International Baccalaureate®
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Middle Years Programme

# Sciences teacher support material
# Example interim objectives

For use with the *Sciences guide* (January 2005)

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# Objectives for years 1, 3 and 5 of the Middle Years Programme

## Year 5 objectives

The sciences objectives for year 5 of the Middle Years Programme (MYP) are already in place and can be found in the *Sciences guide* (January 2005). This set of **prescribed** objectives forms the basis for the **assessment criteria**, also published in the guide, which must be used for final assessment of students' work during year 5.

## Example interim objectives

Example interim objectives for years 1 and 3 of the MYP appear in the tables that follow. They have been developed in order to:

- promote articulation between the MYP and the Primary Years Programme (PYP)
- support individual schools in developing a coherent curriculum across the five years of the programme (or however many years a school is authorized to offer)
- emphasize the need to introduce students to the required knowledge, understanding, skills and attitudes from the first year of the programme
- provide examples of possible learning activities and assessment tasks that will allow students to work towards meeting the final objectives for year 5
- support schools that are authorized to offer the first three years of the MYP in designing appropriate assessment tasks for the end of the third year.

Unlike the objectives for year 5, the interim objectives for years 1 and 3 are not prescribed, although the IB recommends that all schools use them. Schools may choose to adopt the objectives contained in this document or develop their own.

If choosing to develop their own interim objectives, schools must start with the prescribed objectives for year 5 and modify each one by taking into account the age, prior knowledge and stage of development of students in an earlier year of the programme. Each year 5 objective will then correspond directly to a modified objective in a preceding year of the programme. **No objectives should be omitted** from an earlier year as it is vital to ensure a coherent progression of learning across all five years of the programme.

# Tables of objectives

Where the objectives in the tables that follow are the same for different years of the programme, there is a natural assumption that the student will gain more knowledge, understanding and skills, and become more mature as the course progresses. The units of work are therefore likely to become more complex and the underlying concepts to become more sophisticated as the student progresses from one year to the next.

## A One world

This objective refers to enabling students to understand the interdependence between science and society. Students should be aware of the global dimension of science, as a universal activity with consequences for our lives and subject to social, economic, political, environmental, cultural and ethical factors.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| At the end of the first year, students should be able to: | At the end of the third year, students should be able to: | At the end of the last year, students should be able to: |
| • make comments on the ways in which science is applied and used to solve local and global problems | • describe and explain ways in which science is applied and used to solve local and global problems | • describe and discuss ways in which science is applied and used to solve local and global problems |
| • give examples of science and scientific applications and describe how these could affect people, societies and the environment | • give examples of science and scientific applications and discuss some of their positive and/or negative effects on people, societies and the environment | • describe and evaluate the benefits and limitations of science and scientific applications as well as their effect on life and society |
| • give examples of ways in which science has played a part in the development of technology, and ways in which technology has played a part in the development of science | • describe and explain how science and technology depend on each other for the development of knowledge and technological applications | • discuss how science and technology are interdependent and assist each other in the development of knowledge and technological applications |
| • understand that science is part of the world they live in by giving examples and commenting on ways in which science affects life, society and the world. | • understand that science is part of the world they live in by describing how science and its applications are affected and/or influenced by some of the following factors: social, economic, political, environmental, cultural, ethical. | • discuss how science and its applications interact with social, economic, political, environmental, cultural and ethical factors. |

## B Communication in science

This objective refers to enabling students to develop their communication skills in science. Students should be able to understand scientific information, such as data, ideas, arguments and investigations, and communicate it using appropriate scientific language in a variety of communication modes and formats as appropriate.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| At the end of the first year, students should be able to: | At the end of the third year, students should be able to: | At the end of the last year, students should be able to: |
| • demonstrate understanding of basic scientific language by using appropriate scientific terminology, units of measurement and symbolic representation | • understand and use scientific language relevant to the units of work covered | • communicate scientific information using a range of scientific language |
| • provide scientific information using appropriate modes of communication: oral, written, visual representation (formulae, graphs, tables, diagrams) with guidance | • provide scientific information using appropriate modes of communication: oral, written, visual representation (formulae, graphs, tables, diagrams) consistent with the level of complexity of the units of work covered | • communicate scientific information using appropriate modes of communication |
| • present scientific information in appropriate formats (such as, laboratory reports, experimental accounts, explanations, essays, expositions, audio-visual presentations) with guidance, and become familiar with the system used in the school to acknowledge sources | • present scientific information in formats (such as laboratory reports, experimental accounts, explanations, essays, expositions, audio-visual presentations) appropriate to the work covered, and acknowledge sources | • present scientific information in a variety of formats, acknowledging sources as appropriate |
| • recognize the need for honesty when collecting and processing data and information, and when acknowledging sources | • demonstrate honesty when handling data and information, and acknowledging sources | • demonstrate honesty when handling data and information, acknowledging sources as appropriate |
| • use, with guidance, information and communication technology applications (World Wide Web, data loggers, databases, spreadsheets or software for plotting graphs) to access, process and/or communicate scientific information. | • use where appropriate information and communication technology applications (World Wide Web, data loggers, databases, spreadsheets and/or software for plotting graphs) to access, process and communicate scientific information. | • use where appropriate a range of information and communication technology applications to access, process and communicate scientific information. |

## C Knowledge and understanding of science

This objective refers to enabling students to understand the main ideas and concepts of science and to apply them to solve problems in familiar and unfamiliar situations. Students are expected to develop critical and reflective thinking and judge the credibility of scientific information when this is presented to them.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| At the end of the first year, students should be able to: | At the end of the third year, students should be able to: | At the end of the last year, students should be able to: |
| • recognize and recall scientific information relevant to the units of work covered | • recognize and recall scientific information relevant to the units of work covered | • recognize and recall scientific information |
| • explain and apply simple scientific information to solve problems in familiar and, with guidance, in unfamiliar situations | • explain and apply scientific information to solve problems in familiar and, with guidance, in unfamiliar situations | • explain and apply scientific information to solve problems in familiar and unfamiliar situations |
| • identify basic scientific components, relationships and patterns, both in experimental data and ideas | • analyse simple scientific information by identifying basic components, relationships and patterns, both in experimental data and ideas | • analyse scientific information by identifying components, relationships and patterns, both in experimental data and ideas |
| • identify basic scientific components found in information from different sources (Internet, newspaper articles, television, scientific texts and publications) and be able to give an opinion justified by their knowledge and understanding of sciences. | • discuss scientific information from different sources (Internet, newspaper articles, television, scientific texts and publications) and comment on its credibility. | • discuss and evaluate scientific information from different sources (Internet, newspaper articles, television, scientific texts and publications) and assess its credibility. |

## D Scientific inquiry

This objective refers to enabling students to develop scientific inquiry skills to design and carry out scientific investigations.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| At the end of the first year, students should be able to: | At the end of the third year, students should be able to: | At the end of the last year, students should be able to: |
| • recognize, with guidance, the problem or research question to be tested by a scientific investigation | • recognize and attempt to articulate the problem or research question to be tested by a scientific investigation | • define the problem or research question to be tested by a scientific investigation |
| • ask questions of the type: What will happen if? Why does this happen when? and become familiar with making predictions and providing simple reasoning ("If I do this, then this will happen … ") | • formulate a simple hypothesis and explain it using a logical reasoning and their knowledge of sciences ("If I do this, then that will happen because … ") | • formulate a hypothesis and explain it using logical scientific reasoning |
| • identify, with guidance, the factors that can be measured in an investigation (dependent variables), the factors that can be manipulated (independent variables) and those that must remain constant (control variables); identify some of the materials/equipment needed; describe a simple method | • design scientific investigations that include variables and controls that are identified; identify materials/equipment needed; describe a method to be followed; suggest the data to be collected | • design scientific investigations that include variables and controls, materials/equipment needed, a method to be followed, data to be collected and suggestions for its analysis |
| • comment on the method and the quality of the results, with guidance | • comment on the method and the accuracy and/or precision of the results | • evaluate the method, commenting on its reliability and/or validity |
| • suggest improvements to the method, with guidance. | • suggest improvements to the method. | • suggest improvements to the method. |

## E Processing data

This objective refers to enabling students to record, organize and process data. Students should be able to collect and transform data by numerical calculations into diagrammatic form. Students should be able to analyse and interpret data and explain appropriate conclusions.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| At the end of the first year, students should be able to: | At the end of the third year, students should be able to: | At the end of the last year, students should be able to: |
| • collect and record data using appropriate units of measurement, with guidance | • collect and record data using appropriate units of measurement | • collect and record data using appropriate units of measurement |
| • organize and transform data into simple numerical and/or diagrammatic forms, including mathematical calculations and/or visual representations (tables, graphs and charts), with guidance | • organize and transform data into numerical and diagrammatic forms, including mathematical calculations and visual representation (tables, graphs and charts) | • organize and transform data into numerical and diagrammatic forms, including mathematical calculations and visual representation (tables, graphs and charts) |
| • with guidance, present data in a variety of ways using appropriate communication modes (oral, written and visual representation, and use of technologies) and conventions (units of measurement) | • present data in a variety of ways using appropriate communication modes (oral, written and visual representation, and use of technologies) and conventions (units of measurement) | • present data in a variety of ways using appropriate communication modes and conventions (units of measurement) |
| • interpret data by identifying trends, patterns and relationships, with guidance | • analyse and interpret data by identifying trends, patterns and relationships | • analyse and interpret data by identifying trends, patterns and relationships |
| • draw appropriate conclusions based on the data, with guidance. | • draw conclusions supported by explanations that are consistent with the analysis of the data. | • draw conclusions supported by scientific explanations and a reasoned interpretation of the analysis of the data. |

## F Attitudes in science

This objective goes beyond science and refers to encouraging attitudes and dispositions that will contribute to students' development as caring and responsible individuals and members of society.

This objective is set in the context of the science class but will pervade other subjects and life outside school. It includes notions of safety and responsibility when working in science as well as respect for and collaboration with others and their shared environment.

| Year 1 | Year 3 | Year 5 |
|---|---|---|
| **Objectives** | | |
| During the course, students should: | During the course, students should: | During the course, students should: |
| • carry out scientific investigations, with guidance, using materials and techniques safely and skillfully | • carry out scientific investigations using materials and techniques safely and skillfully | • carry out scientific investigations using materials and techniques safely and skillfully |
| • work effectively as members of a team, by being guided into collaborating, acknowledging and supporting others as well as ensuring a safe working environment | • work effectively as members of a team, collaborating, acknowledging and supporting others as well as ensuring a safe working environment | • work effectively as members of a team, collaborating, acknowledging and supporting others as well as ensuring a safe working environment |
| • show respect for themselves and others, and deal responsibly with the living and non-living environment. | • show respect for themselves and others, and deal responsibly with the living and non-living environment. | • show respect for themselves and others, and deal responsibly with the living and non-living environment. |

# MYP units of work

Examples of possible learning activities and assessment tasks are provided in the tables that follow. Each learning activity is intended to form part of a larger unit of work designed to address a central question or theme, known as the **MYP unit question**. More information about MYP units of work can be found in the section on "Planning for teaching and learning" in *MYP: From principles into practice* (August 2008).

Within each unit of work, the **context for learning**, **significant concept(s)** and **assessment tasks** are defined in relation to the MYP unit question. The areas of interaction provide the context for learning while the significant concepts refer to the underlying concepts that define the principal goal of the unit. Assessment tasks are designed to address the levels of students' engagement with the MYP unit question and the aligned objectives.

## Context for learning

Every MYP unit of work has an approaches to learning (ATL) component: a shared and agreed set of skills that all teachers develop with their students throughout the entire programme. The context that frames a particular unit of work is generally derived from one of the other four areas of interaction, although ATL might be the specific context on some occasions. Some of the examples of assessment tasks listed in the tables that follow have an obvious connection to one of the areas of interaction, for example, "How can humans improve the environment?" Others may not, initially, show any clear connection. However, it should be possible to integrate many different types of assessment tasks and learning activities into a single unit of work.

Planning an interdisciplinary unit in collaboration with other subject teachers is also a possibility and several of the examples listed offer this possibility.

## Assessment tasks

One of the first stages in planning a unit of work is to design **summative assessment tasks**, linked to the MYP unit question, which provide varied opportunities for students to demonstrate their knowledge, understanding, skills and attitudes. It is also important to include ongoing **formative assessment tasks** within a unit of work as these provide valuable insights into the extent of student learning as the unit of work progresses. Examples of possible assessment tasks have been included in the tables that follow. Each assessment task is intended to be integrated into a unit of work and may therefore be regarded as a formative or summative assessment task depending on the MYP unit question being explored.

| MYP year 1 | |
|---|---|
| **Examples of possible assessment tasks** | **Examples of possible learning activities** |
| **Objectives A and B** | |
| *"Can we stop using petroleum?"*<br><br>Using a question as a prompt students investigate an issue and express an opinion, supported by scientific knowledge and reasoning. Students communicate their findings and opinions through the creation of a web page, a poster or another form of visual presentation. Students support their creation with a written reflection. | Teachers design learning activities that provide students with opportunities to:<br>• carry out research into the use of energy sourced by petroleum and the current requirements for energy produced this way<br>• identify methods that could meet current requirements for energy using alternative sources to petroleum<br>• explain, using scientific terms, how science and technology are involved in providing solutions to the problem<br>• investigate how these solutions may affect their lives<br>• investigate how different societies may have needs that conflict with these solutions<br>• use an appropriate range of sources and compile a bibliography. |

| | |
|---|---|
| *"How can humans improve the environment?"*<br><br>Students give a written response focusing on how humans impact on their environment and the ways in which science can either support or damage the balance of a particular ecosystem. | Teachers design learning activities that provide students with opportunities to:<br>• carry out research into human activities that affect their local environment<br>• identify the biotic and abiotic factors in their ecosystem<br>• investigate the role of technology in relation to these factors<br>• investigate possible solutions and identify those that are feasible<br>• discuss how these solutions may affect their lives and those of others<br>• discover how different societies may have needs that conflict with the solutions<br>• make use of scientific knowledge and terminology<br>• become familiar with the structure of essay writing<br>• use an appropriate range of sources and compile a bibliography. |
| **Objective B** | |
| *"How are plant cells constructed?"*<br><br>Students create a three-dimensional model of a plant cell that is designed to be accurate in form, structure and relative proportions. | Teachers design learning activities that provide students with opportunities to:<br>• convert text-based descriptions of a plant cell (from a variety of sources) into a three-dimensional model<br>• work out scale factors for representing structures respecting relative proportions<br>• develop a meaningful annotated key<br>• compile a bibliography. |
| **Objective C** | |
| *"How can organisms be classified?"*<br><br>Students create a visual presentation showing how fruits, seeds or shells can be classified according to a self-developed dichotomous key. They also write a summary of the processes they followed and include details of any problems they solved during the process. | Teachers design learning activities that provide students with opportunities to:<br>• collect a wide variety of tree leaf examples<br>• research into leaf structure using scientific terminology<br>• identify patterns and relationships in the leaf structures<br>• develop a dichotomous key<br>• identify, through evaluation of individual keys, successful strategies employed in the development of the keys.<br>Students then:<br>• collect examples from another organism (fruits, seeds or shells)<br>• research into the structure of the organism, and identify patterns and relationships<br>• develop a dichotomous key<br>• assess each other's keys to improve their own presentation. |
| *"To what extent do carbon dioxide emissions affect the climate?"*<br><br>Students express an informed opinion by answering a series of structured questions that guide them into identifying scientific information and allow them to demonstrate their knowledge, skills and attitudes. | Students are presented with information about carbon dioxide emissions from at least two different sources (for example, the Internet and a newspaper article). They answer a structured question that guides them towards:<br>• identifying the scientific information contained in each source<br>• making comparisons between the scientific components of both sources<br>• looking for relationships and patterns<br>• expressing an informed opinion based on their scientific understanding of the issue. |

<table>
<tr><td colspan="2">Objectives B and E</td></tr>
<tr><td>“How do populations grow?”<br><br>Students use scientific language to write an account of the processes they followed in observing the growth of a population, as well as identifying and explaining the patterns and trends they observed.</td><td>Teachers design learning activities that provide students with opportunities to:<ul><li>grow a culture on bread</li><li>regularly measure the growth of the culture over a period of time</li><li>create a graphic or diagrammatic representation of the growth process</li><li>express the area of growth as a percentage of the whole and present data in the form of a pie chart or bar graph</li><li>use an appropriate range of sources and compile a bibliography.</li></ul></td></tr>
<tr><td colspan="2">Objectives D, E and F</td></tr>
<tr><td>Investigations<br><br>Students produce written laboratory reports that provide details of their investigations into one or more of the following:<ul><li>how different solutes might change the boiling point of water</li><li>how a change in temperature affects the solubility of a solute</li><li>the cooling of paraffin wax.</li></ul></td><td>Teachers design learning activities that provide students with opportunities to carry out investigations by:<ul><li>writing an aim</li><li>identifying experimental variables and at least one control variable</li><li>making a simple prediction</li><li>designing an experiment using appropriate materials and equipment</li><li>providing a simple evaluation of their method and at least one improvement</li><li>carrying out the experiment and recording data in a table</li><li>transforming numerical data into graphs, histograms or pie charts</li><li>making conclusion with reference to the data.</li></ul></td></tr>
<tr><td colspan="2">Objective F</td></tr>
<tr><td>Attitudes and behaviour<br><br>Students are assessed according to their ability to:<ul><li>take into account their own safety and that of others</li><li>work cooperatively in different groups</li><li>clean up their space in the laboratory</li><li>select appropriate apparatus</li><li>set up apparatus correctly</li><li>use and dispose of chemicals responsibly</li><li>share data with partners or their group</li><li>take responsibility for sharing work equally for a given task.</li></ul></td><td>Teachers design learning activities that provide students with opportunities to:<ul><li>produce health and safety codes for working in the sciences class</li><li>confront issues of safety</li><li>reflect upon the health and hazard of irresponsible work</li><li>work in different groups</li><li>look after their space in the laboratory</li><li>select, set and handle apparatus safely</li><li>use chemicals safely and responsibly</li><li>collect data</li><li>share out work for a given task.</li></ul></td></tr>
</table>

| MYP year 3 | |
|---|---|
| **Examples of possible assessment tasks** | **Examples of possible learning activities** |
| **Objectives A and B** | |
| *"Can we reach zero population growth?"*<br>Using a question as a prompt, students investigate an issue and express their opinions, supported by scientific knowledge and reasoning. Students communicate their findings and opinions through the creation of a web page, a poster or another form of visual presentation. Students support their creation with a written reflection. | Teachers design learning activities that provide students with opportunities to carry out research into:<br>• problems relating to an increasing global population<br>• the need (or otherwise) to control growth and ways in which this could or could not be achieved.<br>Students should carry out their research using an appropriate range of sources. When writing up the results of their research, they should include:<br>• descriptions of measures, decisions and technologies that could be used to control population growth<br>• explanations supported by their scientific understanding of ways in which science is involved in possible solutions to the problem and ways in which possible solutions might affect our lives<br>• descriptions of how possible solutions may be interpreted by different societies and cultures. |
| *"Has malnutrition developed into a global issue?"*<br>Students investigate malnutrition in relation to a specific macro- or micro-nutrient in a particular area of the world. Students write an essay and discuss the scope of the problem, its causes, consequences and possible ways for eradication. | Teachers design learning activities that provide students with opportunities to carry out research into this topic by:<br>• identifying the nutrient and associated diseases connected with malnutrition<br>• describing how science and/or technology could be used to alleviate malnutrition<br>• presenting information in different forms (maps, graphs and charts)<br>• determining how the cause and possible solutions are affected by societal factors<br>• finding out how the possible solutions may be interpreted by different societies<br>• using an appropriate range of sources and compiling a bibliography. |
| **Objective B** | |
| *"How does the human digestive system work?"*<br>Students design a T-shirt that shows a stylized design of the digestive system, correctly labelled and scientifically accurate, by using appropriate technologies. | Teachers design learning activities that provide students with opportunities to convert a text-based description of the digestive system into a diagram and then into a stylized design. The design must:<br>• be accurate both in structure and in the relationship of organs to each other<br>• have all parts labelled correctly.<br>A complete bibliography should be included on the back of the T-shirt. |
| **Objective C** | |
| *"Are genetically modified foods safe for us and the environment?"*<br>Students express an informed opinion by answering a series of structured questions that guide them into identifying scientific information and commenting on its credibility, allowing them to demonstrate their knowledge, skills and attitudes. | Students are presented with at least three sources of information about genetically modified foods, one of which is of dubious quality. Teachers design learning activities that provide students with opportunities to answer structured questions, requiring them to:<br>• identify and describe the scientific information contained in each source |

| | |
|---|---|
| | • use appropriate scientific terms<br>• make comparisons between the scientific components of the sources<br>• look for relationships and patterns<br>• express an informed opinion based on their understanding of the sciences behind the issue<br>• comment on the credibility of each source based on their understanding of sciences and how the different sources have been selected and presented, and acknowledge the sources of the information. |
| **Objectives D, E and F** | |
| *Investigations*<br><br>Students produce a written laboratory report of their investigations into:<br>• factors affecting the rate of a reaction, for example, the rate of solubility<br>• determining the percentage composition of a mixture<br>• the rate of evaporation for different liquids<br>• measuring personal power (in a vertical direction). | Teachers design learning activities that provide students with opportunities to carry out investigations by:<br>• writing a research question<br>• identifying dependent and independent variables and suitable control variables<br>• making a simple hypothesis and supporting it with a scientific explanation<br>• designing a simple experiment using appropriate equipment<br>• identifying the data to be collected and the way of recording it<br>• writing an evaluation of their method and including at least one improvement<br>• commenting on the reliability of their data<br>• carrying out the experiment<br>• recording data in an appropriate form (for example, a table), using an appropriate degree of accuracy that takes into account the precision of their measuring instruments and the accuracy of the readings<br>• transforming numerical data into a graph, histogram and/or pie chart<br>• arriving at a conclusion and supporting it by the interpretation of the data. |
| **Objective F** | |
| *Attitudes and behaviour*<br><br>Students are assessed according to their ability to:<br>• take into account their own safety and that of others<br>• work cooperatively in different groups<br>• clean up their space in the laboratory<br>• select appropriate apparatus<br>• set up apparatus correctly<br>• use and dispose of chemicals responsibly<br>• share data with partners or their group<br>• take responsibility for sharing work equally for a given task. | Teachers design learning activities that provide students with opportunities to:<br>• confront issues of safety<br>• work in different groups<br>• look after their space in the laboratory<br>• select, set up and use apparatus safely and responsibly<br>• use chemicals safely and responsibly<br>• collect data<br>• share out work for a given task. |

| MYP year 5 | |
|---|---|
| **Examples of possible assessment tasks** | **Examples of possible learning activities** |
| **Objectives A and B** | |
| *"How have electricity and electronics changed our lives?"*<br><br>Using a question as a prompt, students investigate an issue and express their opinions, supported by scientific knowledge and reasoning. Students communicate their findings and opinions through the creation of an essay, supported by a range of visual representations. | Teachers design learning activities that provide students with opportunities to conduct their own research by:<br><br>• finding out how science is used in the technologies, and explaining their findings using scientific concepts and terminology<br>• preparing appropriate visual material to support their explanation<br>• evaluating the benefits and limitations of the scientific technology involved in the issue<br>• finding out and explaining how science is applied to resolve this issue<br>• exploring the influence of at least two societal factors on the application of science in this context<br>• using an appropriate range of sources and compiling a bibliography including in-text references. |
| *"What is happening to the ozone layer?"*<br><br>Students write an essay focusing on the effect of chlorofluorocarbons (CFCs) on the ozone layer. | Teachers design learning activities that provide students with opportunities to take part in a focused discussion on the effects of CFCs on the ozone layer and then conduct research, using a range of resources, which enables them to:<br><br>• appreciate that ozone depletion is a consequence of our modern living<br>• use scientific terms and concepts to explain the effect of CFCs (and other atmospheric gases) on ozone<br>• explain how sciences and/or technology are applied in this situation<br>• explore the influence of at least two societal factors on ozone depletion<br>• explain how technology is the cause but also the solution to this problem<br>• use correct chemical symbols and construct diagrams, graphs, maps and charts<br>• acknowledge all sources of information accurately using in-text references and a bibliography. |
| **Objective C** | |
| *"Does the use of mobile phones pose health risks?"*<br><br>Students express an informed opinion by answering a series of structured questions that guide them into identifying scientific information and assessing its credibility, allowing them to demonstrate their knowledge, skills and attitudes. | Teachers design learning activities that allow students to:<br><br>• collect articles presented in the media (Internet, newspapers, magazines) about mobile phones<br>• identify the scientific information contained in each article<br>• discuss, analyse and evaluate each component of scientific information<br>• assess the credibility of their sources based on their scientific understanding of the issues<br>• demonstrate the ability to transfer knowledge from one situation to another. |

| **Objectives D, E and F** | |
|---|---|
| *Investigations*<br>Students produce a written laboratory report of their investigations into:<br>• determining the best material to keep a liquid hot<br>• exploring the threshold of taste<br>• determining the factors that affect the solubility of an organic liquid<br>• comparing the elasticity of different types of plastic bags<br>• comparing the efficiency of a ball's bounce. | Teachers design learning activities that provide students with opportunities to carry out investigations by:<br>• writing a research question<br>• identifying the experimental variables and a suitable number of controlled variables<br>• making a hypothesis and supporting it with a logical scientific explanation<br>• designing an experiment using appropriate equipment<br>• identifying the data to be collected and how it is to be recorded and analysed<br>• writing an evaluation of their method by commenting on its validity in relation to the hypothesis, citing improvements and discussing the reliability of the data<br>• recording data in a table to an appropriate degree of accuracy by recognizing the levels of precision offered by their equipment<br>• transforming numerical data into a graph, histogram or pie chart<br>• explaining patterns in their data using scientific reasoning<br>• drawing a conclusion with reference to the data. |
| **Objective F** | |
| *Attitudes and behaviour*<br>Students are assessed according to their ability to:<br>• take into account their own safety and that of others<br>• work cooperatively in different groups<br>• clean up their space in the laboratory<br>• select appropriate apparatus<br>• set up apparatus correctly<br>• use and dispose of chemicals responsibly<br>• share data with partners or their group<br>• take responsibility for sharing work equally for a given task. | Teachers design learning activities that provide students with opportunities to:<br>• confront issues of safety<br>• work in different groups<br>• look after their space in the laboratory<br>• select, set up and use apparatus safely and responsibly<br>• use chemicals safely and responsibly<br>• collect data<br>• share out work for a given task. |