

Using ICT to enhance teaching and learning in Science



Here are a selection of measures from the MIICE Toolbox which can be helpful when planning and evaluating work in primary science using ICT. The focus for these measures is to enhance the quality of pupil experience and learning.

Can learners express evaluations of their actions?

Example

Children can discuss the successes and problems they have had during a science project

MIICE reference

This comes from MICE quality indicator 1 on learner reflection, which relates to their ability to think about what they are doing, and their ability to put it into a number of contexts; in particular to theme 3 on their ability to articulate evaluations of their actions

Curriculum for Excellence links

- Learning in the sciences will enable me to develop skills for learning, life and work
- I have collaborated in the design of an investigation into the effects of fertilisers on the growth of plants. I can express an informed view of the risks and benefits of their use [Planet Earth: Biodiversity and interdependence at second level; SCN 2-03a]
- By considering current issues of science, learners increasingly develop their understanding of scientific concepts and their capacity to form informed social, moral and ethical views. They reflect upon and critically evaluate media portrayal of scientific findings [Introduction to Topical science]

Can learners articulate ways in which school activity relates to activities in the wider world?

Example

Children can talk about applications in the real world which mirror the experiments and activities which they conduct in the classroom, such as the use of robotic devices in factories related to the use of Lego or other robotic devices used in the classroom

MIICE reference

This also comes from MIICE quality indicator 1 on learner reflection, which relates to learners' ability to think about what they are doing, and their ability to put it into a number of contexts; in particular to theme 4 on developing informed attitudes in relation to ICT in society

Curriculum for Excellence links

- Learning in the sciences will enable me to develop as a scientifically-literate citizen with a lifelong interest in the sciences
- Through exploring nonrenewable energy sources, I can describe how they are used in Scotland today and express an informed view on the implications for their future use [Planet Earth: Energy sources and sustainability at second level; SCN 2-04b]
- Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society [Topical science at second level; SCN 2-20a]
- When exploring technologies in the world around me, I can use what I learn to help to design or improve my ideas or products. [Technological developments in society TCH 2-01a]

Do learners use ICT imaginatively to prepare and present their own material?
<i>Example</i> The children use spreadsheets, graphs, digital camera, video or microscope images in PowerPoint to enhance and illustrate their project write-ups when they are involved in science work
<i>MIICE reference</i> This comes from MIICE quality indicator 2 on skills development, which relates to learners' development of systematic skills in using ICT tools for a purpose; in particular to theme 2 on creation and presentation of their own material
<i>Curriculum for Excellence links</i> <ul style="list-style-type: none"> • Learning in the sciences will enable me to demonstrate a secure knowledge and understanding of the big ideas and concepts of the sciences • Learning in the sciences will enable me to recognise the role of creativity and inventiveness in the development of the sciences • Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes [Materials: Properties and uses of substances at early level; SCN 0-15a] • As I extend and enhance my knowledge of features of various types of software, including those which help find, organise, manage and access information, I can apply what I learn in different situations. [ICT to enhance learning at first and second level; TCH 1-03a / TCH 2-03a] • Throughout all my learning, I can use search facilities of electronic sources to access and retrieve information, recognising the importance this has in my place of learning, at home and in the workplace.[ICT to enhance learning at second level; TCH 2-03b] • I can create, capture and manipulate sounds, text and images to communicate experiences, ideas and information in creative and engaging ways. [ICT to enhance learning at second level; TCH 1-04b / TCH 2-04b]

Can learners use computers and other devices such as sensors to monitor and/or control the environment?
<i>Example</i> The children can use data logging devices and software to monitor changes in temperature
<i>MIICE reference</i> This comes from MIICE quality indicator 3 on managing and manipulating digital information, which relates to learners' ability to modify a variety of digital data types using a problem-solving approach, and the ability to use the tools to model and speculate and apply the resultant information; in particular to theme 3 on controlling, modelling and exploring within the digital environment
<i>Curriculum for Excellence links</i> <ul style="list-style-type: none"> • Learning in the sciences will enable me to develop the skills of scientific inquiry and investigation using practical techniques • I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school [Planet Earth: Biodiversity and interdependence at first level; SCN 1-03a] • By collaborating in experiments on different ways of producing sound from vibrations, I can demonstrate how to change the pitch of the sound [Forces, electricity and waves: Vibrations and waves at first level; SCN 1-11a] • By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed [Materials: Properties and uses of substances at second level; SCN 2-15a]

Can learners share their learning?
<p><i>Example</i></p> <p>The children can work together to create a clear and appropriate presentation of their findings from a science experiment or task</p>
<p><i>MIICE reference</i></p> <p>This comes from MIICE quality indicator 6 on shared learning, which relates to the learners' ability to communicate and collaborate in a flexible and positive way; in particular theme 1 on taking into account purpose and intended audience</p>
<p><i>Curriculum for Excellence links</i></p> <ul style="list-style-type: none"> • Learning in the sciences will enable me to develop skills in the accurate use of scientific language, formulae and equations • I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications [Forces, electricity and waves: Forces at second level [SCN 2-08a] • I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made [Materials: Chemical changes at second level; SCN 2-19a]

Can learners break down projects into manageable steps and put into context findings from systematic searches?
<p><i>Example</i></p> <p>The pupils can search the internet or a database to find specific information in order to investigate the relationship between height and weight</p>
<p><i>MIICE reference</i></p> <p>This comes from MIICE quality indicator 5 on investigatory learning, which relates to the learners' ability to search systematically through electronic data and to put information found in context, breaking the project down into manageable steps ; in particular component 1 on searching and researching and theme 3 collecting and analysing information</p>
<p><i>Curriculum for Excellence links</i></p> <ul style="list-style-type: none"> • Learning in the sciences will enable me to develop curiosity and understanding of the environment and my place in the living, material and physical world • By investigating how water can change from one form to another, I can relate my findings to everyday experiences [Planet Earth: Processes of the planet at early and first level; SCN 0-05a/SCN 1-05a] • By observing and researching features of our solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it [Planet Earth: Space at second level; SCN 2-06a] • I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience [Materials: Properties and uses of substances at second level; SCN 2-16a]

Can teachers enhance learning outcomes?

Example

Is there widespread teacher exploration on new instructive styles using data projectors and SmartBoards linked to external devices such as digital microscopes, visualisers or data logging information?

MIICE reference

This comes from MIICE quality indicator 8 relates to teachers' focus on setting expectations for continuing but realistic progress in the uses of ICT and on putting it into a wider context

Curriculum for Excellence links

- Learning in the sciences will enable me to establish the foundation for more advanced learning and future careers in the sciences and the technologies
- Learners investigate the factors affecting plant growth and develop their understanding of the positive and negative impact of the human population on the environment [Introduction to Biodiversity and interdependence in Planet Earth]
- Learners develop their understanding of series and parallel circuits and of electrical and electronic components and apply their knowledge to the process of designing, constructing, testing and modifying [Introduction to Electricity in Forces, electricity and waves]
- Through observation, research and practical investigation learners explore the risk and impact of microorganisms in relation to health, and then in industrial processes [Introduction to Body systems and cells in Biological systems]
- Learners begin to use symbols and chemical formulae as a way of communicating information about elements and compounds [Introduction to Properties and uses of substances in Materials]

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