MYP Sciences

A companion manual to support Principles to Practice and the Subject Guide

Langford World Middle School

This guide was inspired by the Middle Years Program at Millbrook High School in Raleigh, North Carolina. Thank you!

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Conceptual Understanding

A concept is a "big idea"—a principle or notion that is enduring, the significance of which goes beyond particular origins, subject matter or a place in time. Concepts represent the vehicle for students' inquiry into the issues and ideas of personal, local and global significance, providing the means by which they can explore the essence of mathematics. Concepts have an important place in the structure of knowledge that requires students and teachers to think with increasing complexity as they organize and relate facts and topics. Concepts express understanding that students take with them into lifelong adventures of learning. They help students to develop principles, generalizations and theories. Students use conceptual understanding as they solve problems, analyse issues and evaluate decisions that can have an impact on themselves, their communities and the wider world.

In the MYP, conceptual understanding is framed by prescribed key and related concepts. Teachers must use these concepts to develop the curriculum.

KEY CONCEPTS

Key concepts promote interdisciplinary understanding. They represent big ideas that are both within and across disciplines and subjects.

The MYP has chosen 16 key concepts to be explored across all subjects, but 4 have been identified as the framework for mathematics. As your focus for the year, these concepts will inform units of work and help to organize teaching and learning. Unit of study will focus on one to two key concepts and each concept should be addressed at least once in the duration of the course.

Aesthetics	**Change**	Communication	Communities
Connections	Creativity	Culture	Development
Form	Global Interactions	Identity	Logic
Perspective	**Relationships**	**Systems**	Time, Place, & Space

Change

Change is a conversion/shift/movement from one state to another. Exploring change allows students to examine forces that shape the world: past, present and future. Inquiry into the concept of change invites students to consider causes, processes and consequences: natural and artificial, intentional and unintentional, positive and negative.

In sciences, change is viewed as the difference in a system's state when observed at different times. This change could be qualitative (such as differences in structure, behaviour, or level) or quantitative (such as a numerical variable or a rate). Change can be irreversible, reversible or self-perpetuating.

Relationships
Relationships allow students to identify and understand the connections and associations between properties, forces, objects, people and ideas, including the human community's connection with the worlds in which we live. Any change in relationship brings consequences—some of which may occur on a small scale, while others may be far reaching, affecting large systems like human societies and the planet as a whole.
Relationships in sciences indicate the connections found among variables through observation or experimentation. These relationships also can be tested through experimentation. Scientists often search for the connections between form and function. Modelling is also used to represent relationships where factors such as scale, volume of data, or time make other methods impractical.

Systems
Systems are sets of interacting or interdependent components. Everything in the known universe is a component of a system and generally also a part of multiple interacting and interdependent systems. Systems provide structure and order in both natural and human environments. Dynamic and complex in nature, systems rely on a state of equilibrium and are very vulnerable to change.
Systems in sciences describe sets of components that function due to their interdependence or complementary nature. Common systems in science are closed systems, where resources are not removed or replaced, and open systems, where necessary resources are renewed regularly. Modelling often uses closed systems to simplify or limit variables.
Other key concepts can also be important in sciences. For example, development is an important aspect in the continual growth through change that epitomizes scientific knowledge. Science offers important perspectives on the definition, measurement and meaning of time, place and space. Creativity is always important for scientists working together to extend the limits of human understanding.

RELATED CONCEPTS

Related concepts promote deep learning. They are grounded in specific disciplines and are useful for exploring key concepts in greater detail. Inquiry into related concepts helps students develop more complex and sophisticated conceptual understanding. Related concepts may arise from the subject matter of a unit or the craft of a subject—its features and processes.

Balance (biology specific)	The dynamic equilibrium that exists among members of a stable natural community; the regulation of the internal environment of an organism.
Balance (chemistry specific)	A state of equilibrium or stable distribution.
Conditions (chemistry specific)	The environment, both physical and chemical, of a reaction or process; factors which contribute to an interaction including temperature, pressure, concentration, pH and the absence or presence of a catalyst.
Consequences	The observable or quantifiable effects, results, or outcomes correlated with an earlier event or events.
Development (physics specific)	The process of applying theory to data and observations in order to improve, progress, or further scientific understanding.
Energy	The capacity of an object to do work or transfer heat.
Environment (biology specific)	All of the biotic and abiotic factors that act on an organism, population or community and influence its survival, evolution and development.
Environment (physics specific)	A description of the universe or a closed system through the application of the laws of physics; the complex of physical conditions or climate affecting a habitat or community.
Evidence	Support for a proposition derived from observation and interpretation of data.
Form	The features of an object that can be observed, identified, described, classified and categorized.
Function	A purpose, a role or a way of behaving that can be investigated; a mathematical relationship between variables.
Interaction	The effect or effects two or more systems, bodies, substances or organisms have on one another, so that the overall result is not simply the sum of the separate effects.

Models	Representations used for testing scientific theories or proposals that can be accurately repeated and validated; simulations used for explaining or predicting processes which may not be observable or to understand the dynamics of multiple underlying phenomena of a complex system.
Movement	The act, process, or result of displacing from one location or position to another within a defined frame of reference.
Patters	The distribution of variables in time or space; sequences of events or features.
Transfer (chemistry specific)	The net movement of matter or particles from one location to another.
Transformation (biology specific	Differentiation of a cell; change of energy form, including at a molecular level; alteration of molecules and metabolism and/or genetic make-up of an organism or species and consequently a community, relative to external factors.
Transformation (physics specific)	A change from one well-defined state to another well-defined state; an alteration in form or condition, including energy and particle nature.

Global Contexts

Global contexts direct learning towards independent and shared inquiry into our common humanity and shared guardianship of the planet. Using the world as the broadest context for learning, MYP mathematics can develop meaningful explorations. Many inquiries into mathematics concepts naturally focus on scientific and technical innovation. However, courses in this subject group should, over time, offer students multiple opportunities to explore all MYP global contexts in relationship to the aims and objectives of the subject group.

MYP Global Contexts		
identities and relationships *Who am I? Who are we?*	Students will explore identity; beliefs and values; personal, physical, mental, social and spiritual health; human relationships including families, friends, communities and cultures; what it means to be human.	Possible explorations to develop: • competition and cooperation; teams, affiliation and leadership • identity formation, self-esteem, status, roles and role models • personal efficacy and agency; attitudes, motivations, independence; happiness and the good life • physical, psychological and social development, transitions, health and well-being, lifestyle choices • human nature and human dignity, moral reasoning and ethical judgment, consciousness and mind
orientation in time and space *What is the meaning of 'where' and 'when'?*	Students will explore personal histories; homes and journeys; turning points in humankind; discoveries; explorations and migrations of humankind; the relationships between, and the interconnectedness of, individuals and civilizations, from personal, local and global perspectives.	Possible explorations to develop: • civilizations and social histories, heritage; pilgrimage, migration, displacement and exchange • epochs, eras, turning points and 'big history' • scale, duration, frequency and variability • peoples, boundaries, exchange and interaction • natural and human landscapes and resources • evolution, constraints and adaptation
personal and cultural expression *What is the nature and purpose of creative expression?*	Students will explore the ways in which we discover and express ideas, feelings, nature, culture, beliefs and values; the ways in which we reflect on, extend and enjoy our creativity; our appreciation of the aesthetic.	Possible explorations to develop: • artistry, craft, creation, beauty • products, systems and institutions • social constructions of reality; philosophies and ways of life; belief systems; ritual and play • critical literacy, languages and linguistic systems; histories of ideas, fields and disciplines; analysis and argument • metacognition and abstract thinking • entrepreneurship, practice and competency

MYP Global Contexts		
scientific and technical innovation *How do we understand the worlds in which we live?*	Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	Possible explorations to develop: • systems, models, methods; products, processes and solutions • adaptation, ingenuity and progress • opportunity, risk, consequences and responsibility • modernization, industrialization and engineering • digital life, virtual environments and the information age • the biological revolution • mathematical puzzles, principles and discoveries
globalization and sustainability *How is everything connected?*	Students will explore the interconnectedness of human-made systems and communities; the relationship between local and global processes; how local experiences mediate the global; reflect on the opportunities and tensions provided by world-interconnectedness; the impact of decision-making on humankind and the environment.	Possible explorations to develop: • markets, commodities and commercialization • human impact on the environment • commonality, diversity and interconnection • consumption, conservation, natural resources and public goods • population and demography • urban planning, strategy and infrastructure
fairness and development *What are the consequen-ces of our common humanity?*	Students will explore rights and responsibilities; the relationship between communities; sharing finite resources with other people and with other living things; access to equal opportunities; peace and conflict resolution.	Possible explorations to develop: • democracy, politics, government and civil society • inequality, difference and inclusion • human capability and development ; social entrepreneurs • rights, law, civic responsibility and the public sphere • justice, peace and conflict management • power and privilege • authority , security and freedom • imagining a hopeful future

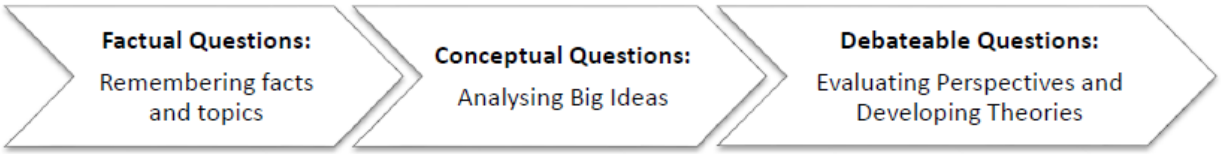
Teaching and Learning Through Inquiry

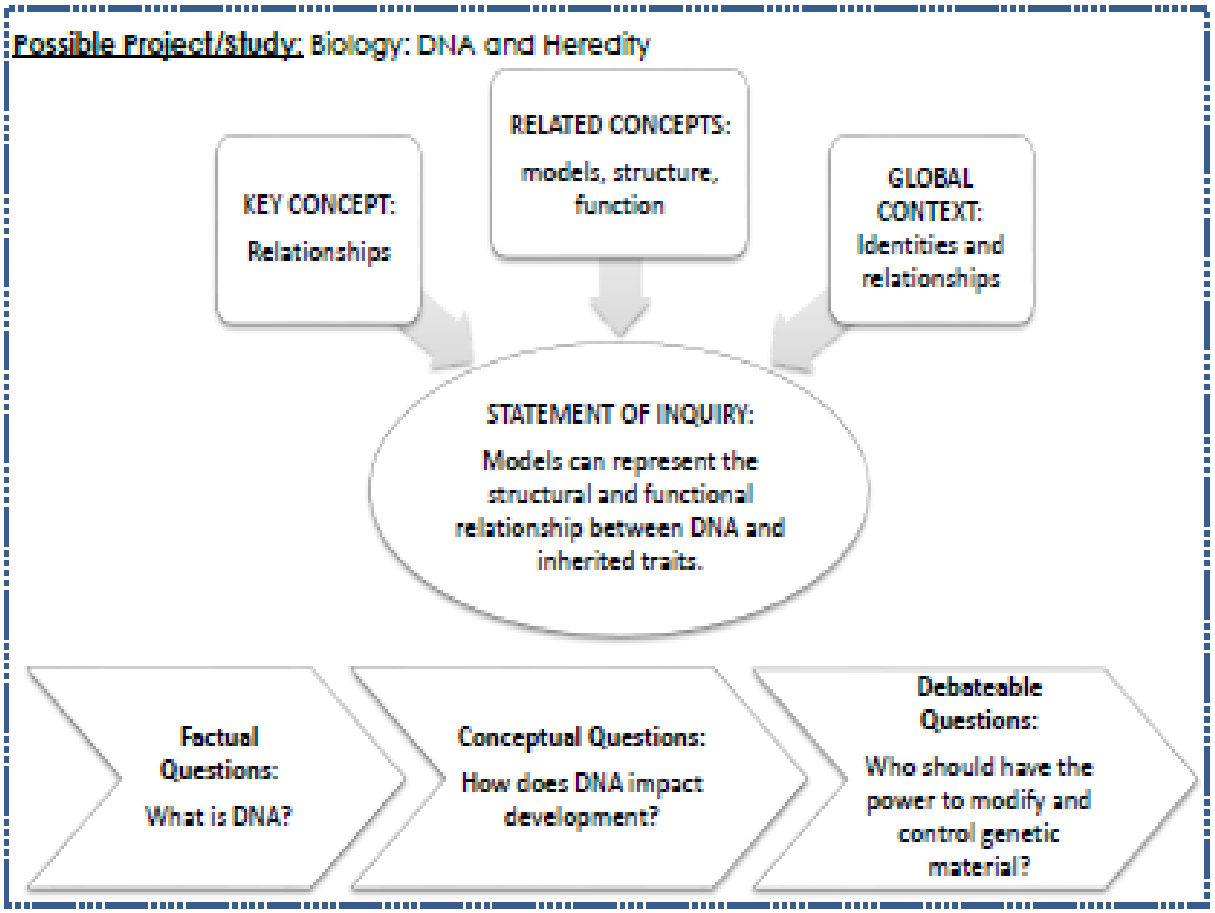
Statements of Inquiry

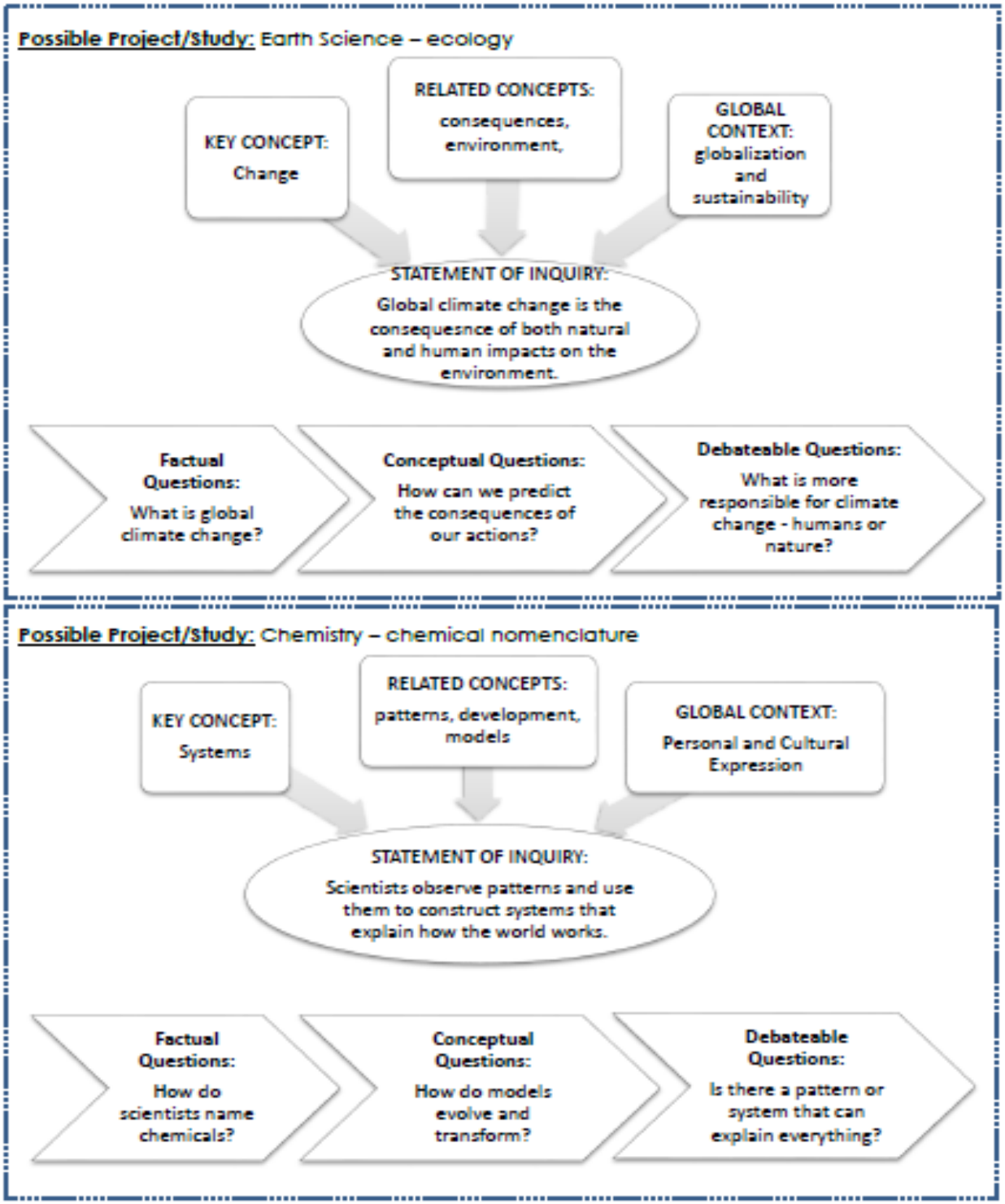
A statement of inquiry sets conceptual understanding in a global context in order to frame classroom inquiry and direct purposeful learning.

Inquiry Questions

Teachers and students use statements of inquiry to help them identify factual, conceptual and debatable inquiry questions. Inquiry questions give direction to teaching and learning, and they help to organize and sequence learning experiences.






Possible Project/Study: Earth Science – ecology
KEY CONCEPT:
Change
RELATED CONCEPTS:
consequences, environment,
GLOBAL CONTEXT:
globalization and sustainability
STATEMENT OF INQUIRY:
Global climate change is the consequesnce of both natural and human impacts on the environment.
Factual Questions:
What is global climate change?
Conceptual Questions:
How can we predict the consequences of our actions?
Debateable Questions:
What is more responsible for climate change - humans or nature?
Possible Project/Study: Chemistry – chemical nomenclature
KEY CONCEPT:
Systems
RELATED CONCEPTS:
patterns, development, models
GLOBAL CONTEXT:
Personal and Cultural Expression
STATEMENT OF INQUIRY:
Scientists observe patterns and use them to construct systems that explain how the world works.
Factual Questions:
How do scientists name chemicals?
Conceptual Questions:
How do models evolve and transform?
Debateable Questions:
Is there a pattern or system that can explain everything?

Sciences Learning Objectives

The objectives of any MYP subject state the specific targets that are set for learning in the subject. They define what the student will be able to accomplish as a result of studying the subject.
The objectives of MYP sciences encompass the factual, conceptual, procedural and metacognitive dimensions of knowledge.
Each objective is elaborated by a number of strands; a strand is an aspect or indicator of the learning expectation.
Together these objectives reflect the holistic nature of science and the real-world work of scientists. They enable students to engage with all aspects of science, either through individual objectives or connected processes.

Subject groups must address all strands of all four objectives at least twice in each year of the MYP.

In order to keep track of the standards used in each unit and the number of times it has been used, teachers/PLTs may want to develop a system or check list. Below is an example.

OBJECTIVE	STRAND	UNIT WHERE IT IS ASSESSED		
Knowing and understanding	1			
	2			
	3			
	4			

Objective A. Knowing and understanding

Students develop scientific knowledge (facts, ideas, concepts, processes, laws, principles, models and theories) and apply it to solve problems and express scientifically supported judgments.

Assessment of this objective must be done using tests or exams. To reach the highest level students must make scientifically supported judgments about the validity and/or quality of the information presented to them. Assessment tasks could include questions dealing with "scientific claims" presented in media articles, or the results and conclusions from experiments carried out by others, or any question that challenges students to analyse and examine the information and allows them to outline arguments about its validity and/or quality using their knowledge and understanding of science.

In order to reach the aims of sciences, students should be able to:

i. explain scientific knowledge

ii. apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations

iii. analyse and evaluate information to make scientifically supported judgments.

Achvmnt Level	Level Descriptor
0	The student **does not** reach a standard described by any of the descriptors below.
1-2	The student is able to: i. **state** scientific knowledge ii. apply scientific knowledge and understanding to **suggest solutions** to problems set in **familiar situations** iii. **interpret** information to make **judgments**.
3-4	The student is able to: i. **outline** scientific knowledge ii. apply scientific knowledge and understanding to **solve problems** set in **familiar situations** iii. **interpret** information to make **scientifically supported judgments**.
5-6	The student is able to: i. **describe** scientific knowledge ii. apply scientific knowledge and understanding to **solve problems** set in **familiar situations** and **suggest solutions** to problems set in **unfamiliar situations** iii. **analyse** information to make **scientifically supported judgments**.
7-8	The student is able to: i. **explain** scientific knowledge ii. apply scientific knowledge and understanding to **solve problems** set in **familiar and unfamiliar situations** iii. **analyse** and **evaluate** information to make **scientifically supported judgments**.

Objective B. Inquiring and Designing

Intellectual and practical skills are developed through designing, analysing and performing scientific investigations. Although the scientific method involves a wide variety of approaches, the MYP emphasizes experimental work and scientific inquiry.

When students design a scientific investigation they should develop a method that will allow them to collect sufficient data so that the problem or question can be answered. To enable students to design scientific investigations independently, teachers must provide an open-ended problem to investigate. An open-ended problem is one that has several independent variables appropriate for the investigation and has sufficient scope to identify both independent and controlled variables. In order to achieve the highest level for the strand in which students are asked to design a logical, complete and safe method, the student would include only the relevant information, correctly sequenced.

In order to reach the aims of sciences, students should be able to:

i. explain a problem or question to be tested by a scientific investigation
ii. formulate a testable hypothesis and explain it using scientific reasoning
iii. explain how to manipulate the variables, and explain how data will be collected
iv. design scientific investigations.

Achvmnt Level	Level Descriptor
0	The student **does not** reach a standard described by any of the descriptors below.
1-2	The student is able to: i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable hypothesis iii. **outline** the variables iv. **design** a method, **with limited success.**
3-4	The student is able to: i. **outline** a problem or question to be tested by a scientific investigation ii. **formulate** a testable hypothesis **using scientific reasoning** iii. **outline** how to manipulate the variables, and **outline** how **relevant data** will be collected iv. design a **safe method** in which he or she **selects materials and equipment**.
5-6	The student is able to: i. **describe** a problem or question to be tested by a scientific investigation ii. **formulate and explain** a testable hypothesis **using scientific reasoning** iii. **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected iv. design a **complete and safe method** in which he or she selects **appropriate materials and equipment**.
7-8	The student is able to: i. **explain** a problem or question to be tested by a scientific investigation ii. **formulate and explain** a testable hypothesis **using correct scientific reasoning** iii. **explain** how to manipulate the variables, and **explain** how **sufficient, relevant data** will be collected iv. **design** a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment**.

Objective C: Processing and Evaluating

Students collect, process and interpret qualitative and/or quantitative data, and explain conclusions that have been appropriately reached. MYP sciences helps students to develop analytical thinking skills, which they can use to evaluate the method and discuss possible improvements or extensions.

In order to reach the aims of sciences, students should be able to:

i. present collected and transformed data
ii. interpret data and explain results using scientific reasoning
iii. evaluate the validity of a hypothesis based on the outcome of the scientific investigation
iv. evaluate the validity of the method
v. explain improvements or extensions to the method.

Achvmnt Level	Level Descriptor
0	The student **does not** reach a standard described by any of the descriptors below.
1-2	The student is able to: i. **collect and present** data in numerical and/or visual forms ii. **interpret** data iii. **state** the validity of a hypothesis based on the outcome of a scientific investigation iv. **state** the validity of the method based on the outcome of a scientific investigation v. **state** improvements or extensions to the method.
3-4	The student is able to: i. **correctly collect and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results iii. **outline** the validity of a hypothesis based on the outcome of a scientific investigation iv. **outline** the validity of the method based on the outcome of a scientific investigation v. **outline** improvements or extensions to the method that would benefit the scientific investigation.
5-6	The student is able to: i. **correctly collect, organize and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results **using scientific reasoning** iii. **discuss** the validity of a hypothesis based on the outcome of a scientific investigation iv. **discuss** the validity of the method based on the outcome of a scientific investigation v. **describe** improvements or extensions to the method that would benefit the scientific investigation.
7-8	The student is able to: i. **correctly collect, organize, transform and present** data in numerical and/ or visual forms ii. **accurately interpret** data and **explain** results **using correct scientific reasoning** iii. **evaluate** the validity of a hypothesis based on the outcome of a scientific investigation iv. **evaluate** the validity of the method based on the outcome of a scientific investigation v. **explain** improvements or extensions to the method that would benefit the scientific investigation.

Objective D: Using language

Students gain global understanding of science by evaluating the implications of scientific developments and their applications to a specific problem or issue. Varied scientific language will be applied in order to demonstrate understanding. Students are expected to become aware of the importance of documenting the work of others when communicating in science. Students must reflect on the implications of using science, interacting with one of the following factors: moral, ethical, social, economic, political, cultural or environmental, as appropriate to the task. The student's chosen factor may be interrelated with other factors. In order to reach the aims of sciences, students should be able to:

i. explain the ways in which science is applied and used to address a specific problem or issue
ii. discuss and evaluate the various implications of the use of science and its application in solving a specific problem or issue
iii. apply scientific language effectively
iv. document the work of others and sources of information used.

Achvmnt Level	Level Descriptor
0	The student **does not** reach a standard described by any of the descriptors below.
1-2	The student is able to: i. **outline** the ways in which science is used to address a specific problem or issue ii. **outline** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **apply** scientific language to communicate understanding but does so **with limited success** iv. document sources, with **limited success**.
3-4	The student is able to: i. **summarize** the ways in which science is applied and used to address a specific problem or issue ii. **describe** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **sometimes apply** scientific language to communicate understanding iv. **sometimes** document sources correctly.
5-6	The student is able to: i. **describe** the ways in which science is applied and used to address a specific problem or issue ii. **discuss** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **usually apply** scientific language to communicate understanding clearly and precisely iv. **usually** document sources correctly.
7-8	The student is able to: i. **explain** the ways in which science is applied and used to address a specific problem or issue ii. **discuss and evaluate** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **consistently apply** scientific language to communicate understanding **clearly and precisely** iv. document sources **completely**.

Assessment in the MYP

Assessment practices in the MYP aim to
- support student learning by providing consistent feedback on the learning process
- provide opportunities for students to demonstrate transfer of skills across disciplines
- develop critical and creative thinking skills
- assign the most accurate achievement level for student performance, rather than averaging achievement levels over a given period of time
- assess student understanding at the end of a course

Choosing from a range of **assessment strategies**, teachers can devise **assessment tasks** that give students opportunities to show clearly what they can achieve in relation to the Statement of Inquiry, the MYP objectives, and state standards of the unit. Teachers will ensure that they document and record student performance using various **assessment tools**.

ASSESSMENT STRATEGIES	ASSESSMENT TASKS	ASSESSMENT TOOLS
Observation Whole class or individual; as a non-participant or while engaged **Selected Response** Asking specific or general questions to elicit responses from students **Open Ended Tasks** Provide students with a stimulus and ask students to provide an original response – presentations, diagrams **Performance** Allow students to show that they can do something with the knowledge that they have gained **Process Journals** Encourages reflection and metacognition in students; allows for communication between student and teacher **Portfolio Assessment** Collection of work that shows student mastery of content	**Composition** Musical, physical, or artistic **Creations of Solutions** In response to given problems **Essays** **Examinations** **Questionnaires** **Investigations** **Research** **Presentations** Verbal (oral or written) or graphic; uses various media	**Anecdotal Records** Brief written notes regarding whole class or individual performance **Continuums** Visual representation of students development that helps identify next stages of learning **Rubrics** Measure students' performance at a variety of levels **Examples** Using student work as concrete examples of performance at various achievement levels **Checklists** Check off when students demonstrate a particular response to a task

Developing Task Specific Rubrics

WHY?

1. Brings transparency to the assessment process for students, teachers, parents
2. Provides clear measurable evidence of learning
3. Can be used year after year
4. Can be modified as the units are revised
5. Contribute to the teacher reflections of units

HOW?

1. Study the assessment criteria; these are very vague and generalized
2. Study your assessment task
3. Redraft the level descriptors to match your specific assessment task for the unit

THINGS TO CONSIDER

1. When sharing the rubrics with students, make sure they are written in student-friendly language. Rubrics must be written so that students understand them.
2. Students should be able to accomplish the highest level of achievement. Be careful not to design assessment tasks that are impossible for students.
3. The rubrics should be standardized across the course. Teachers and students should see consistency across every section of the course.

RUBRIC EXAMPLES

The table below shows an example of a task-specific clarification for Criterion B in a thermochemistry unit.

Level	Level Descriptor	Task Specific Clarification
0	The student **does not** reach a standard described by any of the descriptors below.	You did not reach a standard described by any of the descriptors below.
1-2	The student is able to: i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable hypothesis iii. **outline** the variables iv. **design** a method, **with limited success.**	You were able to: 1. State a problem or question to be tested based on which material insulates the best. 2. Outline a testable hypothesis about which material insulates the best 3. Outline the dependent, independent and controlled variables 4. Design a method, with limited success
3-4	The student is able to: i. **outline** a problem or question to be tested by a scientific investigation ii. **formulate** a testable hypothesis **using scientific reasoning** iii. **outline** how to manipulate the variables, and **outline** how **relevant data** will be collected iv. design a **safe method** in which he or she **selects materials and equipment**.	You were able to: 1. Outline a problem or question to be tested by a scientific investigation based on which material insulates the best 2. Formulate a testable hypothesis using scientific reasoning about which material insulates the best 3. Outline how to manipulate the variables and outline how relevant the collected data will be. 4. Design a safe method in which you select materials and equipment that would b used during an insulation experiment.

Achievement Levels and Assigning Grades

Each criterion is divided into various achievement levels. The level descriptors for each band describe a range of student performance in the various strands of each objective. At the lowest levels, student achievement in each of the strands will be minimal. As the numerical levels increase, the level descriptors describe greater achievement levels in each of the strands.

When applying the assessment criteria to student performance, the teacher should determine whether the first descriptor describes the performance. If the student work exceeds the expectations of the first descriptor, the teacher should determine whether it is described by the second descriptor. This should continue until the teacher arrives at a descriptor that does not describe the student work; the work will then be described by the previous descriptor. In certain cases, it may appear that the student has not fulfilled all of the descriptors in a lower band but has fulfilled some in a higher band. In those cases, teachers must use their professional judgment in determining the descriptor that best fits the student's performance.

Conversion Chart from MYP Grade to Standard Grade

MYP Criterion/Rubric Score Range	Standard Grade
8	100%
7	94%
6	89%
5	84%
4	79%
3	74%
2	69%
1	64%
0	50% (Attempted)
0	0% (Did not attempt)

Measuring Student Growth throughout the Course

MYP assessment focuses on student understanding at the end of the course but also requires teachers to determine the most accurate demonstration of student understanding. This means recording and tracking student performance on each criterion as it is assessed for the duration of the course. Remember, subject areas must address all strands of all four assessment criteria at least twice each year. This allows students and teachers to measure growth over time.

Approaches to Learning Skills

Through approaches to learning (ATL) in IB programmes, students develop skills that have relevance across the curriculum that help them "learn how to learn". ATL skills can be learned and taught, improved with practice and developed incrementally. They provide a solid foundation for learning independently and with others. ATL skills help students prepare for, and demonstrate learning through, meaningful assessment. They provide a common language that students and teachers can use to reflect on, and articulate on, the process of learning. All MYP teachers are responsible for integrating and explicitly teaching ATL skills.

Well-designed learning engagements and assessments provide rich opportunities for students to practice and demonstrate ATL skills. Each MYP unit explicitly identifies ATL skills around which teaching and learning can focus and through which students can authentically demonstrate what they are able to do. Formative assessments provide important feedback for developing discrete skills, and many ATL skills support students as they demonstrate their achievements in summative assessments of subject group objectives.

ATL Skills Important to Sciences

Category	Skill Indicator
Thinking Skills	Interpret data gained from scientific investigations
Social Skills	Practice giving feedback on the design of an experiment
Communication Skills	Use appropriate visual representations of data based on purpose and audience
Self-Management Skills	Structure information appropriately in laboratory investigation reports
Research Skills	Make connections between scientific research and related moral, ethical, social, economic, political cultural or environmental factors

ATL Skills Demonstrated in Sciences

Approaches to learning (ATL)
Thinking (or critical thinking): Draw justifiable conclusions based on processing, interpreting and evaluating data gained from scientific investigations
Communication (or interaction): Use appropriate scientific terminology, data tables and graphs to make the meaning of your findings clear to an audience of your peers

Category	Cluster	Skills
Research	Information Literacy Skills	**Finding, interpreting, judging and creating information** • Collect, record and verify data • Access information to be informed and inform others • Make connections between various sources of information • Understand the benefits and limitations of personal sensory learning preferences when accessing, processing and recalling information • Use memory techniques to develop long-term memory • Present information in a variety of formats and platforms • Collect and analyse data to identify solutions and make informed decisions • Process data and report results • Evaluate and select information sources and digital tools based on their appropriateness to specific tasks • Understand and use technology systems • Use critical-literacy skills to analyse and interpret media communications • Understand and implement intellectual property rights • Create references and citations, use footnotes/endnotes and construct a bibliography according to recognized conventions • Identify primary and secondary sources
	Media Literacy Skills	**Interacting with media to use and create ideas and information** • Locate, organize, analyse, evaluate, synthesize and ethically use information from a variety of sources and media (including digital social media and online networks) • Demonstrate awareness of media interpretations of events and ideas (including digital social media) • Make informed choices about personal viewing experiences • Understand the impact of media representations and modes of presentation • Seek a range of perspectives from multiple and varied sources • Communicate information and ideas effectively to multiple audiences using a variety of media and formats • Compare, contrast and draw connections among (multi)media resources

Category	Cluster	Skills
Communication	Communication Skills	**Exchanging thoughts, messages and information effectively through interaction** • Give and receive meaningful feedback • Use intercultural understanding to interpret communication • Use a variety of speaking techniques to communicate with a variety of audiences • Use appropriate forms of writing for different purposes and audiences • Use a variety of media to communicate with a range of audiences • Interpret and use effectively modes of non-verbal communication • Negotiate ideas and knowledge with peers and teachers • Participate in, and contribute to, digital social media networks • Collaborate with peers and experts using a variety of digital environments and media • Share ideas with multiple audiences using a variety of digital environments and media
		Reading, writing and using language to gather and communicate information • Read critically and for comprehension • Read a variety of sources for information and for pleasure • Make inferences and draw conclusions • Use and interpret a range of discipline-specific terms and symbols • Write for different purposes • Understand and use mathematical notation • Paraphrase accurately and concisely • Preview and skim texts to build understanding • Take effective notes in class • Make effective summary notes for studying • Use a variety of organizers for academic writing tasks • Find information for disciplinary and interdisciplinary inquiries, using a variety of media • Organize and depict information logically • Structure information in summaries, essays and reports
Social	Collaboration Skills	**Working effectively with others** • Use social media networks appropriately to build and develop relationships • Practise empathy • Delegate and share responsibility for decision-making • Help others to succeed • Take responsibility for one's own actions • Manage and resolve conflict, and work collaboratively in teams • Build consensus • Make fair and equitable decisions • Listen actively to other perspectives and ideas • Negotiate effectively • Encourage others to contribute • Exercise leadership and take on a variety of roles within groups • Give and receive meaningful feedback • Advocate for one's own rights and needs

Category	Cluster	Skills
Self –Management	Organization Skills	**Managing time and tasks effectively** • Plan short- and long-term assignments; meet deadlines • Create plans to prepare for summative assessments (examinations and performances) • Keep and use a weekly planner for assignments • Set goals that are challenging and realistic • Plan strategies and take action to achieve personal and academic goals • Bring necessary equipment and supplies to class • Keep an organized and logical system of information files/notebooks • Use appropriate strategies for organizing complex information • Understand and use sensory learning preferences (learning styles) • Select and use technology effectively and productively
	Affective Skills	**Managing state of mind** • Mindfulness – Practise focus and concentration – Practise strategies to develop mental focus – Practise strategies to overcome distractions • Perseverance – Demonstrate persistence and perseverance – Practise delaying gratification • Emotional management – Practise strategies to overcome impulsiveness and anger – Practise strategies to prevent and eliminate bullying – Practise strategies to reduce stress and anxiety • Self-motivation – Practise analysing and attributing causes for failure – Practise managing self-talk – Practise positive thinking • Resilience – Practise "bouncing back" after adversity, mistakes and failures – Practise dealing with disappointment and unmet expectations – Practise dealing with change
	Reflection Skills	**(Re)considering the process of learning; choosing and using ATL skills** • Develop new skills, techniques and strategies for effective learning • Identify strengths and weaknesses of personal learning strategies • Demonstrate flexibility in the selection and use of learning strategies • Consider content (What did I learn about today? What don't I yet understand? What questions do I have now?) • Consider ATL skills development (What can I already do? How can I share my skills to help peers who need more practice? What will I work on next?) • Consider personal learning strategies (What can I do to become a more efficient and effective learner? How can I become more flexible in my choice of learning strategies? What factors are important for helping me learn well?) • Focus on the process of creating by imitating the work of others • Consider ethical, cultural and environmental implications • Keep a journal to record reflections

Category	Cluster	Skills
Thinking	Critical Thinking Skills	**Analysing and evaluating issues and ideas** • Practise observing carefully in order to recognize problems • Gather and organize relevant information to formulate an argument • Recognize unstated assumptions and bias • Interpret data • Evaluate evidence and arguments • Recognize and evaluate propositions • Draw reasonable conclusions and generalizations • Test generalizations and conclusions • Revise understanding based on new information and evidence • Evaluate and manage risk • Formulate factual, topical, conceptual and debatable questions • Consider ideas from multiple perspectives • Develop contrary or opposing arguments • Analyse complex concepts and projects into their constituent parts and synthesize them to create new understanding • Propose and evaluate a variety of solutions • Identify obstacles and challenges • Use models and simulations to explore complex systems and issues • Identify trends and forecast possibilities • Troubleshoot systems and applications
	Creative Thinking Skills	**Generating novel ideas and considering new perspectives** • Use brainstorming and visual diagrams to generate new ideas and inquiries • Consider multiple alternatives, including those that might be unlikely or impossible • Create novel solutions to authentic problems • Make unexpected or unusual connections between objects and/or ideas • Design improvements to existing machines, media and technologies • Design new machines, media and technologies • Make guesses, ask "what if" questions and generate testable hypotheses • Apply existing knowledge to generate new ideas, products or processes • Create original works and ideas; use existing works and ideas in new ways • Practise flexible thinking—develop multiple opposing, contradictory and complementary arguments • Practise visible thinking strategies and techniques • Generate metaphors and analogies
	Transfer Skills	**Using skills and knowledge in multiple contexts** • Use effective learning strategies in subject groups and disciplines • Apply skills and knowledge in unfamiliar situations • Inquire in different contexts to gain a different perspective • Compare conceptual understanding across multiple subject groups and disciplines • Make connections between subject groups and disciplines • Combine knowledge, understanding and skills to create products or solutions • Transfer current knowledge to learning of new technologies • Change the context of an inquiry to gain different perspectives

Unit Planner Guide

Unit Title	
Course/Grade Level	
Teachers	
Length of Unit	

Stage 1 Integrate statement of inquiry, global context and inquiry questions

Key Concept	Related Concepts
Choose 1 (maybe 2) from the list	Choose 2 (maybe 3) from the list.

Global Context	Choose 1 from the list provided.
Explanation for Global Context	Include any bullet points from the list that students will explore in this unit.

Statement of Inquiry
A clear concise statement that includes the Key Concept and the Related Concept with regards to the Global Context.

Inquiry Questions	
Factual	Develop a question that rooted in the content, and is at the recall/remember level. Expect students to demonstrate understanding.
Conceptual	Develop a question that requires students to analyze the new knowledge in the context of the course.
Debatable	Develop a question that requires students to apply the new knowledge in a way that reaches beyond your course and connects the concept to other disciplines. This question should connect to your Statement of Inquiry.

Assessment
What task(s) will allow students the opportunity to respond to the unit question?
What will constitute acceptable evidence of understanding? How will students show what they have understood?

Each unit must include one summative assessment that will be graded on the IB subject specific criterion rubrics that are located in your subject guide.

If you are assigning a multiple choice test, it does not meet the assessment requirement unless it is graded with the IB rubrics.

If you assign multiple summative assessments, only include the assessment evaluated with the IB rubrics on the unit planner.

Briefly describe the assessment in this box.

Which specific MYP objectives will be addressed during this unit?

Copy and paste the MYP objectives from your subject guide.

Specific objectives should be chosen from the criterion. List the specific bullet points from those criterions that the unit will address. The bullets can come from multiple criterions.

Avoid saying "Criterion A" or "Investigate" because you may not be teaching every strand of that objective.

Which MYP assessment criteria will be used?

Identify the specific criterion rubric that will be used. This should be the Criterion that has the most bullet points listed above. Here you can say "Criterion A" or "Investigate".

Stage 2 Backward planning: From the assessment to the learning activities through inquiry

Content
What knowledge and/or skills (from the course overview) are going to be used to enable the student to respond to the unit question?

What (if any) state, provincial, district, or local standards/skills are to be addressed? How can they be unpacked to develop the significant concept(s) for stage 1?

Copy and paste all Georgia Standards of Excellence (GSE) here.
In other words, all of the GSE taught during this unit.

Learning experiences	Teaching strategies
How will students know what is expected of them? Will they see examples, rubrics, templates? How will students acquire the knowledge and practise the skills required? How will they practise applying these? Do the students have enough prior knowledge? How will we know?	How will we use formative assessment to give students feedback during the unit? What different teaching methodologies will we employ? How are we differentiating teaching and learning for all? How have we made provision for those learning in a language other than their mother tongue? How have we considered those with special educational needs?
Big Ideas to cover in these boxes: Differentiation strategies, literacy instruction, 21st century skill integration, technology integration.	
Just answer the questions above.	Just answer the questions above.

Approaches to Learning		
Category	Cluster	Skill
Identify the category, cluster and the specific skills you will teach. Can be bulleted list.		
Explanation of Instruction	Explain exactly how you will teach the skills you identified.	

Learner Profile Traits Encouraged	Explanation of Inclusion
Choose from the list.	Explain how this will be a part of the instruction.

Resources
What resources are available to us?
How will our classroom environment, local environment and/or the community be used to facilitate students' experiences during the unit?

Be very specific when listing materials.

Imagine someone from another country reading your unit planner, how would they identify the resources that you have listed?

Include titles of books, textbooks, videos, etc.

Ongoing reflections and evaluation

In keeping an ongoing record, consider the following questions.

Students and teachers
What did we find compelling? Were our disciplinary knowledge/skills challenged in any way?
What inquiries arose during the learning? What, if any, extension activities arose?
How did we reflect—both on the unit and on our own learning?

Possible connections
How successful was the collaboration with other teachers within my subject group and from other subject groups?
What interdisciplinary understandings were or could be forged through collaboration with other subjects?

Assessment
Were students able to demonstrate their learning?
How did the assessment tasks allow students to demonstrate the learning objectives identified for this unit? How did I make sure students were invited to achieve at all levels of the criteria descriptors?
Are we prepared for the next stage?

Data collection
How did we decide on the data to collect? Was it useful?

Include things to consider before the unit is taught.
What questions will students ask? What materials will I need? How can I incorporate other disciplines?

Include Post-teaching reflections. What went well? What can be improved?

As you reflect and revise unit planner, keep copies of the old unit planners as a way to measure growth and change.

IDEA– Type each reflection in different color each year.
Then the file would only be saved once, but the reflections would be easy to identify each year.