can build simple models to explain abstract ideas.
11. I can discuss an experiment with my group.
12. I can name some scientists, including contemporary and local ones, and describe their work.
13. I can link natural and man-made phenomena to relevant branches of science.
-  **COGNITIVE LEARNING**
14. I can discuss how studying different branches of science can lead to specific jobs.
15. I can choose the equipment I need for an experiment.
16. I can choose appropriate measuring instruments to make accurate measurements of a range of quantities.
-  **PRACTICAL**
17. I can light and use a Bunsen burner safely.
18. I can work on a scientific investigation in a team, assuming a designated role.
-  **SOCIAL LEARNING**
19. I can interpret hazard symbols on chemicals and suggest safety procedures.




Subject Focus: How do we stay alive?

1. I can use a key to identify and classify animals.
2. I can describe the characteristics of living and non-living things.
3. I can name and give examples of some groups of invertebrates.
4. I can use examples to explain what is meant by labelling animals as consumers and plants as producers.
5. I can construct a food chain.
6. I can interpret food webs.
7. I can describe how a flowering plant reproduces.
8. I can use a key to identify and classify a range of locally occurring plants.
9. I can describe, draw and label typical animal and plant cells.
10. I can use a microscope to distinguish between plant and animal cells.
11. I can name and describe the function of the main human organs.
12. I can describe how reproduction occurs in mammals.
13. I can label the diagram of the male and female reproductive systems, and explain how a sperm fertilises an egg.
14. I can describe how animals obtain their energy.
15. I can discuss a range of local, national, and global environmental problems.
-  **LEARNING TO LIVE TOGETHER**




Subject Focus: How do we keep fit and healthy?

1. I can develop food plans for people with different dietary needs.
2. I can label a diagram to show how the heart pumps blood around the body.
3. I can apply my understanding of a balanced diet to suggest improvements to what I eat.
 LEARNING TO BE
4. I can explain how sports and exercise can improve overall health.
5. I can differentiate between microbes which are harmful and others which are useful to the human body.
6. I can explain how the body fights disease.
7. I can discuss the importance of vaccines to prevent the spread of diseases.
 SELF-AWARENESS
8. I can explain why it is important to conserve natural habitats.
9. I can describe how decomposition returns chemicals into the soil for other organisms to use.

Subject Focus: How do our senses help us gather information?

1. I can investigate how particular animals, *e.g. bats*, rely on one of their senses more than on the others.
2. I can label the main parts of the ear.
3. I can find out about the importance of sounds in our lives and those of some animals.
4. I can show that sound travels in all directions and that it makes the material through which it passes vibrate.
 PRACTICAL
5. I can interpret information about decibel levels.
 COGNITIVE LEARNING
6. I can evaluate the harmful effects of noise pollution and the need for ear protection.
7. I can investigate what happens when light strikes different materials.
 PRACTICAL
8. I can show how light can be bent when passing from one medium to a different medium.
9. I can label the main parts of the eye on a diagram, and explain the function of these parts.
10. I can investigate whether some animals have a better sense of smell than human beings.
11. I can give examples of how the senses of smell and taste can protect us from dangers.






Subject Focus: What is Energy?

1. I can explain and describe how energy flows through a food chain.
2. I can describe how plants produce food by photosynthesis in their leaves.
3. I can investigate how the energy value of different foods is measured.
4. I am able to compare the energy values of different foods from labels and relate this to body needs, depending on activity and lifestyle.
 LEARNING TO DO
5. I can explain how fossil fuels were formed.
6. I can investigate features that would make a building more energy efficient.
7. I can classify resources as finite or renewable.
8. I can build up basic series and parallel circuits, and draw circuit diagrams.
9. I can investigate which materials conduct electricity and which materials don't.
 PRACTICAL
10. I can describe the purpose of an electrical cell.
11. I can explain simply how a coal, oil or gas-fired power station produces electricity.
12. I can identify alternative ways of producing electricity.
13. I can apply my understanding of the difference between high and low voltage electricity to describe how to use each safely.
 COGNITIVE LEARNING
14. I can use diagrams to show how energy is transferred and transformed in different situations.
15. I can identify the form of energy input, and useful and non-useful output in some common household devices.

Subject Focus: What are things made of?

1. I can describe and demonstrate how particles move in solids, liquids and gases.
2. I can discuss the importance of evaporation and condensation in the water cycle.
3. I can explain the difference between mass and volume.
4. I can investigate some specific physical properties; *e.g. strength, hardness, thermal insulation and magnetism* of different types of materials.
5. I can discuss and demonstrate how the properties of certain materials change when treated in certain ways, including heating or freezing.
6. I can investigate the factors that affect the time it takes for something to dissolve.
7. I can identify examples of mixtures used in everyday life.
8. I can separate mixtures by sieving, filtration, distillation, with a magnet, and by evaporation.
9. I can make some materials react with air by heating them.
10. I can show that the materials formed in a reaction have different properties from the original materials.
11. I can use indicators to classify some common laboratory chemical as acids or alkalis.
12. I can name some common elements and find out their chemical symbols.
13. I can explain that compounds are chemicals made of two or more elements joined together.
14. I can use the periodic chart to decide whether a substance is an element or a compound.

Subject Focus: How does planet Earth support life?

1. I can describe examples of how natural disasters or human actions can upset the balance of the environment.
 LEARNING TO DO
2. I can investigate how habitats in Malta have changed over time, and how animals which used to live on Malta and no longer do exist only as fossils.
3. I can present information on the importance of the conservation of habitats and species in Malta and the wider world.
 COMMUNICATION
4. I can carry out simple tasks during a fieldwork activity.
5. I can find out about the importance of soil organisms, and their role in soil formation and the soil environment.
6. I can record and identify a range of plants in my local area.
7. I can identify some indigenous and endemic species.
8. I can investigate the types of agribusiness that take place in Malta and their importance.
 SOCIAL LEARNING
9. I can show that sea water contains dissolved salts.
10. I can describe the production of potable water locally.
11. I can explain how increasing carbon dioxide in the atmosphere is causing climate change as a result of the greenhouse effect.
 LEARNING TO KNOW
12. I can explain how different habitats change with the seasons, and how such changes affect plants and animals.
13. I can collect data from measurements of temperature, wind speed, rainfall and wind direction.
 PRACTICAL

Subject Focus: How do things move?

1. I can show that the bigger the force, the greater the effect on the speed or shape of an object.
2. I can discuss how scientific theories develop and change over time.



SOCIAL LEARNING

3. I can show that some items float in water and some in air, and explain why these objects float.
4. I can describe some benefits and some problems caused by friction.
5. I can give examples of sports where acceleration is important.
6. I can draw simple diagrams to show forces.
7. I can investigate how different fabrics are suited for different purposes.
8. I can describe how joints in our bodies work, and research how to keep bones and joints healthy.
9. I can investigate the protective function of safety gear.



PRACTICAL

Subject Focus: What is there out in Space?

1. I can observe and record the phases of the moon.



PRACTICAL

2. I can describe the motion of the moon around the Earth.
3. I can describe and demonstrate what is happening when there is a solar or lunar eclipse.
4. I can explain why the moon appears to change shape through its various phases.



COGNITIVE LEARNING

5. I can describe the location of our solar system in the context of our galaxy.
6. I can find out about the purposes of artificial satellites in orbit round the Earth.
7. I can investigate why objects and astronauts become weightless in space.

Subject Focus: What do Forensic Scientists do?

1. I can work with a group to present a crime scene story.
2. I can make notes about evidence observed at a crime scene.






PLANNING AND REFLECTION


3. I can gather fingerprint evidence.
4. I can use matching techniques to identify suspects.
5. I can identify different types of teeth and explain how form is related to function. I can compare tooth and hair samples and explain the type of evidence these can provide.
6. I can use chromatography to identify matching inks or dyes.

LEVEL 8


Subject Focus: What do scientists do?



1. I can formulate more complex scientific questions which I can investigate.
2. I can investigate a scientific concept or topic using a range of provided resources.
3. I can make a clear and reasoned prediction using scientific explanations in a familiar scientific context.
4. I can analyse a given problem, use scientific knowledge to identify the main variables, and plan a fair test.
5. I can identify shortcomings in an investigation and suggest improvements.
 INTERPERSONAL
6. I can plot data as a line graph or bar chart where appropriate.
7. I can interpret graphical data to explain patterns observed.
8. I can write a simple scientific report - which includes clear descriptions and simple explanations - with some help.
 WRITING
9. I can build models of increasing complexity.
10. I can work in a group and plan an investigation.
11. I can describe the historical development of a scientific idea.
12. I can give examples of how technology has changed some occupations.
13. I can design and set up equipment to collect evidence for an investigation.
14. I can use data logging equipment to take measurements.
15. I can decide with my peers what role to assume in a team.
 INTERPERSONAL

Subject Focus: How do we stay alive?


1. I can identify members of the main groups of animal life, and compare and contrast the criteria that defines membership in each group.
2. I can identify the 8 main animal phyla, and the classes of arthropods and vertebrates.
3. I can explain the key role of insects in pollinating plants, including crops.
4. I can research how plants can spread through wind, animal or water dispersal of seeds.
5. I can explain that organisms are composed of tissues and organs, which are composed of cells.
6. I can carry out an experiment to observe the structure of a simple plant cell and describe the role of the main parts.
7. I can compare the structure of animal and plant cells and explain the function of each part.
8. I can describe the basic structure of the human skeletal system.
9. I can describe the development of organisms from embryo to adult.
10. I can list the changes that take place in an embryo during the 40 weeks of pregnancy.
11. I can discuss how smoking, medicine, and the general health of the mother affect the growing embryo.
12. I can research survival practices employed by some living organisms to survive extremes of weather, such as severe cold or drought.
 CREATIVE LEARNING
13. I can carry out a case study on an important conservation issue.

Subject Focus: How do we keep fit and healthy?



1. I can describe the human digestive system.
2. I can develop a presentation to convince my peers that eating healthily has a positive effect on our bodies including our circulatory system.
 EXPRESSIVE LANGUAGE
3. I can investigate how pulse rate is affected by exercise.

4. I can explain how healthy eating is beneficial.
5. I can carry out experiments to investigate how sporting activities affect pulse rate.
6. I can describe the human breathing system.
7. I can describe the harmful effects of smoking.
8. I can explain how the human body is habitat to a variety of organisms.
9. I can name some common allergens and describe their effects on the human body.
10. I can present information on a conservation project.
 COMMUNICATION
11. I can describe the role of microorganisms in the decomposition of matter.
12. I can explain what is meant by genetic engineering, and explain how genetically modified foods can be engineered for our benefit.
 LEARNING TO KNOW
13. I can find out how X-rays, ultrasound and MRI scanning are used to see inside the body.

Subject Focus: How do our senses help us gather information?

1. I can investigate the range of sound frequencies that I can hear.
 PRACTICAL
2. I can describe how sounds travel as sound waves.
3. I can demonstrate how sounds can be used to send messages.
4. I can explain what is meant by the pitch and the loudness or volume of a sound.
5. I can describe and demonstrate the properties of transparent, translucent, and opaque materials.
6. I can demonstrate how white light can be split into its constituent colours of the spectrum.
7. I can investigate how lenses affect the paths of light rays.
8. I can explain what happens when light is mixed, and how this differs from the mixing of paints.
9. I can show how concave and convex mirrors produce images.
10. I can explain how the lens of the eye forms an image on the retina.

Subject Focus: What is Energy?

1. I can describe the chemical process of photosynthesis and carry out simple experiments on photosynthesis.
2. I can carry out experiments to compare the energy content of some foods.
3. I can discuss the negative effect of continued use of fossil fuels.
4. I can explain what is meant by the term “carbon footprint”.
5. I can explain how the temperature of buildings can be controlled with the use of sustainable measures such as double glazing, size and position of windows, and insulation.
6. I can make a simple chemical cell.
 PRACTICAL
7. I can investigate and describe the electrostatic effects of charges.
8. I can investigate how electrical power is transmitted and distributed to domestic and commercial users in Malta.
9. I can give a reasoned explanation of the most sustainable forms of electricity generation suitable for Malta.
 LEARNING TO DO
10. I can demonstrate how to wire a plug and how to change the fuse in a plug.
11. I can describe examples of the use of series and parallel circuits in everyday life.
12. I can apply my understanding of the difference between AC and DC electricity to describe how to use each safely.
13. I can explain the concept of efficiency, and investigate how the efficiency of some devices could be improved.
14. I can write the word equation for photosynthesis.

Subject Focus: What are things made of?

1. I can describe diffusion in gases.
2. I can apply my understanding of how particles move and are arranged to explain the differences between solids, liquids and gases.



COGNITIVE LEARNING

3. I can discuss how the melting of ice caps is related to climate change, and the effects of this on both wildlife and humankind.
4. I can investigate whether materials float or sink and relate this to the density of the material.
5. I can use scientific instruments to measure some specific properties of a chosen material.
6. I can use the periodic table to identify metals and non-metals.
7. I can compare the properties of metals and non-metals, and give examples of their uses.
8. I can investigate the reactivity of different metals and place them in order.
9. I can investigate the conditions needed for rusting.
10. I can link the properties of common metals to their use.
11. I can describe the difference between a mixture and a compound.
12. I can carry out experiments to show that many reactions produce heat energy.



SOCIAL LEARNING

13. I can carry out experiments to identify factors that influence the rate of reactions.
14. I can investigate the reactions between acids and alkalis/carbonates.
15. I can identify examples of useful chemical reactions in local industry.
16. I can carry out neutralisation experiments using acids and alkalis.
17. I can describe practical uses of acids and alkalis in the home and industry.
18. I can investigate which plant material is best suited to be used as an indicator.
19. I can name some common compounds and find out their chemical formula.
20. I can use the periodic table to identify elements, as well as their symbols and properties.
21. I can describe and/or model the basic atomic structure of simple elements.

Subject Focus: How does planet Earth support life?


1. I can critically evaluate my lifestyle and give alternate ways of reducing, reusing and recycle material.
2. I can identify the use of the Earth's material resources in industrial processes, and say why it is important to use them in a sustainable way.
3. I can discuss the temporary visits to a habitat of migrating animals.
4. I can participate in a fieldwork activity and observe different habitats in the local environment.
5. I can identify common alien plant species in Malta.
6. I can discuss how technology can be used to produce better quality yields of crops and medicine.
7. I can explain why salt is important for marine organisms.
8. I can test the quality of water.




PRACTICAL

9. I can describe examples of the effects that climate change is having on weather patterns.
10. I can describe how weather conditions are related to changes in barometric pressure.
11. I can describe the composition of gases in the atmosphere.
12. I can describe what is causing pollution in the air, and the effects of this pollution on the quality of rain.
13. I can demonstrate how a magnetic compass works, and make a simple paperclip compass.
14. I can investigate different forms and types of permanent magnets and their uses.
15. I can investigate economic aspects of recycling materials

Subject Focus: How do things move?

1. I can demonstrate how balanced forces cause an object to move at a steady speed or remain stationary.
2. I am able to construct a model of a bridge to show how a suitable structure ensures strength.
 PRACTICAL
3. I can investigate the importance of the position of the centre of gravity on the stability of an object.
4. I can find out about gravitational experiments currently being conducted in the Large Hadron Collider.
5. I can investigate the effect of a parachute on a falling object.
6. I can investigate the strength of the frictional force between different surfaces.
7. I can investigate how motion is related to function in devices.
8. I can describe and draw a diagram showing the forces acting on a person on a swing.
9. I can investigate why nylon is a good material to wear for running and doing aerobics.
10. I can demonstrate how when a muscle contracts it shortens, and so it pulls the bones attached to it.
11. I can demonstrate that when a muscle relaxes, it goes back to its normal size.


Subject Focus: What is there out in Space?

1. I can observe and identify some constellations.
2. I can model the movement of the Earth, moon and sun relative to each other.
 PRACTICAL
3. I can describe how the atmosphere and composition of another planet is different from the Earth's and describe what adaptations man would have to make to live on it.
4. I can describe the motion and characteristics of moons, asteroids, comets and meteors.
5. I can use a model to demonstrate how the tilt of the Earth is responsible for different seasons.
6. I can explain the concept of an expanding universe and why scientists believe it began with the "big bang".
7. I can present information about space stations, how they are built, the materials used and some examples of their purpose.

 COMMUNICATION




Subject Focus: What do Forensic Scientists do?

1. I can make simple inferences from evidence.
2. I can use flame tests to identify chemicals.
3. I can demonstrate that fire requires fuel, air and heat.
4. I can use a chemical test to investigate and identify food groups.




 PRACTICAL

LEVEL 9

Subject Focus: What do scientists do?

1. I can plan and investigate a complex scientific concept or topic using a range of resources.
2. I can develop my own questions or hypotheses for testing, and plan a fair test in which several variables are controlled.
3. I can make refinements to improve techniques and reduce sources of error.
4. I can describe the relationship between variables in terms of scientific concepts, and indicate whether the data is sufficient to support the conclusion drawn.
5. I can write a scientific report, which includes clear descriptions and explanations, using appropriate scientific terminology.
 -  WRITING
6. I can critique scientific models for their effectiveness to explain scientific ideas.
7. I can investigate how scientists arrive at conclusions.
8. I can discuss positive and negative effects of science on quality of life.
 -  LEARNING TO DO
9. I can evaluate the ethical nature of some scientific occupations.
10. I can learn how to use sophisticated scientific apparatus.
11. I can collect and record data systematically using repeated trials for consistency.
12. I can formulate a risk assessment report linked to an investigation and suggest safety procedures.
13. I can assume a leadership role during a scientific investigation.
 -  INTERPERSONAL

Subject Focus: How do we stay alive?

1. I can construct a simple key to identify animals in the main animal phyla and classes.
2. I can present information on the negative effect of pesticides on pollinating insects.
 -  COMMUNICATION
3. I can explain how features are inherited from a parent type and how new varieties of plants are produced.
4. I can construct a simple key to identify common local endemic plants species.
5. I can describe the structure and function of some specialised animal cells for particular functions, such as transport, movement and sensitivity.
6. I can defend the benefits of organ transplants.
 -  LEARNING TO DO
7. I can describe the processes of complete and incomplete metamorphosis.
8. I can discuss the implications of becoming a parent.
9. I can evaluate information related to contraception and in-vitro fertilisation.
 -  COMMUNICATING FOR DIVERSITY
10. I can discuss and critique the relevance of Charles Darwin's work.

Subject Focus: How do we keep fit and healthy?

1. I can justify, using examples, why blood transfusions are sometimes necessary.
2. I can discuss the benefits of eating local produce and organic food.
3. I can investigate how sporting activities affect breathing patterns.
4. I can make choices regarding sporting activities that are beneficial for myself.
5. I can explain how sexually transmitted diseases, known as STDs, can be avoided.
6. I can investigate how new pandemics have affected the modern world.



INFORMATION MANAGEMENT

7. I can describe how allergic reactions can be treated.
8. I can discuss common atmospheric pollutants, their sources and implications.
9. I can explain decomposition of organic and inorganic materials, and the need for waste management.
10. I can explain the advantages of sewage treatment.
11. I can give examples of how modern technologies can monitor health and be used to diagnose illnesses.

Subject Focus: How do our senses help us gather information?

1. I can investigate how sound can be reflected, and describe examples of how this can be useful or problematic.
2. I can investigate how the microphone and the stethoscope detect sounds.
3. I can build a simple telescope using lenses.
4. I can find out how coloured images are created on a TV or computer screen.

Subject Focus: What is Energy?

1. I can critically evaluate the economic and environmental benefits of using energy-efficient appliances in the home.



LEARNING TO BE

2. I can investigate the relationship between the difference in temperature between an object and its surroundings, and the rate at which heat energy is transferred.
3. I can discuss the advantages and disadvantages of rechargeable batteries.
4. I can investigate the effects of electric fields on positive and negative charges.
5. I can explain the need to link the supply of electricity to demand.
6. I can interpret scientific claims about energy sources and their impact on the environment.
7. I can model or illustrate how houses, schools and work places are electrically wired.






PRACTICAL

8. I can use a circuit to investigate the relationship between voltage, current and resistance.
9. I can describe how semiconductors differ from ordinary conductors, and how and why they are used.

Subject Focus: What are things made of?

1. I can investigate how volume, temperature and pressure are related for a gas.
2. I can demonstrate through simple investigations how the density of a material depends on its mass and volume.
3. I can talk about the development of new materials.
4. I can research the properties and uses of important alloys.
5. I can investigate the use of catalysts in reactions.
6. I can research and write a report about chemicals which are used in everyday life .
7. I can investigate the causes and implications of acid rain.
8. I can investigate how water can be split into its constituent elements.
9. I can explain the nature of radioactivity.


Subject Focus: How does planet Earth support life?

1. I can investigate how landscapes can change due to natural causes, including flooding, volcanoes and earthquakes.
2. I can investigate how various materials which are normally discarded can be recycled.
 LEARNING TO DO
3. I can discuss the threats alien plant species pose.
 LEARNING TO DO
4. I can explain how knowledge of plant biology has helped inform agricultural practice.
5. I can discuss issues related to water conservation on a national and international level.
6. I can discuss ways of slowing down or reducing the impact of climate change.
7. I can present information about how seasons and the life cycles of plants and animals are interrelated.
 COMMUNICATION
8. I am able to explain how the use of chemicals has caused depletion of the ozone layer.


Subject Focus: How do things move?

1. I can investigate how acceleration is related to unbalanced force on an object.
2. I can explain the forces acting on the structure of a bridge.
3. I can explain the difference and relationship between mass and weight.
4. I can describe the role of Galileo, Newton and Einstein in developing our understanding of gravity.
5. I can investigate how to build the best parachute.
6. I can describe the motion of a roller-coaster in terms of the forces acting and conservation of energy.

Subject Focus: What is there out in Space?

1. I can explain why detecting the presence of water on another planet is important.
2. I can explain why light years are used as an astronomical unit of distance measurement.
3. I can describe and demonstrate the magnetism of the Earth.
4. I can explain why scientists believe that the universe is billions of years old.
5. I can research the materials used for space suits to allow astronauts to survive outside their spacecraft.
 INFORMATION MANAGEMENT
6. I can explain how gravity keeps planets in orbit around the sun.

Subject Focus: What do Forensic Scientists do?

1. I can reconstruct a crime by combining several types of evidence.
 SOCIAL LEARNING
2. I can explain how DNA evidence can be used to solve crimes.
3. I can explain how evidence can be obtained from burnt material.
4. I can extract DNA from plant material.

LEVEL 10

Subject Focus: What do scientists do?

1. I can formulate relevant scientific questions after researching an idea.
2. I can research a scientific topic using a range of resources and collate relevant information.
3. I can make a clear and reasoned prediction using scientific explanations in an unfamiliar scientific context.
4. I can plan a sequence of fair tests or long-term investigations.
5. I can evaluate the limitations of an investigation and the validity of the conclusions.
6. I can draw a conclusion which shows awareness of the uncertainty of data.
7. I can write a scientific report, which includes researched detail.
8. I can suggest alternatives to models, giving reasoned explanations to these changes based on scientific principles.
9. I can justify or discredit the work of a scientist using ethical arguments.
10. I can evaluate how scientific theories change and develop.
11. I can make judgements about the accuracy of observations and explain errors in data collected.
12. I can use preliminary tests to improve procedures and measurement techniques.
13. I can interpret complex hazard nomenclature on chemicals.

Subject Focus: How do we stay alive?

1. I can present information about trophic levels in the environment.
2. I can explain cell division for sexual reproduction and replication.
3. I can critique ethical issues related to organ transplants.
4. I can discuss the basic processes of cloning and selective breeding.
5. I can critically evaluate the advantages and disadvantages of IVF.
6. I can explain why it is important to have ethical regulations regarding new technologies such as IVF.


Subject Focus: How do we keep fit and healthy?

1. I can research the causes, effects and treatments for asthma.
2. I can explain the importance of physiotherapy to treat sports injuries.
3. I can carry out a case study on a recent epidemic, and show how scientists worked to contain its spread and prevent another outbreak.
4. I can carry out a case study into the importance of the careful use of antibiotics.
5. I can research and report on possible environmental factors which cause allergies.
6. I can discuss the damage caused by excessive levels of nitrates in the environment.
7. I can research the carbon and nitrogen cycles and explain their importance to the environment and to food production.
8. I can discuss the arguments for and against the use of genetic engineering, acknowledging the empirical evidence, data and beliefs that make this debate so challenging.
9. I can investigate the implications of the 4th Millennium Development Goal dealing with the reduction of the mortality rate in young children.
10. I can identify and compare drugs which are used to treat common infections.

Subject Focus: How do our senses help us gather information?

1. I can research some examples of ultrasonic devices, and how they can assist the visually impaired in 'seeing'.
2. I can describe how optical devices such as microscopes and telescopes are used in science.
3. I can research and report on some sight problems and how they can be treated.


Subject Focus: What is Energy?

1. I can discuss the sustainability of the use of air conditioning for heating and cooling.
 LEARNING TO LIVE TOGETHER
2. I can investigate emerging technologies that may lead to be major growth areas for the economy, such as cheaper solar power, higher capacity electric-car batteries, lightweight portable electronic devices, and implantable medical devices.
3. I can research the relationship between magnetic and electric fields.
4. I can investigate how the absence of electricity in some countries affects people's lifestyle.
5. I can investigate and compare various types of power stations found all over the world, their efficiency and impact on the environment.
6. I can engage in a discussion about power generation, making points that show insight and are substantiated by evidence.
7. I can design and construct a practical control circuit such as a fire alarm.
8. I can plan an inquiry on energy transfers in falling objects using measurements obtained through data loggers.

Subject Focus: What are things made of?

1. I can explain changes of state in terms of particle kinetic energy, and relative strength of the chemical bonds.
2. I can research the properties of new materials and their impact on healthcare, for example materials that can be used for skin grafting.
3. I can research products that result from industrial use of separation techniques, such as fractional distillation.



Subject Focus: How does planet Earth support life?

1. I can research natural phenomena which may result in heavy loss of life.
2. I can carry out a case study on the impact of man's activities on an important habitat in Malta.
 LEARNING TO DO
3. I can reflect on the impact of alien plant species in Malta, and construct a rational argument for their eradication or their continued existence.
4. I can discuss sustainable agribusiness practice in Malta, and how innovation in agribusiness is based on scientific understanding.
5. I can plan for a water crisis.
6. I am able to discuss and evaluate measures being taken to mitigate the effects of climate change on crops and our environment.
7. I can discuss the effects of the depletion of the ozone layer on human beings and other organisms.

Subject Focus: How do things move?

1. I can research different types of bridges and explain their structure in terms of the forces present.
2. I can investigate scientists such as Stephen Hawking, who are developing new theories of physics, gravity and cosmology.

Subject Focus: What is there out in Space?

1. I can use the internet to research the dates and paths of future eclipses.
 INFORMATION MANAGEMENT
2. I can talk about the possibilities of life on other planets, and the conditions needed for life as we know it to exist.
3. I can discuss the significance of important recent discoveries about other planets.
4. I can explain how cosmic rays occur, and what their effects are on the Earth.
5. I can research the existence of black holes and theories about their properties.
 INFORMATION MANAGEMENT
6. I can research how astronauts live in the International Space Station, and how they sustain themselves on very limited resources.
7. I can research economic benefits of space exploration, and discuss some related moral or ethical issues.



Pedagogy

A. PEDAGOGY AND GOOD PRACTICE LEARNING

Educators need to keep up-to-date with the latest pedagogical strategies and concepts in order to be able to better understand and respond to learners' needs. Europe's *Education and Training 2020* strategy puts special emphasis on the teachers' role in the lives of their learners. Teachers play a crucial role in guiding their learners towards their goals and shaping their perceptions (European Commission, 2015).

New models for teaching and learning science suggest that children learn better when they are actively involved in their own learning, when they learn in a context and when they engage with each other and learn from one another. One of the main models of instruction that is best suited for learning science is an inquiry-based model of learning. This involves placing the learners at the centre of their learning experience, encouraging them to explore and construct their own understanding of scientific concepts and relate these to other concepts. This model is known as the 5E model and allows learners to engage, explore, explain, elaborate and evaluate. This process is described in the literature as follows:

The teacher first determines the topic of inquiry and provides a discrepant event or focus question or problem to engage learner interest and curiosity. The learners, with their teacher as guide and co-investigator, begin to explore the problem or question. They make further observations and attempt to explain the phenomena they observe. The teacher then challenges learners to elaborate on their understandings by linking observations to prior knowledge and by applying the concepts and skills in new situations. Finally, the teacher encourages learners to evaluate their understandings and abilities, and the teacher evaluates or assesses the areas of strengths and weaknesses exposed by learner performance in the activity (Jorgenson, Cleaveland and Vanosdall, 2004:19).

Another valuable definition that encompasses this main pedagogy which will characterise the Maltese science classroom is that given by the PRIMAS team:

Pupils inquire and pose questions, explore and evaluate. The problems they address seem real to them. Learning is driven by open questions and multiple-solution strategies. Teachers are proactive: they support and encourage pupils who are struggling and extend those that are succeeding through the use of carefully chosen strategic questions. They value pupil contributions – including mistakes, and scaffold learning using pupils' reasoning and experience. In the classroom there is a shared sense of purpose and ownership. (PRIMAS, 2013).

Learning science must shift from a transmission model, where the science educator dictates notes or talks through explanations, to a collaborative model where the educators and learners work together on interconnected and challenging tasks. Rather than giving information, the role of the educator needs to shift to one of creating positive learning environments where learners challenge themselves and each other, pose questions, learn how to discuss and communicate results, are open to alternative points of view and learn how to make connections between ideas and put their learning within a relevant context. Thus, the learning experience centres around the process of working scientifically together to identify the impact of science on society as a whole, rather than exclusively on transmitting content.

The classroom context needs to be one that encourages different points of view, where there is no right and wrong answer but only possibilities and where learning opportunities are shared and learners are helped to develop a sense of ownership over their own learning. Practical work should be part and parcel of the learning process and there should not be a clear dichotomy between theory and practice. Learning should:

- start from what the learners already know.
- actively involve the learners.
- include problem solving activities.
- include questions that promote reasoning.
- allow learners to work collaboratively.
- provide opportunities for creative writing and drawing.
- provide opportunities for storytelling and drama.
- link science concepts to everyday life.
- place science within a historical and current context.
- allow learners to develop a personal identity as science learners.

Learning to Learn Strategies

The following are examples of the strategies which form part of the 'learning to learn process', one of the eight competencies featured in the document *European Reference Framework Key Competencies for Lifelong Learning* (European Commission, 2007):

- Pedagogical discussions between learners where, on a voluntary basis, learners explain how they carried out a specific task and how they managed to overcome the difficulties encountered, resulting in an exchange of strategies and techniques in a cooperative environment.
- Teaching learners to make use of punctuation marks, pictures, additional information outside the text, such as accompanying explanation of difficult keywords and identification of keywords during reading/ comprehension tasks.
- Teaching and guiding on the different stages of essay writing and the different tools and methods which could be adopted during each stage.

The Subject Learning Outcomes (SLOs) have been written in a way which helps educators to adopt engaging, enterprising and active learning approaches in a variety of contexts to promote and enable learner-centric teaching and learning strategies. Curriculum planners at all stages should regularly consider the opportunities presented by the SLOs to develop active learning throughout the levels in the Learning Outcomes Framework. Planning should be responsive to, as well as encourage participation by, the learner who can and should influence and contribute to the process.

To support curriculum planning and to ensure that all learners have access to an active, enterprising learning environment, a coherent approach to planning learning, teaching and assessment and to sharing information about progress and achievements is needed. In undertaking this type of curriculum planning, it is important not to see the SLOs as limiting factors containing the learning potential of learners and preventing any deviation of learning beyond that contained within the SLOs. This view fails to take into account the scope and flexibility provided by the learning outcomes approach. How, where and when the outcomes are taught and learned is at the discretion of the educator. The SLOs are there to demystify the assessment process by setting out straightforward learning expectations. In doing so, assessment is bound to evidencing the meeting of these same expectations.

Once the learning expectations are set educators can begin to introduce the flexibility in curriculum design and delivery that has been difficult to do up to this point. The learning outcomes approach allows educators to lean towards learner-centric teaching and learning strategies. This will mean knowing the many ways in which learners are different from one another, which of the many ways of learning are significant to the learning at hand and how to deal with this variance in ways that are supportive of the individual learners and allow them to progress. Section C: Reaching different learners within each level offers guidance on how this can be done.

B. EMBEDDING THE DELIVERY OF THE CROSS CURRICULAR THEMES

Across Europe there has been a shift from an exclusively subject-based approach to a more cross curricular, thematic, inter-disciplinary and collaborative approach that reflects real life situations and encourages transfer of skills from one learning area to another. Through a cross curricular approach, many curricular areas have been given a higher profile and a number of transversal competences have enhanced their status (European Commission, 2012). The CCTs connect the subjects by highlighting common learning objectives which are also reflected at in the school ethos (Ministry for Education and Employment, 2012: 31, 39).

The Cross Curricular Themes (CCTs) have been introduced in the LOF to ensure that all learners, as they progress through the levels, come into continual contact with the types of knowledge, skills and understanding needed to participate actively, prosper and contribute to Maltese society.

The embedding of the CCTs in the Subject Learning Outcomes offers access to a new learning identity that goes beyond the subject; learners will value the CCT learning when they see that it is an integral part of the Learning Outcomes Framework and that it is vital in helping them become holistic learners.

Each CCT is presented as a set of additional learning outcomes that young people need to encounter and develop a knowledge and understanding of as they progress through the Learning Outcomes Framework.

The Cross Curricular Themes are:

Digital Literacy



Education for Diversity



Education for Entrepreneurship, Creativity and Innovation



Education for Sustainable Development



Learning to Learn and Cooperative Learning



Literacy



The Cross Curricular Themes can be found in the Appendix and online at <http://www.schoolslearningoutcomes.edu.mt/en/category/cross-curricular-themes>

The CCTs need to be embedded within the learner's learning journey and experiences, the main point being that the CCT knowledge and understanding needs to be learned, consolidated and secured within a context. The context is important in order to add meaning and purpose and to reinforce the usefulness of the CCT. There is no one effective way of organising the embedded learning of the CCTs. However, directly linking a CCT outcome to an appropriate practical task within an SLO and then ensuring that there is an opportunity for CCT support at the time the practical task is undertaken is a particularly effective way of embedding a CCT.

Embedding is not just about interlinking different curricula. Mapping where the CCT content might fit in with SLOs or Subject Foci is only a starting point. The educator needs to establish how the CCT content adds value to the SLOs being taught and how something greater than just the sum of the different parts can be achieved. In essence, the CCT learning adds value in the establishment of key transferable knowledge, skills and understanding by starting with meaningful 'situated' engagements with the learning.

Embedding as a process

There are three main ways to approach the delivery of the knowledge, skills and understanding addressed in the CCTs in the learning process. These are:

- through delivery of and the learning associated with the SLOs
- by choosing particular teaching methods and strategies over others to deliver the SLOs.
- undertaking specifically constructed cross curricular or whole school activities.

This process implies an important shift in the way teachers approach the teaching of the subject content in the classroom. Integrating the cross curricular learning outcomes in the teaching of separate subjects requires teachers to step outside their traditional boundaries and work in close collaboration with one another to develop their approach to the CCTs and to exchange information about the learning development of specific learners in relation to the CCTs (European Commission, 2012:25).

Delivering CCTs through the SLOs




The first approach to the delivery of CCT content is by integrating the CCT learning with that of particular SLOs. The framework provides guidance on the best opportunities to do this. Where a particular SLO presents a good opportunity to address learning related to a Cross Curricular Theme a CCT icon appears after the SLO. This indicates that the SLO:

- creates a naturally occurring opportunity to begin to look at learning and skills development associated with a particular aspect of a CCT.
- can be enhanced or enriched by introducing a particular aspect of one of the CCTs.

To guide the educator to the specific learning outcomes of the CCT that are most relevant, the CCT icon which is attached to the SLO in question also includes a heading to identify which particular aspect of the CCT is the 'best fit', i.e. the part of the CCT content that is most closely linked to the knowledge, understanding and/or skills addressed within the SLO.

Although only one CCT has been identified this does not necessarily mean that other CCTs are not relevant. The identification of a particular theme merely suggests that the educator may find the one identified to be the most relevant, most appropriate or easiest to embed at that particular point, allowing the educator to teach the subject and the CCT in an integrated way.

Examples of this type of embedding in Core Science include:

- I can investigate how various materials which are normally discarded can be recycled.
 LEARNING TO DO
 Taken from Level 9, Subject Focus: How does planet Earth support life?
- I can investigate which materials conduct electricity and which materials don't.
 PRACTICAL
 Taken from Level 9, Subject Focus: What is energy?
- I can link natural and man-made phenomena to relevant branches of science.
 COGNITIVE LEARNING
 Taken from Level 7, Subject Focus: What do scientists do?

Example 1: Finding opportunities to address CCT learning in Science SLOs

- I can decide with my peers what role to assume in a team.

 INTERPERSONAL

Taken from Level 8, Subject Focus: What do scientists do?

There is a real opportunity with this SLO to look at developing/fostering the child as autonomous learner and encouraging taking responsibility (relatively speaking) for their own learning and performance. The core CCT outcomes that will help with this are:

- I feel competent in managing my own learning.
- I am pleased when I succeed at difficult tasks.
- I believe that effort can lead to success.
- I reflect on my mistakes and learn from them.

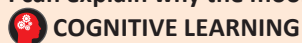
The decision to be made maybe more around whether:

- it is better to use the SLO as an opportunity to introduce and develop the CCT knowledge, skills, understanding, attitudes and behaviours, simultaneously, or whether
- it is better to cover some of the CCT learning early on so the learner can bring these skills to the learning and learning processes and demonstration of the SLOs, enhancing their performance in response to the learning challenges within the SLO.

Clearly, at this level the learner is starting to build a relationship with CCT learning and opportunities here are more about where and how best to introduce the learner to the CCT learning.

Example 2: Finding opportunities to address CCT learning in Core Science SLOs

- I can explain why the moon appears to change shape.



COGNITIVE LEARNING

Taken from Level 7, Subject Focus: What is there out in Space?

By focusing on the critical evaluation process of this SLO, opportunities open up for addressing aspects of the Learning to Learn and Cooperative Learning outcomes related to cognitive learning. The particular outcomes that seem to be most relevant are:

- I am able to remember by recalling, recognising and locating information.
- I am able to link new information to my existing knowledge.
- I am able to analyse information that I come across.
- I assess myself to analyse and further develop my ideas.
- I am able to focus on the main subject and summarise important points.
- I am able to apply my knowledge and understanding in differing contexts.

In preparation for this and related SLOs, the Cognitive Learning outcomes could be addressed and CCT learning developed, consolidated and retained. That would allow the learner to transfer the knowledge and skills and apply it to the SLO. In this type of scenario the learner would then be able to enhance performance in the process of learning and enrich the quality of the outcome in response to the Core Science SLO challenge. Alternatively, both the SLO and the CCT outcomes could be dealt with together as part of a wider learning opportunity.

Addressing CCTs through use of particular teaching methods and strategies


CCTs can be used to inform the creation of Science Departmental policies and strategies, for example, by deliberately structuring learning to maximise the use of digital technologies. At the Departmental level the following CCTs may be particularly suitable to help inform the pedagogy choices and delivery styles selected to maximise the flexibility introduced by the LOF:

 Learning to Learn and Cooperative Learning

 Digital Literacy

 Education for Diversity

Educators may find that the following CCTs have a role to play in the choice of topics to stimulate interest and debate:

 Education for Sustainable Development

 Education for Entrepreneurship, Creativity and Innovation.





It will become evident that some of the CCTs are naturally suited to particular learning and teaching styles. Section *C Reaching different learners within each level* provides guidance on how particular CCTs can equip learners to thrive in particular learning environments. Deliberately choosing particular teaching strategies involving active and/or experiential learning and problem solving approaches where a certain degree of learner autonomy as well as team work is required will help frame learning in ways conducive to the introduction of the Digital Literacy and Learning to Learn and Cooperative Learning CCTs.

For example, the Learning to Learn and Cooperative Learning CCT comprises a category of learning outcomes on Personal Learning and, by addressing the learning related to this category of the CCT, learners will be developing the learning skills to bring to any task where a degree of autonomy and self-management is required. Similarly, the Social Learning category within the same CCT can help learners develop a framework of skills, attitudes and behaviours that will help them make the most of group or team work and other social learning strategies.

The Digital Learning CCT will help learners develop the competencies related to managing learning, sourcing, manipulating, communicating and presenting information. Having these types of learning skills embedded in the learning before they are most heavily used or required will help the learner approach the tasks with greater confidence in both the process of learning about SLOs and in demonstrating achievement of the outcomes themselves.

Addressing CCTs through cross curricular or whole-school activities

All the CCTs can be used as whole-school strategies for creating a high quality learning environment that values all learners and sets high expectations for all. Schools may see the benefit in having whole-school policies on the advancement of:

-  Literacy
-  Digital Literacy
-  Education for Diversity
-  Education for Sustainable Development

These types of CCTs can be used to help inform whole-school policies as well as add real value to the learning within the classroom. However, other CCTs may be used to form the basis of whole Year Group activities, or wider all-learner school initiatives around environmental issues. For example:

- The Education for Sustainable Development CCT could be used to form the basis of whole-school extra-curricular activities related to the Eko-Skola type of initiatives or low energy use initiatives. Fundraising activities to help with a school pursuit of renewable energy sources might bring together learning from this CCT with that of the Education for Entrepreneurship, Creativity and Innovation CCT.
- The Education for Entrepreneurship, Creativity and Innovation CCT could be used to underpin the learning and experiences associated with activities ranging from a 'learner-owned' tuck shop to a school event or whole-school initiatives about the world of work.

C. REACHING DIFFERENT LEARNERS WITHIN EACH LEVEL

One of the benefits of working within a Learning Outcomes Framework (and at the same time one of the challenges) is the ability to allow learners to progress at their own speed and to be able to adapt the teaching methodology and curriculum to meet their learning needs. The SLOs clearly show where the learning ‘finish line’ is at each level for each learner but educators need to acknowledge and plan for those learners who will reach this point quicker than some and also for those who may need more time and more scaffolding to be able to get to the standard required.

The Subject Foci are not rigid or restrictive and do not have to be delivered in a particular sequence or as discrete content areas taken in isolation. Subject Foci can be overlapped and blended into larger (or smaller) learning programmes. Educators may prefer to approach the learning contexts in a different order depending on the situation, or to deliver aspects of the learning through preferred topics.

Diversity of learners

The NCF embraces diversity and requires that this be promoted through an inclusive environment.

The NCF addresses the needs of:

- gifted and talented learners for whom the process of learning needs to be sufficiently challenging to engage and motivate them to develop their talents.
- learners with special educational needs for whom the curriculum should be written in a way that allows the teachers to appreciate how every student can access the same curriculum in every learning area and allows for the assessment of a continuum of ability.
- learners with severe disabilities for whom the curriculum should offer an education based on a continuum of abilities expressed in terms of developmental phases.
- learners from disadvantaged social backgrounds for whom the school, in collaboration with key local and institutional stakeholders in the community, needs to up-skill and support families and the local community to provide an environment that is educationally rich and stable.
- learners from diverse social, cultural and linguistic backgrounds including children of refugees and asylum seekers for whom the curriculum should include access to an educational programme which is embedded within an emotionally and psychologically supportive environment that respects their individual circumstances.

A National Curriculum Framework for All, Ministry for Education and Employment (2012:41)

All classrooms, even where setting is used, will comprise a range of abilities. This is because learners will have different strengths and limitations and will develop at different rates. To define a ‘mixed ability’ class simply as a group of learners with a range of abilities is overly simplistic. What about the range of learning styles and preferences, interest levels and home backgrounds, which all impact on the learning experience? Each learner will show strengths at different times depending on the topic being studied and the learning style being used. When they are outside their learning comfort zone they will perform less well. It is unrealistic to expect any group of learners, whatever their ability, to progress through a body of work at exactly the same pace. Two thirds of learners in a classroom will be working outside their learning style unless the task is varied.

One of the most effective ways to ensure that different learners are reached within each level and throughout the LOF is to teach learners to think for themselves. Some of the CCTs provide the toolkit of knowledge and skills for learners to be able to become more effective, resilient, resourceful and autonomous learners.

Progression and differentiation in learning

The principles of diversity and inclusion which underpin the NCF imply that at all stages learners of all aptitudes and competences should experience success, challenge, and the necessary support to sustain their effort. They need flexible learning programmes providing diverse learning experiences that cater for a wide spectrum of learners and allow for different rates of progression as children and young people work through their school years. Different approaches are needed to address different learning needs. With the focus increasingly on the learner, and with more mixed-ability classes in schools, differentiated approaches are becoming more important and teachers need to adopt strategies that build on children's and young people's previous learning and help them progress.

A National Curriculum Framework for All, Ministry for Education and Employment (2012:40)

Strategies for teaching a mixed ability class

The teacher in the classroom must start by making a connection with each learner in their classes on a personal level by knowing and using their names and getting to know what interests them. Incorporating areas of interest into the learning can be a good way to engage learners. Similarly, using this type of knowledge when setting homework or individual class work can be a useful motivator and may help keep learners engaged.

Personal Learning:

- I can identify the support and resources I need to learn.
- I am aware of my preferred way to learn and can use this to plan my own learning.
- I manage goals and time efficiently in learning.
- I feel competent in managing my own learning.
- I am open to feedback from others and am able to consider it.
- I reorganise myself by explicitly changing my assumptions over time.
- I am able to follow my own interests as this helps me to reflect on 'who I am'.
- I am pleased when I succeed at difficult tasks.

Taken from the Learning to Learn and Cooperative Learning CCT

Ways to empower learners and make them more able to thrive within the LOF

Create a dynamic learning environment by:

- managing the classroom and creating opportunities for learners to work individually, in pairs and in groups.
- changing the layout of the classroom to match the learning taking place.
- providing a choice of differentiated activities, allowing learners to select their level of engagement and challenge. This will help with the 'ownership' suggestion listed further down.
- using carefully selected and differentiated resource banks.
- presenting different ways to learn the same thing.

Engage learners by:

- creating a sense of learner ownership of the learning process by, for example, allowing learners to choose their own project.
- allowing learners to demonstrate their understanding in different ways, for example through self-selected means, be it a visual representation, an oral presentation or physical demonstration.
- building in the higher order thinking skills using Bloom's taxonomy (at all levels) and working with the SLOs to keep learning tasks interesting, providing useful stretch and challenges as SLOs are given added dimensions or are approached from different directions. This can be done by giving learners problem-solving tasks with the opportunity to transfer and apply their knowledge to a new context.

Turn learners into resilient learners by:

- at an early stage introducing the learners to the key learning strategies encompassed by the Learning to Learn and Cooperative Learning CCT.
- discussing the learning objective in each lesson with learners, making them aware of what they are expected to achieve by the end of the lesson. The SLOs (written in the first person) are directed at the learner.
- making learners aware of different learning styles; teaching learners techniques for learning new content using visual, auditory and kinaesthetic modes of learning and varying teaching strategies to cater for visual, auditory and kinaesthetic learners.
- teaching learners how to be less dependent on the teacher. For example, how do they get themselves 'unstuck' if they are stuck?

Use group work to:

- allow for reinforcement and extension (by using flexible groups).
- encourage learners to engage in Social Learning and to appreciate diverse viewpoints and personalities; build confidence in discussing their views with others; collaborate with other learners as part of their learning; seek out guidance and support from other learners; talk with others about learning; listen to others talk about learning and discuss various subjects and learning strategies with peers (by using mixed ability groups).

An inclusive approach to teaching and curriculum planning needs to be ensured. While the school will want to create an ethos of achievement for all learners, valuing a broad range of talents, abilities and achievements, the teacher will need to work out what that means in their classroom. At a basic level this starts with promoting success and self-esteem by taking action to remove barriers to learning, thus making sure that all learners in all groups thrive in the classroom. Teachers can overtly promote understanding and a positive appreciation of the diversity of individuals in their class and use the Diversity CCT as a catalyst for this approach extending it to include the learner directly.

Values- based education

Education is as much about building character as it is about equipping students with specific skills. The way forward for the implementation of the framework is through values-based education. Values-based education refers to any explicit and/or implicit school-based activity which promotes student understanding and knowledge of values and which develops the skills and dispositions of students so they can enact particular values as individuals and as members of the wider community. It ensures that those leaving school should have qualities of self confidence, high self esteem, optimism and commitment to personal fulfilment as a foundation for their potential life roles as family, community and employees. Furthermore they should have the capacity to exercise judgement and responsibility in matters of ethical and social judgements.

Adapted from *Respect for All Framework*, Ministry for Education and Employment (2014:10)

Schools should have a vibrant and progressive culture, promoting well-being and respect, with ambition and achievement for all learners as its focus. This type of approach needs to be taken in each classroom. A great school is a caring school that supports every single person, irrespective of background or learning need. Such schools work in an atmosphere of unconditional positive regard. They work tirelessly to promote healthy and productive attitudes to learning, to life and to work. Developing an ethos of achievement and ambition defines the aspirational nature of successful schools, making the connection between expectation and success - success which covers all aspects of developing skills for life, for work and for learning - a hallmark of excellence.

From the perspective of the classroom, an inclusive approach addresses learners' needs through a variety of approaches including: early intervention strategies and a curriculum and approaches to learning and teaching which are designed to match the needs of all learners. Educators should have high expectations of their learners because they need to be encouraged to have high aspirations and goals for themselves. It is imperative that educators ensure that their learners know where they are in relation to their learning and how they can improve. Learners should be praised regularly, selectively and effectively to keep motivated.

As learners progress within the levels and between levels they should be encouraged to reflect on, take increasing ownership of and assume more responsibility for their own learning. Educators should start to introduce techniques to allow learners to make increasingly greater use of self-assessment to identify their strengths and development needs from the evidence of their efforts and act on feedback given from peers as well as educators in order to plan their next steps.

D. TEACHING DIFFERENT LEVELS WITHIN ONE YEAR GROUP

There will be learners within each class that need more time to be able to achieve the learning needed to demonstrate achievement of the SLOs. As learners progress through their learning journey they may move to a new year and start a new level but still have areas of unsecured learning from the previous level. The first important factor here is clarity of information on progress following this learner that makes it clear to their new teacher what support or additional work they may need to ensure that they can progress on to the new level.

Section C *Reaching different learners within each level* referred to the use of a range of strategies designed to respond to the different learning preferences of each learner. Where learners are entering the class in need of support to secure some aspects of the previous level it is important that:

- there is clear information about where the areas in need of support are.
- it is clear how these areas relate to progression and achievement in the new level.
- there are a range of strategies and learning devices available to match the learning style to the learner preference to assist with early progression.
- conversation with the learner about areas in need of support or reinforcement remains positive, learner-affirming and constructive.

One of the benefits of the LOF structure is that Levels 7 and 8 are delivered across two-year curriculum windows allowing time to develop learning programmes and deploy a range of learning methods to help learners progress and achieve.

There are a few models to consider when looking at introducing a measure of stretch for learners able to achieve SLOs well within the delivery time associated with the level. Educators may want to consider:

- exploring the SLOs in a broader and/or deeper way, perhaps looking to transfer or apply learning associated with the SLOs in new contexts.
- using more exacting or challenging texts.
- adding stretch by setting more challenging or complex tasks which exposes the learner to more challenging texts and vocabulary or introduces new Subject Foci or new areas of existing Subject Foci, remembering that the SLOs do not set a ceiling on the learning.
- looking at opportunities offered by the CCTs as sources of inspiration for introducing new areas of content to provide additional curriculum content that both enhances the subject learning experience and looks at CCT content in perhaps different or more challenging ways.

One other key source of material related to provision of additional challenge or stretch is the Subject Foci and SLOs from the level above. While it may not always be appropriate to begin to address these directly, educators may want to look at the contextual learning or preparation work that serves as a good introduction to learning at the next level. The focus here is on looking at the bridges between the learning in each level and how the learner can begin to access this learning. In this type of approach, as with the other areas of extension work, it will be important to keep a proper record of achievement to be able to inform teaching staff working with the learners when they move formally to the next level.

Although the above suggestions will help educators address the challenges of differentiation, it is nevertheless acknowledged that it is hard to implement differentiated instruction in a heterogeneous classroom, especially if educators are not supported or they do not know what they are differentiating – the curriculum or the instructional methods used to deliver it. It is hence important to give teachers clear guidance and support on what they need to do to differentiate instruction and be responsive to the needs of each learner by taking into account what they are teaching and who they are teaching. Time should also be factored in for teachers to assess their learners' needs, interest and readiness levels and to plan and design appropriate activities for each learner. These concerns can be addressed through effective professional development that strongly encourages teachers to apply their skills and which provides coaching throughout the process of using differentiation as a teaching approach.

E. TEACHING ONE LEVEL ACROSS TWO YEAR GROUPS

Within the LOF, Levels 7 and 8 have an added additional layer of challenge in curriculum planning and design in that both levels run across two different years. For example, Level 8 SLOs sit across Years 9 and 10. This means that educators need to consider how they might want to structure the delivery programmes needed to achieve the SLOs that will allow learning to take place in a meaningful and coherent way across two years that capitalises on any progression opportunities within the level. However, this wider window to reach the standard of a level also helps deal with some of the challenges discussed in the previous chapter.

When looking at the content shaped by the SLOs within a level, educators may be able to identify SLOs that are considered to be prerequisites for others in the same level and structure the curriculum accordingly. Some Subject Foci may naturally be delivered before others or educators may look to design and implement a curriculum that has more of a spiral curriculum progression feel to it. Educators may even feel that there are different ways to work with the Subject Foci, wrapping them up and addressing the SLOs by creating new subject areas incorporating the Subject Foci.

There are at least three obvious potential approaches that educators may wish to consider:

- Developing a period of ground work or preparation style learning before proceeding on to the curriculum directly associated with the SLOs.
- Developing a developmental approach across the existing SLOs where some suitable Subject Foci and corresponding SLOs are addressed before others with these supporting the learning of the SLOs to be covered in the second year.
- Developing a curriculum and learning programme approach that exhibits a mixture of the above two approaches.

There are also the more ambitious approaches where the Subject Foci and SLOs are absorbed into a more locally designed approach that may meet the strengths and interests of the staff and learners in a better way. Educators have the freedom to decide if there is a more integrated way to deliver and learn the subject. The LOF allows educators this measure of control and innovation to the benefit of their learners. Whichever the method selected, curriculum planning, resource selection and the selection of teaching strategies will all be important.



Assessment

A. METHODOLOGIES THAT WILL ENSURE FIT FOR PURPOSE ASSESSMENT

Within the learning outcomes context of teaching and learning, the ways in which science learning is assessed also needs to change. Educators need to move away from a culture of assessing recall of facts and knowledge to an assessment culture that focuses on assessment for learning. Assessment should take place alongside learning and provide learners with continuous, qualitative feedback that allows them to grow and move forward in their learning. This helps learners have greater ownership of their own learning.

As stated by Wiliam (2009), assessment for learning is based on one big idea, using evidence of learning to adapt lessons in real time to meet learners' learning needs. This involves five key processes:

- clarifying and sharing learning intentions and criteria for success (*Sharing learning intentions*).
- carrying out effective classroom discussion, questions and learning tasks that produce evidence of learning (*Questioning*).
- providing feedback that moves the learner forward (*Feedback*).
- activating learners as owners of their own learning (*Self-Assessment*).
- activating learners as instructional resources for one another (*Peer Assessment*).

Assessment tasks need to be varied to match the different learning styles and the multiple intelligences of learners. Assessment needs to move away from paper and pencil tests that simply allow recall of factual knowledge and test only learners' linguistic and perhaps mathematical ability. Assessment tasks need to tap into as many different intelligences as possible and provide learners with the opportunities to show what they know, understand and can do through a variety of ways.

Assessment tasks may involve investigations and problem solving tasks, learning logs and portfolios, presentations that may be visual or artistic, narratives and stories, report writing, building scientifically sound models and role play. Formal tests and examinations may also be used but only as one of many different assessment formats. Learners should also be involved in self and peer assessment since this gives them greater ownership over their own learning. More importantly assessment should be used to obtain feedback, feedback to provide teachers with information about learner-learning in order to be able to adapt their teaching as well as feedback to learners to help them understand the gaps in their learning and what they need to do to move forwards. Through this, learners are encouraged to talk among themselves, as well as with their teacher, about what they are learning and how they are learning it. This involves hypothesising, questioning, challenging, arguing and concluding using appropriate communicable scientific language (Windschilt, 2002). Such dialogue would include questions such as *How did you find that out?* and *What evidence do you have to support that view?* In order to achieve this, educators must model their own inquisitive and reflective approach to learning about science. This entails sharing unanswered questions during the process, in order to express the dynamic perspective of science as a discipline that is continually changing and growing.

Each SLO can be extended to the gifted and talented learners as follows:

- Less teacher guidance in inquiry based learning activity to reach SLO indicated in Level 10.
- Learners are encouraged to develop more complex questions and hypotheses and plan to investigate them. They also research the work of scientists in the field in question. Learners are then encouraged to share their findings with peers.

Assessment, as described by Wiliam (2011: 50), is the bridge between teaching and learning:

The teacher's job is not to transmit knowledge, nor to facilitate learning. It is to engineer effective learning environments for the learners. The key features of effective learning environments are that they create learner engagement and allow teachers, learners and their peers to ensure that learning is proceeding in the intended direction. The only way to do this is through assessment. That is why assessment is indeed the bridge between teaching and learning.

Assessment

Assessment is an integral part of the learning and teaching process, providing students and their parents with continuous, timely and qualitative feedback about their children's progress, giving teachers' information about their practice and providing schools and colleges with information about their curriculum planning, learning and teaching.

Assessment *for* learning (assessment for formative purposes) is a process carried out as learning is taking place. Learners and their teachers use the outcomes to find what learners know and are able to do in relation to learning.

Assessment *of* learning (assessment for summative purposes) is carried out at the end of a unit, mid-year or at the end of the year.

Assessment *as* learning (ongoing assessment) is the use of ongoing self-assessment by learners in order to monitor their own learning.

In subjects that are taught as modules, assessment of learning will take place at the end of a module. Information and judgments about learning are pulled together in a summary form for purposes of reporting to parents and sharing information with other teachers in the next class or school. If learners are fully aware of what is expected of them (the learning intentions) and the success criteria against which their learning will be evaluated, they will develop the self-evaluation skills which will help them become self-directed learners.

Well-designed and appropriately implemented, classroom assessment processes can:

- support learners to use self-assessment to gauge their learning, identify their strengths, their learning needs and their next steps.
- encourage learners to support one another's learning through peer assessment.
- help teachers to understand children's learning better, use evidence to monitor learners' progress, reflect on their practice and adapt or match their teaching to their learners' needs.
- help teachers plan for the learning of individuals and groups and ensure that all children receive appropriate attention.
- support parents to share their children's learning experiences, interpret assessment information and follow their children's educational development.
- promote the reporting on individual progress and achievement in an incremental manner.

Colleges and schools are required to develop an assessment policy. The policy should seek to address the quantity and quality of assessment practices as well as reporting to parents and other stakeholders.

Adapted from *A National Curriculum Framework for All*, Ministry for Education and Employment (2012:41-42) and *Assessments as learning*, Lam (2015:1)

Learners and others involved in their learning need timely, accurate feedback about what they have learned and how much and how well they have learned it. This helps to identify what they need to do next and who can help them build up their knowledge, understanding and skills. A learner's progress should be assessed in ways and at times appropriate to their learning needs. Judgements made about this learning should be based on evidence from a broad range of sources, both in and out of school and by reference to a learner's progress over time and across a range of activities.

By planning for ongoing assessment opportunities and periodic testing, particularly where learners use their skills in an integrated way, educators will allow learners to demonstrate, over time, *how much* and *how well* they have learned.

A balance of ongoing and periodic assessment opportunities will require learners to demonstrate a body of learning built up over time and to apply their knowledge and skills in different contexts. Mixing a range of learner controlled formative assessment opportunities will allow the learners themselves gauge how they are progressing against individual or grouped SLOs.

Educators should look to gather a range of quality pieces of evidence to show progression in learning from both ongoing formative assessment opportunities and periodic, summative assessments. The amount and range of evidence should be sufficient to build up a profile of the learner's achievement but also be proportionate and manageable. Learners should be involved in the selection of evidence. The evidence should show that the learner has understood a significant body of knowledge, has responded consistently well to challenging learning experiences and has been able to apply what they have learned in new and unfamiliar contexts.

Learning, teaching and assessment should be designed in ways that reflect how different learners progress in order to motivate and encourage them in their learning. To support this, all learners should be involved in planning and reflecting on their own learning, through formative assessment, self and peer evaluation and personal learning planning. Once learners are given the chance to interact with their peers and receive constant feedback from their educator, they are ultimately guided to make decisions on how to improve their Core Science knowledge and skills. The learners are thus given the chance to play an active role in self-assessment which encourages them to seek out personal goals for learning Core Science. These types of assessments can be planned at particular points, such as the end of a thematic unit, whereby the learners can judge and review their own performance by means of a grid stating the intended learning outcomes vis-à-vis the level in which they have been attained.

Core Science educators will need to have a clear understanding of how their own learners are progressing in relation to others in their school and in other schools in Malta, against the outcomes and experiences at different levels. Regular, planned opportunities for dialogue are to be facilitated by Education Officers to help educators reach a shared and consistent interpretation of meaning as they apply the SLOs.

The learner does not have to be secure in every outcome at one level in order to move on to the next. When appropriate, the learner should have the opportunity to engage in learning experiences at the next level. Educators should plan to give learners experience of all the outcomes but should take a holistic view. When learners have had a deep learning experience at one level, they should move on to the next.

Educators must ensure that their view of what a learner has achieved is supported by sound evidence. Their evaluation of this evidence must be consistent with the evaluations of colleagues in their own, or another, department or centre. Centres should plan together and use their professional judgement in coming to a shared understanding of what it means to achieve a level. Emerging national guidance will support this process. Moderation is particularly important at times of transition from one level to the next and in transitions between Middle and Secondary Years.

The delivery of the learning associated with the CCTs and the associated assessment is the responsibility of all educators.

Improving the quality of teaching and learning also implies fostering a culture which ensures the transparency of quality assessment outcomes and having in place approaches, structures and roles played by internal and external school evaluation systems.

Quality assurance in education can be understood as policies, procedures, and practices that are designed to achieve, maintain or enhance quality in specific areas, and that rely on an evaluation process ... [that is] a general process of systematic and critical analysis of a defined subject that includes the collection of relevant data and leads to judgements and/or recommendations for improvement. The evaluation can focus on various subjects: schools, school heads, teachers and other educational staff, programmes, local authorities, or the performance of the whole education system.

Assuring Quality in Education: Policies and Approaches to School Evaluation in Europe,
European Commission (2015a:13)

Schools will need to begin to develop new quality assurance procedures, while enhancing existing ones, to support the introduction of the LOF and to secure its successful implementation in classrooms. This will need to be part of a whole-school implementation and quality strategy that could include opportunities for:

- Senior Management Teams taking an active interest in teacher CPD, monitoring teacher confidence levels and learner progress, e.g. sampling learners' work and leading whole-school self-evaluations.
- Heads of Schools creating shared preparation and planning time to help facilitate collaborative working.
- standards and expectations sharing through displaying learners' work aligned to levels to show progression, for example in work displayed on a 'learning wall'.
- staff engaging children and young people in discussions about progress and target-setting as part of planning to meet their learning needs.
- development of whole-school approaches to learning and assessment of CCTs.
- clear reporting strategies for feedback on progress within the school and outside the school, e.g. parents and guardians.

In schools or Science Departments (in addition to the activities listed above), educators will need to be engaged in:

- regular meetings to plan learning, teaching and assessment in a coherent way, with colleagues sharing effective strategies which they see as improving learning and achievement of learners.
- collaborative planning with other teachers, peer review and discussion of standards and expectations when teaching learners at the same level.
- cross-marking end of topic tests, periodic assessments and other internal assessments by marking learner work from other classes or groups, educators can engage in professional dialogue about the nature of the assessment, its fitness for purpose and the learner results.
- design of assessment materials, marking schemes and reporting strategies in collaboration with other teachers within the department or with appropriate staff in neighbouring schools.
- adopting strategies to avoid pre-judging outcomes, for example marking learners' work without knowing who the learner is.
- professional dialogue around learners' work that has been pre-marked to help reach an agreed view on quality and standards.
- Communities of Practice to share and/or strengthen their professional practice, focusing on sufficiency in assessment, consistency in interpreting SLOs, reporting progress to learners, parents and guardians and other teachers.

The Directorate for Quality and Standards in Education (DQSE) will ensure that:

- Education Officers carry out quality assurance visits to validate accuracy of each school's self-evaluation evidence and sample quality and consistency of the learning, teaching and assessment.
- staff members collate and analyse a range of local and national data to be used as the basis of discussion with Heads of Schools, Deputies and Faculty Heads/Principals to inform planning for improvement of learners' achievements.
- where good practice is identified, Education Officers, School Management Teams and other key personnel organise good practice events for staff across schools within the authority to disseminate good practice.

It is here being acknowledged that any feedback coming from schools, including that yielded from assessment, should reflect the wider objectives of education. Moreover, Quality Assurance conclusions will not automatically impact on the performance of schools. Schools need more than information on their performance – they also need guidance on how to improve and support, while attempting such improvement. The ultimate aim of quality assurance procedures should be to provide schools with an appropriate, coherent and comprehensive evaluation strategy which has a positive impact on the school leadership team and on the quality of teaching and learning.

B. INCLUSIVE ASSESSMENT METHODOLOGIES

To help allow vibrant and diverse classrooms to thrive and demonstrate their learning potential educators need to ensure that assessment in the classroom is fair and inclusive, allowing every learner to show what they have achieved and how well they are progressing. Educators can ensure that assessment meets all learners' needs by providing each learner with appropriate support, employing a range of assessment methods and options and, in doing so, affording all learners the best chance of success. This will mean using performance and assessment information from a variety of sources to monitor progress and to inform what needs to happen next in the learning journey.

Educators need to be aware of, and work to, the relevant legislative frameworks that support learners experiencing barriers to learning. Barriers may exist as a result of family circumstances, disability or health needs and social or emotional factors. Where these circumstances occur, learners are entitled to have their additional support needs recognised and supported at the earliest possible stage – by the school, educational authorities and / or the state. Assessment strategies will be effective when educators use a range of assessment approaches flexibly to identify strengths, learning and support needs for vulnerable, disengaged and hard-to-reach learners in their classrooms.

Supporting vulnerable learners

Supporting vulnerable learners may mean using planning tools such as personal learning plans or multi-agency coordinated support plans. Educators need to place the learner at the centre to ensure each learner with additional or diverse learning needs can achieve positive and sustained educational outcomes.

While schools need to consider which approaches will be most effective in helping to remove barriers to learning resulting from social and emotional circumstances including, for example, challenging behaviour, educators need to consider how these whole-school policies translate into action in the classroom.

Assessment planning and the resulting approaches taken (and instruments and methods used) need to ensure that all learners have an equal opportunity to demonstrate what they have learned and what they can do. Educators also need to consider what 'reasonable adjustments' to assessment approaches for disabled learners may look like in assessing ability. This may involve using appropriate assistive technologies. Given that good assessment practice is a key feature of teaching and learning, approaches used to help assess an individual learner's progress need to be as far as possible consistent with those used in the learning itself.

The principle of the continuum of achievement should be such that it allows a learner to follow the best pathway that will allow him or her to reach the maximum of his or her potential - irrespective of whether the student is a high flyer, has average abilities, basic abilities and/or has a disability. In this regard the NCF sought to establish a framework that ensures that, as far as possible, no student becomes a casualty of an education system that is unable to identify those learners who require encouragement and guidance. Equally importantly, the NCF allows for the introduction of different pathways that will truly allow a learner to develop his or her abilities in the manner best suited for him or her.

Adapted from *A National Curriculum Framework for All*, Ministry for Education and Employment (2012:5)

C. RELIABLE AND VALID WAYS OF ASSESSMENT

Assessment will involve planning high quality interactions with learners and will be based on thoughtful and probing questions drawn from the SLOs and designed to ascertain the extent to which the outcomes have been achieved. Learners will be clear about the kind and quality of work required to achieve success in the SLOs. The methods of assessment used need to reflect the nature of what is being assessed.

In the periods between formal assessment interventions individual learners should be encouraged to ask for and should be given timely feedback about the quality of their work that they can understand, reflect on and ask questions about. Educators should strive to encourage the learner's active engagement in discussion about their work and progress, and suggest the steps they can take to improve their performance.

Educators should seek to empower learners to develop the skills to evaluate their own and each other's work against the SLOs, encouraging them to develop an appreciation of their own learning needs, how well they are progressing towards achieving the standard exemplified by the SLOs and the types of action they need to take to improve their progress.

The SLOs have been written in a way that is designed to ensure that the learning expectation is clear. They also act like an anchor for any and all related assessment activity by defining the learning that is in scope for assessment activity and by omission being clear about what is not in scope. This makes the assessment process and assessment expectations more transparent for the learner. At times SLOs involve an additional layer of detail delivered through the use of exemplification to illustrate the nature of the challenge within the SLO or through a clear statement of what must be included as a minimum in addressing the learning associated with the SLO.

Where there is exemplification, the example given is designed to be indicative of the degree of difficulty or challenge expected to be reached in the SLO. The example adds a further layer of detail and clarity so the educator knows the standard the learner should be looking to achieve.

What the assessment should really be trying to establish is whether the learners have reached the standard of the SLO. Can they do what the SLO says they can do? Can they demonstrate the ability to do what the SLO claims for them and can they do it routinely, confidently and comfortably? Here the educator's professional judgement and the professional agreement on what constitutes achievement is important.

The assessment standard is not necessarily what is stated in the SLO. The standard is the shared and consistently applied interpretation of what acceptable learner performance in response to the SLO looks like. In order to reach this judgement, educators will need to work within the subject teaching community to agree what achievement looks like at each of the levels (e.g. Level 8), at the level of the Subject Foci within a level and at the level of an SLO where this is not immediately apparent and there is scope for ambiguity or interpretation.

Assessment within the LOFs will need to be subject to robust quality assurance procedures that are designed to instil confidence in teachers' assessment judgements and assure parents, guardians and other stakeholders that all learners will receive appropriate recognition for their achievements in line with the agreed national standards and that learners are making the appropriate progress in line with expectations.

Where assessment is for high stakes qualifications and external certification, particular safeguards are required to guarantee fairness to all young people and to provide assurance to parents and guardians, MCAST, the University of Malta and employers that the system is robust. To that end MATSEC will produce clear assessment plans for Level 9 and 10 assessment, detailing the balance between high-stakes external assessment and internal assessment procedures and quality assurance.

As learners approach points of transition (for example, across Levels) it is important to have rigorous and robust assessment and related quality assurance procedures in place in order to ensure that there is a reliable system for sharing information about progress and achievements. Again, MATSEC and/or DQSE will be responsible for producing the guidance documentation detailing the policy and procedures for any transition assessment arrangements involving high-stakes or external assessment.

Working the room: Measuring the impact of the teaching

This whole class assessment technique can be used with Level 8 and 9 learners. Challenge stations are set up around the room, a sufficient number to split the class into groups of 3-5 with a different challenge presented to each group. The challenges should be related to what has recently been taught in class and should be based on two or three distinct learning outcomes. The groups should be balanced out evenly in terms of ability with the addition of the elements of time and reward to keep motivation up and maintain the competitive spirit. The assessment of the activity will provide a good idea of how the whole class has understood what has been taught.

By setting appropriate challenges at each work station the same exercise can be applied to all levels of the Science Framework.

Adapted from *Designing Effective Activity Centers for Diverse Learners: A Guide for Teachers At All Grade Levels and for all Subject Areas*, Hilberg, Chang and Epaloose (2003)

D. ASSESSING CROSS CURRICULAR THEMES

The embedded CCTs within the SLOs are for guidance purposes only. As already indicated, the teacher may have better ideas of where, when and how to embed particular aspects of the CCTs.

The CCT icon in embedded SLOs is followed by a sub-heading from the CCT. This indicates the particular area of content that seems most appropriate for embedding within the delivery of the SLO.

The guidance about CCTs also describes how CCTs can be addressed through the choice of pedagogy or delivery style, classroom activity or approach to learning. Some may also be addressed through the introduction of whole-school or year group, curriculum enrichment activities or the adoption of particular sets of behaviours within the school community. The flexibility and freedom to decide upon and select which methods, opportunities and aspects of the CCTs are addressed when, where and how is entirely a subjective one. The aim is to ensure that the learners, through the course of their learning journey through the LOF, come into contact with the key learning associated with all the CCTs in significant and meaningful ways. The role of the CCTs is to yield resilient, adaptable, empowered young people with the robust, transferable skills the country needs to remain caring, inclusive, competitive and productive. This needs to be kept in mind when looking at the overall implementation and embedding of CCTs in the curricula.

This open and flexible approach to where, when and how CCTs are addressed is a challenge when it comes to trying to prescribe assessment approaches. While the lack of uniformity and consistency of when, where and how to embed CCTs in the LOF and in each subject area is attractive from a flexible delivery viewpoint, it represents a challenge in assessment from a standardisation standpoint.

The guidance around assessment of CCTs is simply to ensure that:

- the impact of the embedding strategy adopted at the classroom, departmental and school level is known and understood in terms of what has been learned.
- there is communication between schools, tutors and class teachers about the progress learners have made in coverage and acquisition of the CCT content.
- learners engage with each of the six CCTs with sufficient frequency, meaning and depth to allow them to achieve the key competencies they cover and to benefit from the new learning and skills each CCT introduces.

In each subject, educators may find it most beneficial to work with peers to determine the best-fit CCT opportunities, creating a support community to share development of resources and to help agree a consistent approach to teaching and assessment expectations when it comes to embedding the CCTs. Within this support community one can attempt to:

- agree which teaching approaches lend themselves to particular CCTs.
- share ideas and resource development.
- develop project-based approaches to SLO delivery that are enhanced by CCT inclusion.
- standardise assessment expectations around CCTs.

E. REPORTING PROGRESS

Learner and Parent/Guardian Reporting

Reporting on learning and progress should offer learners, parents, guardians and teachers insight into what learning expectations have been set, how the learner is progressing in relation to these learning expectations and how the learner can do what needs to be done to ensure continued progress and improvement as they go forward with their learning. Reporting should always be constructive, insightful and able to be used to stimulate meaningful discussion between the teacher, learner and their parent or guardian. It should, at the same time, be reflective, looking back at achievement, and forward-looking, focusing on improvement.

The LOF offers local flexibility for schools to decide how best to report information on learner progress, achievements and next steps within a clear set of national expectations. How frequent and what form such reporting takes are also decisions to be taken at the school and college level.

National expectations for reporting

Reporting will provide the learner, their parents or guardians with information on progress and achievement in each subject that includes:

- constructive, insightful and clear feedback throughout the learning experience.
- feedback on the learner's particular strengths, areas for development and completed achievements.
- feedback on the different curriculum areas.
- the particular support the learner is receiving to help them progress.
- attitude of the learner to learning.
- how home can play an active part in supporting the learning process.
- an opportunity to capture the learner's voice.
- an opportunity for parents/guardians to respond directly to the reporting feedback.

It is important that the reporting structure used is manageable for teachers.

Reporting is based upon the assessment of progress and there is a balance to be struck between how often assessment of progress is made and how often this progress is recorded and communicated to the learner and the parent/guardian. The reporting needs of the two groups are different:

- Learners should be receiving feedback on progress on an ongoing basis as a routine part of the learning and assessment process. The use of formative assessment (often called Assessment for Learning) should be a routine part of any assessment strategy. This makes this type of reporting frequent and continual.
- Parents and guardians need to be kept informed of their child's progress at key points in the learning journey where there needs to be feedback given around achievement and a discussion instigated between home and school about how further progress and improvement can be made. This makes this reporting much less frequent but recurring. At the very least, achievement of a level should be reported every time a level is achieved.

Reporting process

It is important to set up a process by which learners can take some ownership of what is reported. Educators should consider working with learners to determine which evidence should be drawn upon to summarise learning and progress for the purposes of reporting. This will invite reflection and dialogue about their learning and will be a useful opportunity to help the learner engage more deeply and meaningfully in discussion about their own learning. This type of dialogue will not restrict or impinge upon educators' professional judgements but will offer them some insight into the learner point of view and may help deepen their understanding of the impact of their own learning strategies.

The LOF offers the ability to report progress within the subject at different levels of detail. Each subject is broken down into levels, containing Subject Foci and each Subject Focus is further broken down into SLOs. With the SLOs making the outcomes of learning explicit, it will be important to establish what the learner, parent/guardian needs to know about progress against the SLOs and what can feasibly be shared, how often and when. Educators will first need to separate out internal reporting needs to chart a learner's progress, so that this can be shared with other teachers as they progress in other subjects, to benchmark progress more widely. Different audiences will need different details about learner progress.

The school and the relevant department need to set the policy on how they intend to report.

Internal Reporting

In order to maximise the opportunities that the LOF brings in terms of flexibility and freedom to help learners progress towards the learning expectations, the teacher will need to have a detailed appreciation of what the learner has already achieved and just how they relate to the learning expectations that the teacher is responsible for teaching. The teacher who comes next will also expect an appraisal of learner performance. It will be important to establish, through discussion with colleagues, how best to manage this internal communication and reporting in order to ensure a balance between what is helpful and insightful in assisting with the transition process and what is unwieldy, onerous and unmanageable.

It is important to remember that the detail that can be created around individual performance does not necessitate or promote an individualised teaching programme for each learner. Instead it is there to be used to facilitate a more responsive approach to curriculum design and more appropriate selection of teaching strategies and resource selection within the class.

As learners progress through the LOF, moving from level to level, year to year and class to class they will progress at different rates. This represents a challenge if learning is to remain fluid and continuous and progression is to be uninterrupted. That said, the Subject Foci and SLOs allow teachers to profile progress and achievement and to communicate that progress in a regular manner, indicating where the learner sits in relation to the overall expectations of a level, even indicating where there is some achievement beyond the level. The school is given the flexibility to decide how best it wants to communicate learner progress within the school and between those responsible for their learning and progression. Within the subject teaching team it will be important to identify an approach that is functional and clear within the subject and will ultimately maximise the Learning Outcome Framework's ability to chart progress in detail and in a personalised, learner-centric way.

A simple Achieved/Not Yet Achieved is clear feedback, yet it does not convey how close or far from being able to demonstrate achievement of the SLO the learner is. Educators may find it useful to come up with a convention that does more than just use a binary method of reporting achievement. Communicating more information about how a learner is relating to a particular level helps instigate discussion of where there may be particular learning challenges or where a learner has only started the learning associated with particular Learning Outcomes.

Evidence informing reporting should be drawn from a range of sources, including formal and informal assessment interventions, and educators should apply their professional judgement to a sufficient and robust body of evidence that allows them to report with confidence about progress made against a significant body of learning. Formal summative assessment interventions need to be subject to collaborative design and development and feature a measure of quality assurance and moderation to ensure what is reported is benchmarked against a wider understanding of the national standard.

How it is done elsewhere

The Scottish *Curriculum for Excellence* frames progression in relation to the learning expectations as developing, consolidating or having secured the learning objectives. These are not rigid categories but signposts indicating where the learner sits in relation to the expectations.

Typically, a learner who has started to engage in the work of a new level or area and starting to make progress in an increasing number of outcomes is at the Developing stage.

Once the learner has achieved a measure of breadth across the Subject Foci; can apply the learning in familiar situations; is beginning to show increased confidence by engaging in more challenging learning; and is starting to transfer their learning to less familiar contexts, they are engaged in a process of Consolidation.

Once significant achievement across the Subject Foci and outcomes has been recorded and there has been consistent success in meeting the level of challenge within the outcomes; learners are engaged in more challenging work; and are confidently transferring their learning and applying it in new and unfamiliar situations, their position in relation to expectations is viewed as Secure.

Adapted from *Building the Curriculum 5, A Framework for Assessment: Reporting*,
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Appendix



Digital Literacy

Digital literacy has become essential for learning and life. Besides cutting across various disciplines it must now be considered as being a discipline of its own such as music, art, science and literature. Digital literacy education seeks to equip learners with the competencies (knowledge, skills and attitudes) in the use of digital technology needed to access learning opportunities, to pursue their chosen careers and leisure interests and to contribute to society as active citizens. It also aims to provide them with knowledge of the principles underpinning these technologies and a critical understanding of the implications of digital technology for individuals and societies.

Digitally literate learners learn to become independent, confident and discerning users of technology. Subsequently they acquire and develop critical and analytical attitudes to appropriately choose the right digital tools according to specific needs.

Digital literacy includes five categories of digital competencies, namely: Information Management, Communication and Collaboration, Digital Media, Using Digital Tools for Learning, Management of the Internet.

The competence in information management enables learners with the means to access, evaluate and analyse and hence make an informed choice from a range of available data and information sources. Competencies relating to Communication and Collaboration empower learners to learn to communicate, collaborate and network with others. Competencies in Digital Media enable learners to analyse messages mediated by digital media and to express themselves creatively across a range of digital media.

Digital literacy also involves competence in using digital tools in various media and in different modes of learning (autonomous, collaborative, exploratory, designing). Digitally literate learners will learn to be responsible and competent in managing the internet, keeping themselves safe and secure online, making informed choices over privacy, taking responsibility for their actions, respecting intellectual property, abiding by the terms and conditions of systems they use and respecting the rights and feelings of others. In teaching digital literacy, teachers should look for authentic, meaningful and socially inclusive learning opportunities which allow learners to apply and develop their skills, knowledge and understanding across the curriculum. Digitally literate learners should be able to undertake challenging creative projects, both individually and collaboratively comprising aspects from different competence categories.

Theme Learning Outcomes:

Information Management

- I am able to identify and articulate my information needs.
- I can find, select, use and combine information from a range of sources.
- I can safely and critically navigate between online sources and select information effectively
- I can navigate between online sources and select information effectively.
- I can create personal information strategies.

Communication

- I can communicate through a variety of digital devices and applications.
- I can adapt my communication modes and strategies according to the people I am communicating with.
- I can use different digital tools to share knowledge, content and resources.
- I can help others to share knowledge, content and resources.
- I know how to quote other people's work and to integrate new information into an existing body of knowledge.
- I can engage with on-line learning communities effectively.
- I can use digital technologies to participate in online citizenship.

Collaboration

- I can use technologies and media to work in teams and collaborate in learning.
- I can collaborate with others and co-construct and co-create resources, knowledge and learning.
- I can function well in digitally mediated Communities of Practice

Use of Digital Media

- I can review, revise and evaluate information presented in a range of digital media.
- I understand both how and why messages in digital media are constructed and for what purposes.
- I can examine how individuals interpret messages in digital media differently.
- I understand how values and points of view are included or excluded and how digital media can influence beliefs and behaviours.
- I understand the ethical / legal issues surrounding the access and use of digital media, including copyright, ownership, licensing and use of proprietary content or software.
- I can work creatively across a range of digital media and multiple systems to present information effectively to a given audience.
- I can edit and improve content that I had already created or that others have created, respecting and acknowledging the rights of the original author.
- I can express myself through digital media and technologies.

Managing Learning

- I can use various tools to manage my own learning.
- I can use various tools and approaches to collaborate with others in learning.
- I can use various tools to explore ideas, theories, relationships and procedures.
- I can use various tools to learn by designing digital objects.
- I can use various tools and approaches to reflect on learning.
- I can use various tools and approaches to evaluate what I have learnt.
- I can build and assess e-portfolios.
- I can work on multiple eLearning management systems and platforms.

Managing Internet Use

- I understand how the internet and the world wide web work and can use them for communication and collaboration.
- I am aware of and abide by the principles of netiquette.
- I know what constitutes plagiarism.
- I can protect my devices from online risks and threats.
- I can protect myself and others from possible online dangers (e.g. cyber bullying) by following appropriate privacy and confidentiality procedures.
- I am able to consider the social, cultural, religious and ethical implications of digital technology and can confidently communicate, share information, access and distribute content without infringing upon other peoples' intellectual property.
- I am aware of cultural diversity online.
- I can develop active strategies to discover inappropriate behaviour.
- I can create, adapt and manage one or multiple digital identities.
- I can protect my e-reputation.
- I can manage the data that I produce through several online accounts and applications to avoid health risks related with the use of technology in terms of threats to physical and psychological well-being.
- I recognise Cloud Computing as a converging technology on which I can work and save my material.



Education for Diversity

The National Curriculum Framework (NCF) acknowledges Malta's cultural diversity and values the history and traditions of its people. It acknowledges and respects individual differences of gender, colour, ethnic and social origin, language, religion or belief, political or any other opinion, membership of a national minority, birth, ableism, age or sexual orientation and geographical location. A curriculum that acknowledges the fact that diversity is a feature of Maltese society, as it is of nations across Europe and the world, that can contribute to national prosperity and social cohesion.

As a member state within the United Nations, Malta is a signatory to international human rights instruments including the Universal Declaration of Human Rights (1948), the European Convention for the Protection of Human Rights and Fundamental Freedoms (1950), the International Covenant on Civil and Political Rights (1966), the International Covenant on Economic, Social and Cultural Rights (1966) and the UN Convention on the Rights of the Child (1989). As a member of the European Union, Malta is legally bound by the EU Charter of Fundamental Rights.

These instruments set out international standards and commit Malta's government and people to democracy and to acknowledging that citizens and other residents have, and should enjoy, human rights without discrimination.

Consequently the NCF aims to help children acknowledge social justice and solidarity as key values in the development of the Maltese society and encourage young people to uphold fundamental democratic values and promote social justice.

Education for Diversity promotes an inclusive educational culture and challenges various educational processes such as decision making within schools, languages of instruction, methodologies used, learner interaction and learning resources. Education for Diversity ensures the inclusion of multiple perspectives and voices within the learning environment, provides spaces for learning about the languages, histories, traditions and cultures of non-dominant groups in a society, encourages team work and cooperative learning in multicultural, multi-ethnic and other diverse contexts, combines traditional and local knowledge and know-how with advanced science and technology and values the practice of multilingualism. In doing so, it encourages an understanding of global issues and the need for living together with different cultures and values.

Theme Learning Outcomes:

Self Awareness

- I am a person committed to democracy and understand that this means ensuring people of different views and cultures have their say and work together for a better society.
- I have a principled and ethical approach to life.
- I am committed to social justice and a democratic and inclusive society.
- I reserve judgement so that it may be made on a fair and rational basis.
- I strive to strike a balance between my rights and duties and those of others.

Social Change

- I uphold fundamental democratic values and work to promote social justice.
- I respect the different religious and humanist convictions, morals and beliefs that inform people's conceptions of right and wrong.
- I recognise unfairness, injustice and preferential treatment in daily life situations including racist, sexist and homophobic language and behaviour.
- I challenge expressions of prejudice and intolerance towards minorities such as racist, sexist and homophobic names, anecdotes and comments.
- I claim my rights and act on my duties knowing that my fellow learners and teachers have equal entitlement to their rights.
- I appreciate that the notion of 'identity' is complex and changing and limited as a concept in capturing who I am and that the idea of 'identities' is a more powerful way of understanding who I am and who others are.
- I attend and respond to my teachers and fellow learners and accept that they may have different points of view.

Communicating for Diversity

- I communicate with, work with and respect all of my fellow learners, teachers and adult helpers.
- I communicate with people who are different to understand how we are the same and to understand myself better.
- I strive to communicate effectively with others in a constructive, supportive and self-determined way.
- I can use effective language to challenge injustices and inequalities.
- I approach differences of opinion and conflicts of interest through dialogue, non-violent communication and consensus; where this fails, I am willing and able to use mediation.



Education for Entrepreneurship, Creativity and Innovation

While entrepreneurship, creativity and innovation can potentially be seen as being discrete attributes, it is perhaps more strategic to consider them as mutually reinforcing features of a more cohesive and singular aim: to ensure that the future citizens of Malta have the wherewithal to contribute to the sustainable prosperity of the nation in an increasingly competitive global economic and social contexts. The goals include the four main competence areas of personal and interpersonal skills, practical and cognitive skills. This more strategic vision reinforces the need for an approach to Entrepreneurship, Innovation and Creativity that permeates all aspects of the curriculum, while being clearly signposted to ensure that learners' entitlements are being met and that learning and teaching in relation to these themes can be quality assured.

The overall goals of entrepreneurship education are to give learners the attitudes, knowledge and capacity to act in an entrepreneurial way and to acquire the skills that will promote their lifelong employability in a rapidly changing commercial, economic and social environment. This includes becoming entrepreneurial citizens in other spheres beyond industry or employability. These goals require the development of the 'soft' generic personal and interpersonal skills fundamental to becoming entrepreneurial, as well as the fostering of the more discrete entrepreneurial knowledge and understanding required to pursue entrepreneurial endeavours and to possess an entrepreneurial mindset which is both creative and innovative.

Creativity is generally recognised as both an innate yet often under-developed quality in young people, as well as a practical skill that helps to unlock an entrepreneurial disposition. It is a skill that can be taught and that everyone can aspire to. It involves opening up young peoples' thinking processes in ways that help them to look at familiar things with a fresh eye, to identify and frame a problem and to generate solutions whilst using their imagination, knowledge and skills to explore new possibilities rather than established approaches.

The ability to be innovative and the confidence to look for innovative responses to opportunities or problems encountered is best nurtured in a safe, supportive environment where this type of approach is encouraged, recognised and rewarded. Such a pedagogy requires allowing learners time to reflect on a situation and tap their resources and imagination to develop plans and solutions. It also requires time for implementation of new processes and the application of new ideas. Teaching and learning for innovation might even include space to 'learn from failure'.

Theme Learning Outcomes:

Personal

- I can work effectively on my own.
- I am resilient and can persevere.
- I understand the importance of nurturing a positive self-image, self-esteem and self confidence.
- I recognise the importance of integrity and ethical values.

Interpersonal

- I know how to communicate my proposed strategies to others effectively.
- I am able to contribute to a team.
- I am able to take the lead.

Cognitive

- I am able to solve problems imaginatively and laterally.
- I am able to think critically.
- I am able to consider different perspectives.
- I can recognise that entrepreneurship and innovation should be underpinned by ethics and values relating to social justice and sustainability.

Practical

- I can turn creative ideas into action.
- I have a basic set of research skills.
- I am able to audit my own skills and interests in order to consider future academic and vocational career choices.
- I appreciate the importance that creativity and entrepreneurship have played in the development and progress of human society.



Education for Sustainable Development

Education for Sustainable Development (ESD) helps learners to develop the necessary competences (knowledge, skills, values, attitudes and behaviour) that enable them to become sustainable citizens. ESD empowers individuals to actively participate in decision making processes which are compatible with living within the environmental limits of our planet in a just, diverse, equitable and peaceful society.

ESD seeks to ensure that learners:

- Develop a sense of identity and belonging to their local, national, regional and global community.
- Are empowered to adopt their roles and responsibilities within a globally interdependent world.
- Understand and are empowered to address the real causes and consequences of unsustainable behaviour within the context of an interdependent and globalised world.
- Develop a future-oriented perspective that highlights the significance of their decisions, choices and actions on the quality of life of present and future generations.
- Are exposed to diverse learning environments using a broad array of educational experiences.
- Develop a holistic concept of the environment involving natural, social, economic, physical and cultural perspectives.
- Value and respect social, cultural and ecological diversity.
- Are committed to action to bring about change.

ESD should be achieved through a whole-school approach that involves the reorientation not only of the curriculum, but also of the school culture, the school campus management, the school community and the wider local community in line with sustainable development.

Learners should experience ESD through transformative pedagogies that facilitate ESD teaching and learning experiences that promote the acquisition of the knowledge, skills, values, attitudes and behaviours necessary to become active global citizens.

ESD should be a lifelong learning process involving a blend of learner-centred processes, such as participatory/ collaborative learning; problem-based learning; inter-disciplinary learning; multi-stakeholder social learning; critical and systemic thinking-based learning; action learning; learning outside the classroom; experiential learning; reflective evaluation and using relevant real-world contexts.

Theme Learning Outcomes:

Learning to Know

- I can explain how the natural, social, cultural and economic systems work and are interrelated.
- I can describe my role as a citizen within the local, national, regional and global context.
- I can recognise the relationship between understanding others and the wellbeing of all in the present and the future.
- I can identify the root causes of inequality and injustice and actions that lead to a better quality of life, equity, solidarity and environmental sustainability.
- I can justify the importance of identifying problems, reflecting critically, thinking creatively and having a wider vision in order to plan for the future and become an effective agent of change.
- I can recognise the importance of lifelong learning and use such learning experiences to approach new challenges and be in a better position to take informed decisions and evaluate their consequences.

Learning to Do

- I can communicate my ideas and present my opinions in thoughtful and informed discussions and decision making processes.
- I can critically assess processes of change in society and envision a more equitable and sustainable world.
- I can identify priorities and evaluate potential consequences of different decisions and actions.
- I am able to collaborate with people having different perspectives on dilemmas, issues, tensions and conflicts from different disciplines/places/cultures/generations.
- I can use the natural, social and built environment that surrounds me, as a context and source of learning.
- I can involve myself and others in real-world issues to bring about a positive difference.

Learning to Be

- I am a critically reflective person and am able to evaluate decisions, choices and actions.
- I am responsible for my actions and capable of anticipating, adapting to and facing change.
- I can reflect upon the consequences of my actions on present and future generations.
- I am sensitive to divergent disciplines and perspectives, cultures and minority groups, including indigenous knowledge and worldviews without prejudices and preconceptions.
- I am motivated to make a positive contribution to other people and their social and natural environment, locally and globally.
- I am able to creatively and innovatively take considered action and challenge assumptions underlying unsustainable practice.

Learning to Live Together

- I can live in harmony with myself, others and the natural world at a range of levels from the local to the global.
- I respect and value diversity and challenge social injustice.
- I have a future-oriented perspective for how I live my life as a citizen of the world.
- I actively engage myself with different groups across generations, cultures, places and disciplines.
- I can actively participate in processes and encourage negotiations for alternative sustainable futures.
- I will help others clarify diverse worldviews through dialogue and recognize that alternative frameworks exist.
- I will challenge unsustainable practices across educational systems, including at the institutional level.



Learning to Learn & Cooperative Learning

The aims of Learning to Learn are for learners to:

- Focus on learning processes as well as final performances.
- Hold a rich conception of learning and based on a personal conviction to manage own learning.
- Acquire a wide range of strategies for learning.
- Develop strategies to plan, monitor and review their own learning.
- Become competent in self-assessment.

Theme Learning Outcomes:

Social Learning

- I can appreciate diverse viewpoints and personalities.
- I am confident in discussing my views with others.
- I can follow the ideas of others and comment on their views.
- I can follow group discussions and collaboration and summarise what is being said or done.
- I collaborate with other learners as part of my learning.
- I learn by designing products with others.
- I seek out and am open for guidance and support from peers and adults.
- I am able to talk with others about learning.
- I listen to others talk about learning.
- I can discuss various subjects and learning strategies with peers.
- I can debate and support my argument without being judgemental while still empathising with others.
- I can learn about my needs to make the right choices.

Personal Learning

- I can identify the support and resources I need to learn.
- I am aware of my preferred way to learn and can use this to plan my own learning.
- I manage goals and time efficiently in learning.
- I feel competent in managing my own learning.
- I am open to feedback from others and am able to consider it for my personal improvement.
- I reorganise myself by explicitly changing my assumptions over time.
- I am able to follow my own interests as this helps me to reflect on 'who I am'.
- I am pleased when I succeed at difficult tasks.
- I believe that effort can lead to success.
- I reflect on my mistakes and learn from them.

Cognitive Learning

- I am able to remember by recalling, recognising and locating information.
- I am able to link new information to my existing knowledge.
- I am able to analyse information that I come across.
- I evaluate knowledge in terms of my learning objectives and my preferred way of learning.
- I am able to solve problems on my own and in collaboration with others.
- I am able to assess myself as this helps me to understand what I know and who I am.
- I assess myself to analyse and further develop my ideas.

- I assess my peers to compare what I know to what others know, gaining knowledge of what mental models others hold of a particular concept and how these mental models can evolve for understanding to happen.
- I am able to focus on the main subject and summarise important points.
- I am able to apply my knowledge and understanding in differing contexts.
- I can manage my own learning to improve important skills including literacy and numeracy skills.
- I understand that learning involves different processes.

Creative Learning

- I take initiative in designing new products.
- I am able to think about new ways of making good use of objects.
- I am able to use my imagination and creativity.
- I prefer to move on to challenging tasks rather than stay on easy ones.
- I am able to face new, challenging experiences and learn from them.
- I learn by exploring events, life experiences and the physical environment.
- I am able to engage in unplanned spontaneous play.
- I am able to engage in planned, purposeful play.
- I understand that I can improve and learn and that if I am stuck I can think upon my difficulties, solve my problems and move forward.



Literacy

One of the most important aspects of literacy in Malta is the implication that a literate person is fluent in both Maltese and English. An essential factor to ensure that Malta remains a bilingual country is making sure that its learners develop equal competences in reading, writing, speaking, listening and comprehending in both official languages from the early years, preferably from kindergarten. Another is ensuring that learners develop the skill to switch easily from Maltese to English (or vice versa) depending on the situational need. Achieving bilingual literacy in our education means that all our young people feel comfortable and confident using both languages.

Literacy development will require a whole-school approach that is clearly reflected in school policies where there is a conscious effort in which a community for literacy is promoted throughout the curriculum. Literacy for learning is an intrinsic part of school life and every subject domain can serve as a context whereby literacy skills development could be enhanced. Furthermore, schools should strive for a literacy rich environment using technology as a platform.

The relevance of reading aloud and presenting ideas to an audience and the opportunities for contextualised language and play acting (drama) should be clearly identified as components of spoken literacy across the curriculum. Stressing the importance of oracy is key to encouraging active learning cultures and communities.

With regard to reading, the fun and interactive aspect of reading is very important; the purpose of reading should initially be for fun/interest and communication. The value of entertainment in reading, which is closely linked to attitude and disposition to language, is crucial especially in the Early and Junior Years. Critical and creative thinking, where the learner increasingly takes control of texts in different domains and gains awareness, will follow.

Theme Learning Outcomes:

Listening and speaking

- I can converse in a range of situations, both formal and informal, matching register and language to the situation and audience.
- I can listen to and understand spoken text well and respond or apply the information appropriately with comments and/or questions.
- I can use language to present my thinking logically and clearly and can talk to engage an audience while analysing and evaluation through an open-ended approach.
- I can use spoken language to share my ideas in a collaborative way, appreciating the social elements of conversation such as waiting for my turn and listening to what others have to say.

Expressive language

- I can use expressive language to develop my own thinking, using words to explore, clarify and confirm ideas.
- I can use expressive language to develop my thinking and the thinking of others by contributing to the explorative talk of my peers and the dialogic talk of my teachers.
- I can use expressive language to organise and rehearse ideas, arguments and language structures in order to synthesise and evaluate before writing and while editing.

Reading and understanding

- I can decode print effectively and successfully establish multisensory linking and phonemic awareness between grapheme and phoneme.
- I can read text in a fluent manner and understand what is written, gain knowledge and enjoy the process.
- I can select real, virtual and multimedia texts to entertain and inform me, constructing meaning from text, using words and visual or audio information to confirm, complement or change what I already know while discarding the superfluous.
- I can approach texts purposefully: I am aware of what I hope to gain from them and am able to use retrieval devices, cross references and links to follow themes or ideas through various means including texts accessed via technology.
- I can select appropriate texts for my purposes, taking account of implied readership and provenance as well as subject matter and format.
- I can identify and follow the different reading conventions of my academic subjects, regarding the place and purpose of reading texts in learning and in questioning or accepting the authority of these texts.

Writing

- I can draw on what I have read, what I have done and what I have felt at home, at school and at play to inform my writing.
- I can convey my thoughts powerfully and eloquently through speech and text.
- I can select the appropriate language, register, genre and medium for the texts I write.
- I can use writing in both manuscript (handwritten form) as well as digital form in order to inform, to persuade and to entertain other people.
- I can use writing to consider ideas and to reflect on and consolidate my own thinking and learning. I can follow the writing conventions of the genres and subjects I am studying.

Accuracy

- I can write accurately using language conventions and rules such as those established by Standard English / Kunsill Nazzjonali tal-Ilsien Malti / l-Akkademja tal-Malti.
- I can use my knowledge of morphology as well as my phonological awareness and visual memory to attempt to spell unfamiliar words and recognise correct spelling.
- I can use a range of punctuation marks to make my meaning clear to a reader.

Planning and reflection

- I can plan my written work and think what I want to communicate before I start to write.
- I can understand the need for drafting; I can edit and proofread my work and allow sufficient time in which to complete a piece of work.
- I can reflect about my writing and think about how I learn best.



Learning Outcomes Framework

This document is part of the ESF1.228 Project entitled 'Design of Learning Outcomes Framework, associated Learning and Assessment programmes and related Training' implemented under the Operational Programme II – Cohesion Policy 2007-2013 and was part-financed by the European Union European Social Fund co-financing rate: 85% EU Fund; 15% National Funds.

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Directorate for Quality and Standards in Education,
Ministry for Education and Employment,
Great Siege Road, Floriana VLT 2000
Malta

Publisher: Directorate for Quality and Standards in Education

www.schoolslearningoutcomes.edu.mt



Operational Programme II - Cohesion Policy 2007-2013
Empowering People for More Jobs and a Better Quality of Life
Project part-financed by the European Union
European Social Fund
Co-financing rate: 85% EU Funds; 15% National Funds



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