Course Overviews MYP Science, UWC Thailand 2018-2019

All units taught in grades 6 to 10 are continuously being developed and improved to best meet the needs of the students at UWCT. Therefore, the following overview is only a reflection of current plans for the course. Some changes to these course overviews may occur as a result of planning done throughout the academic year.

Grade	Unit Number and Title	Key and Related Concepts	Global Context	Statement of Inquiry	Inquiry Questions	Content (topics / knowledge/ subject specific skills)
6	Unit 1: What do Scientists do?	Relationships Evidence	Identities and relationships	To be a scientist means to gather evidence about similarity and difference in nature to understand how things are related.	**Factual**: How do Scientists behave? How is a laboratory different? What is an experiment? **Conceptual:** How are Scientific theories made? **Debatable:** Can Science tell us everything we need to know?	- identify similarities and differences between a science laboratory and other MYP classrooms - suggest and follow laboratory safety rules - identify famous scientists - describe what a scientist is - identify and suggest dependent, independent, and controlled variables - outline the scientific method - design an experiment
6	Unit 2: What Changes? (Chemistry)	Change Form, Transformation	Fairness and development	Science enables us to change the form of matter into useful materials that can make the world a better place.	**Factual**: What are things made from? How do we classify materials? How do we separate materials? What changes do we observe everyday? How do physical changes happen? How do chemical changes happen? **Conceptual:** How might physical and chemical changes help us to manipulate materials? What does purity mean in Science? **Debatable:** What are the implications of using the lifestraw as a solution to the problem of clean drinking water?	- Students will identify and outline the 3 states of matter, namely solids, liquids and gases including inter-particle forces, particle arrangement and particle motion. - Students will state how the properties of solids liquids and gases and outline how this relates to particles. - Students will outline what a mixture is. - Students will describe different ways in which mixtures can be separated and carry out such separations to include. - Students will identify and describe changes of state including what happens to inter-particle forces, particle arrangement and particle motion. - Students will differentiate between melting and dissolving. - Students will outline what a solution is. - Students will investigate factors which affect the rate of dissolving. - Students will state features of a chemical change. - Students will design a water purification system and discuss whether the lifestraw is a successful solution to the problem of widening the availability of clean drinking water.
6	Unit 3: Energy Transformations (Environmental) Unit under construction	Systems Transformation Energy	globalization and sustainability	How energy moves through various systems as it is transformed from one type into another.	**Factual:** What are the different types of energy? **Conceptual:** What is energy and how can it be wasted? **Debatable:** What compass point perspective is most important in driving climate change?	- Students will state basic forms of energy (kinetic, potential, thermal, chemical, electrical, nuclear, electromagnetic) - Students will describe how energy can change form, including loss of energy - Students will describe various pathways the sun's energy can move. - Students will outline how energy move through an ecosystem (energy/food web) - Students will interpret graphs of energy pyramids -Students will outline how human energy consumption leads to climate change. - Students will outline the effects of climate change on vulnerable populations. - Students will evaluate the social, economic and/or political factors that drive climate change.
6	Unit 4:Cells, Bacteria, and Innovations (Biology) Unit under construction	Change Related concepts: Evidence Function	scientific and technical innovation	We will inquire into scientific innovations that have used evidence about the function of cells to create (sustainable) change. Exploration: Systems, models, methods; products, processes and solutions.	**Factual:** What are the functions of organelles and cells? **Conceptual:** what is the difference between prokaryotes and eukaryotes? **Debatable:** what are the cultural, economic, environmental, ethical, moral, political, or social problems associated with the innovations studied?	*Cells* - identify that cell is the basic unit of living things - state the requirements for cells, and living things, to survive (MRS GREN) - identify and compare the general structures of prokaryotes and eukaryotes - identify, draw, and compare the general structures of animal cells and plant cells, - use a microscope to identify some structures in animal and plant cells and describe how to use a microscope - outline the function of each cell structure, - state the meaning of unicellular organism and multicellular organisms and give examples *Innovations* - describe the processes of anaerobic and aerobic respiration and how the anaerobic respiration of bacteria is used in various innovations, particularly Bokashi composting (Service link: Bokashi is made for compost club). - outline how waterborne bacteria can cause disease - describe how innovations used in large scale water purification systems and the Lifestraw can remove bacteria from drinking water - design, build, and explain my own water filter (OEE link: collect water from nearby stream) - discuss a cultural, economic, environmental, ethical, moral, political, or social problem with the Lifestraw with reference to the UN sustainability goals (criterion D) - identify various human and plant specialised cells - outline how innovations in stem cell technology offers benefits to medicine and discuss the ethical implications of stem cell research.

6	Unit 5: Simple Machines and their Forces (Physics) Unit under construction	Relationship Related concepts: Movement Consequences	scientific and technical innovation	We will inquire into the relationships and movement used in simple machines that help make work easier.	**Factual:**What are the different forces and types of machines? **Conceptual:** What is a force? **Debatable:** Is it more efficient to produce a simple machine with many steps to complete a task or put all the effort in one go?	- Students will state that forces are pushes or pulls between two objects - Students will identify forces - Students will calculate resultant force - Students will investigate the effect of friction on the mass required to move an object (Criteria C) - Students will outline the relationship between work, force, and distance (w = fd) - Students will outline the relationship between power, work and time (power = work/time) - Students will solve simple problems using force arrows to find the mechanical advantage of a levers - Students will state the six types of simple machines (inclined plane, lever, wheel and axle, pulley, wedge, screw) - Students will select simple machines that match the type of work needed - Students will summarize how simple machines give a bigger force at the expense of a smaller movement (and vice versa) - Students will design an investigation into the effect of lever length, fulcrum position, or load mass on the output of a catapult (Criteria B) - Students will design a Rube Goldberg Machine
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7	Unit 1: Urban Plant Growing - Environmental	Systems Balance Interactions	*globalization and sustainability*	We will inquire into how interactions between organisms can help to create balance in ecosystems through the context of urban plant growing schemes.	**Factual:** What benefits do plants provide in an ecosystem? What do plants need to survive? **Conceptual:** What is the plant life cycle and how do the different stages help to create balance in the ecosystem? **Debatable:**Are urban plant growing schemes effective?	- Students will describe the interdependence of organisms in an ecosystem - Students will state some benefits plants provide for other organisms in the ecosystem including at least food, habitat, and carbon dioxide removal. - Students will explain the plant life cycle and how different stages help to provide the above benefits including pollination, fertilisation, seed dispersal, germination, and photosynthesis during growth, - Students will state the basic requirements for plant growth (sunlight, water, oxygen, and basic nutrients) - Students will describe how limiting factors and optimum ranges affect plant growth - Students will apply knowledge of plants to investigate how we can manipulate plant growth in an urban context.
7	Unit 2: Elements, Compounds, Mixture - Chemistry	Form Change consequences	Globalization and sustainability	We will inquire into substances changing form at the atomic and molecular level, and the consequences of industrial practices in making these substances.	**Factual:** What is the structure of an atom? **Conceptual**: How has our understanding of the atom changed over time? **Debatable:** Are discoveries in nuclear science a blessing or a curse?	- Students will recall the names and symbols of key elements - Students will describe what elements are and how we represent them by symbols - Students will describe the parts of an atom using Bohr's model -Students will state the meaning of nuclear fissure and that it releases energy - Students will discuss whether the use of nuclear power is justified - Students will state the properties of metals and non-metals - Students will outline the difference between elements, compounds, and mixtures - Students will recall that many everyday substances are mixtures - Students will explain the differences between mixtures and compounds
7	Unit 3: Body Systems	Systems Related concepts: Form Function	*identities and relationships*	We will inquire into who we are by looking at how the form of our body systems and the relationships between them are connected to their functions for life.	**Factual:** What are the structures and functions of the major body systems? **Conceptual:** What are the relationships between different body systems? **Debatable:** Does our body shape our identity?	- Students will explain how the major body systems and their functions interact to support life (digestive, respiratory, circulatory) - Students will describe the structure and function of the digestive system, including enzymes - Students will describe the structure and function of the respiratory system, including gas exchange and breathing - Students will describe the structure and function of the muscular system, including movement and antagonistic muscles - Students will describe the structure and function of the circulatory system, including vessels, blood cells, plasma and platelets in, spinal cord, sensory receptors and motor neurons (simple reflex arc) - Students will research the impact of mindfulness practices on their bodies. - Students will describe a disease of one of the systems studied and discuss whether or how it affects identity.
7	Unit 4: Electricity and Magnetism -Physics	Relationships Balance Energy	*scientific and technical innovation*	We will inquire into how the balanced relationship between electrical energy and magnetism has led to useful inventions.	**Factual**: What is electricity? What is a magnetic field? **Conceptual**: What is the relationship between electricity and magnetism? How does energy move through a circuit? **Debatable**: To what extent are hydroelectric dams a good thing?	- Students will describe the effects of a magnet and define a magnetic field - Students will recall the difference between insulating and conducting materials with examples. - Students will state that electrical current is a flow of charged particles, measured in amperes - Students will state that electrical voltage is the difference in the potential energy of electrons between 2 points in a circuit, measured in volts. - Students will describe how static electricity forms from the transfer of electrons - Students will state that “electrical energy” may mean energy stored in a battery or energy transmitted by electric currents. -Students will recall that electric, and magnetic forces between a pair of objects do not require that the objects be in contact. -Students will outline the differences between a parallel and series circuit. -Students will suggest how to wire a model of a house using parallel and series circuits. - Students will describe electromagnetism and design an investigation into the factors which affect it (criterion B) - Students will describe how energy is generated by a turbine and dynamo

						- Students will distinguish between renewable and non-renewable energy sources used to drive a turbine - Students will evaluate the use of hydroelectric dams (criterion D)
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8	Unit 1. Disease and Epidemics	Change Patterns Interaction	Orientation in Space and Time	We will inquire into how interactions between different factors changes patterns in the context of disease distribution in different places.	**Factual:** How do viruses and bacteria cause disease? How does our immune system fight those viruses? How do diseases spread? **Conceptual:** How can our understanding of epidemiology help to protect us from diseases? **Debatable: I**n relation to a particular disease, which compass factor is most important in explaining its development and spread?	- Students will outline how bacteria, viruses, protoctista, and fungi can cause infectious disease in animals and plants - Students will explain how infectious diseases are spread - Students will interpret maps and data of infectious diseases - Students will explain the role of the immune system in the human body in defence against disease (to include the 1st, 2nd, and 3rd lines of defence) - Students will describe the use of vaccines and medicines in the prevention and treatment of disease - Students will suggest how the spread of infectious diseases may be reduced or prevented - Students will consider how different compass factors contribute to the spread of disease
8	Unit 2. Materials	Relationship Transformation and Function	Scientific and Technical Innovation	We will inquire into how technical innovations in materials have created new functions through transforming relationships at the molecular level.	**Factual:** What type of smart materials are being used and for what purposes? **Conceptual:** How do intermolecular forces or molecular arrangements affect the properties of the materials studied? **Debatable:** Is the development of new materials happening too fast? Should we be more reflective on advancement?	*Polymers* -Students will describe the process of polymerization and the structure of a polymer. -Students will be able to name a polymer when given the monomer (and vice versa) -Students will be able to draw the display formula of a polymer when given the monomer (and vice versa) - Recognise that plastics have a wide array of different properties and that their properties depend on their molecular structure. - Students will explain the properties of Kevlar® and give examples of its use. -Students will explain the properties of Lycra® and give examples of its use. -Students will discuss the controversy caused by the recent developments in polyurethane swimsuits. - Students will explain the properties of Gore-tex®, Thinsulate®, carbon fibre, Teflon® and give examples of their use. -Students will discuss the role of chance in the discoveries of some of these polymers. *Colloids* - Students will state the definition for the term colloid. -Students will explain what is meant by the term emulsion and give uses in household situations. -Students will explain how the distinctive nature of an emulsifying molecule leads to its properties. *Smart materials (many of which are polymers, hydrogels are also colloids)* -Students will state the definition of the term smart material and give some examples. -Students will explain how hydrogels can change their shapes and why they are used in hair gels and baby nappies. -Students will explain how shrink-wrap works.
8	Unit 3. Human impact on the atmosphere and local water.	Communities Related concepts: Consequences and Evidence	Globalization and sustainability	We will inquire into what the consequences of globalization are on water and atmosphere in our local community from the evidence gathered.	**Factual:** What are the indicators that can be used to measure water quality? **Conceptual:**How does global human action relate to the atmosphere and local water quality? **Debatable:** Should humans change their behaviour toward the environment ?	- Students will describe various indicators of water quality (nitrate, phosphate, pH, dissolved oxygen, biochemical oxygen demand, temperature, turbidity) - Students will state the various sources of pollution (household, agricultural, industrial, contamination, heat) - Students will interpret data about water quality indicators and maps - Students will describe both positive and negative human interactions with ecosystems and their impact on biodiversity - Students will document and present how the local community is impacting a local stream/river Students will describe the historical formation and function of the atmosphere. Students will describe how the combustion of fossil fuels and deforestation leads to increased levels of CO_2 in the atmosphere. Students will state how their different activities and lifestyle choices can be directly or indirectly linked to greenhouse gas production or deforestation, including choices around transport, diet, and electricity use. Students will describe how CO_2 and other greenhouse gases cause global warming. Students will identify causes of ozone depletion. Students will describe the ozone cycle and how CFCs disrupt this, leading to ozone depletion. Students will be able to differentiate between global warming and ozone depletion. Students will describe the effects of ozone depletion and global warming. Students will analyse data pertaining to ozone depletion and global warming.
8	Unit 4: Waves	Systems Movement and Energy	Fairness and Development	We will inquire into how musical instruments are systems that harness wave energy and movement to create sounds. We will inquire into how mobile phone systems	**Factual:** What models help to understand energy transfer through waves? **Conceptual:** How can the properties of sound waves help to understand pitch, loudness, and speed of the waves?	*General wave properties* - Students will use a describe a simple model to represent energy transfer through waves (transverse and longitudinal) - Students will describe a wave using wavelength, frequency, amplitude, period, and speed

				harness energy from EM waves to allow communication.	**Debatable:** From a mindful perspective, are smartphones harmful?	- Students will calculate wave speed, frequency, and wavelength using v = f × λ , including interpreting graphs. *Sound* - Students will describe how sound transfers energy as a wave of compressions created by objects vibrating -Students will describe how sound intensity in dB relates to energy transfer -Students will describe how pitch relates to the frequency of sound waves -Students will describe how loudness relates to the amplitude of sound waves - Student will interpret representations of sound waves on an oscilloscope to explain and quantify loudness and pitch -Students will explain how sound waves from musical instruments are caused by vibration and standing waves - Students will explain how to adjust the pitch of a string instrument with reference to string density, wavelength, and tension -Students will explain using ideas about sound waves, why different musical instruments sound different even when playing the same notes - Students will build a musical instrument and describe how it functions. *Phones* -Students will describe the electromagnetic spectrum -Students will describe how mobile phone use EM waves to send and receive signals -Students will describe factors that affect mobile phone signal (including 3/4G and wifi), including the concepts of diffraction and line of sight. -Students will describe why the microwave radiation used in mobile phones does not cook one's brain. -Students will evaluate the impacts of smartphone use on mental well being.
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9	Unit 1: Population Dynamics	System Pattern Evidence	orientation in space and time	How populations change over time through collecting evidence and analyzing data for patterns in the system.	**Factual:** With the data collected, which statistical test should be used? **Conceptual:**How can many different selective pressures affect the growth of populations? **Conceptual:** How can the understanding of patterns in populations, help conservationists to protect species? **Debatable:** Can results be effectively analyzed without statistical analysis?	- Students will interpret data using measures of central tendency (mean, median, mode, range) - Students will apply various sampling techniques to collect data on population size - Students will explain how sample size impacts the sampling techniques - Students will solve for standard deviation - Students will apply various statistical tests support their conclusions (t-test, chi-squared) - Students will describe carrying capacity, and sigmoid growth curves - Students will describe factors that affect population size (predation, birth rate, death rate, disease)
9	Unit 2: Bonding and Balanced Equations	Relationships Balance	globalization and sustainability	We will inquire into how we use models to show balanced chemical relationships.	**Factual:** How do chemical elements/compounds form and interact? **Conceptual:**How does the law of conservation of matter help us understand why reactions must be balanced? **Conceptual:** After learning about chemical bonds, how can students design and explain a chemical reaction? **Conceptual:** How can different chemical tests be used to identify unknowns? **Debatable:** Are balanced equations truly balanced or do we live in a state of flux?	Students will explain what happens in terms of electron transfer when a metal atom reacts with a non-metal atom to form an ionic compound. -Students will explain the difference between an atom and its ion -Students will apply how to write formula by the use of the charges on ions. -Students will apply how to name a compound from it formula - Students will be able to explain what happens in terms of electron transfer when two non-metals react together. - Students will be be able to draw Bohr models for the first 20 elements of the periodic table. - Students will be able to draw lewis structures for simple ionic and covalent structures. - Students will be able to balance equations. -Students will explain why some ionic substances are soluble while others are insoluble (hence form precipitates) -Students will describe how we test for (i) metal ions using flame tests and their reactions with sodium hydroxide, (ii) halide ions using the silver nitrate test, (iii) sulfate ions using the barium chloride test and (iii) carbonate ions using their reaction with acids and the carbon dioxide test. Write word and balanced symbol equations for these tests. - Students will describe the mole concept. - Students will be able to identify how many atoms of each type of element are present in a molecule. - Students will be able to calculate relative molecular mass Students will be able to use the equation n=M/m - Students will apply principles of stoichiometry to calculate reacting masses.
9	Unit 3: Reproductive Health	Relationships Consequences	Identities and Relationships	We will inquire into how to make our own healthy choices, and support others, in matters of reproductive health.	**Factual:** What is the importance of having one sexual gamete small and mobile while the other is larger and immobile? **Conceptual:** How do the hormones in the menstrual cycle fluctuate to drive the female reproductive system? **Conceptual:** How can students make better choices from learning about their own biology?	- Students will recall the structure and function of the male and female reproductive systems - Students will explain the menstrual cycle including hormones - Students will discuss various methods of birth control methods - Students will describe common STDs and how to prevent them - Students will discuss at least one current issue related to reproductive health (women's rights, access to prenatal care, gender bias, etc) - homeostasis -Osmosis diffusion - mitosis review

					Debatable: Debatable Will the enhancement of women in the world bring about positive global change?	Meiosis - Hormones
9	Unit 4: Automated House Circuits	Change Interaction and Function	Scientific and Technical Innovation	We will inquire into how innovations in circuit function have changed our interactions with our surroundings. (open source innovations)	**Factual:** How do circuits work to allow currents to travel through? **Conceptual:** How can models of circuits guide students to build their own Arduino Circuits? **Debatable:** Is there a way that nanoelectronics will be the future of circuits in the next decade?	Students will explain and algebraically manipulate the equation V=IR to describe electrical circuits - I can describe what the equation R=V/I defines regarding electrical circuits - I know what R stands for when discussing electrical circuits - I can describe what the equation I=V/R defines regarding electrical circuits - I know what I stands for when discussing electrical circuits - I can describe what the equation V=IR defines regarding electrical circuits - I know what V stands for when discussing electrical circuits Students will solve for V, I, and R in a circuit - I can use algebra to solve for a missing part of the equation if I have two of the three parts of the equation Students will explain what electrical current is, and how we measure it (including units) - I can describe what electrical current is - I can explain how electrical current works and factors that affect it - I can describe how we measure electrical current, including the proper tools - I can state the unit used to measure electrical current Students will explain what potential difference is, and how we measure it (including units) - I can describe what potential difference is - I can explain how potential difference works and factors that affect it - I can describe how we measure potential difference, including the proper tools - I can state the unit used to measure potential difference Students will explain what electrical resistance is, and how we measure it (including units) - I can describe what electrical resistance is - I can explain how electrical resistance works and factors that affect it - I can describe how we measure electrical resistance, including the proper tools - I can state the unit used to measure electrical resistance Students will present circuit diagrams including switches, power source, and resistors - I can outline the symbols used to represent the parts of a circuit in a circuit diagram (power cell, wire, resistor, switches, lights, etc) - I can outline a circuit by drawing a proper circuit diagram (not a picture) - I can explain a circuit by drawing a proper circuit diagram and labelling the appropriate resistances, currents, and potential differences at each component Students will solve for the amount of power transferred in any circuit device - I can define power - I can solve for the amount of power transferred in circuit device Students will apply their knowledge of circuits to create Arduino circuits - I can describe what an Arduino is - I can outline possible inputs for an Arduino - I can outline possible outputs for an Arduino - I can calculate the appropriate current needed for a given resistance in order to know how to wire an Arduino circuit - I can load the appropriate code onto an Arduino - I can create a working prototype of a circuit using a breadboard - I can explain my design using a circuit diagram and appropriate calculations Thermal Concepts - heat vs temperature - Kinetic energy review = E = 1/2mv^2 - temperature - in terms of average kinetic energy - states of matter - changing state - evaporation - heat transfers - specific heat capacity Q = mCΔT - latent heat Q = mL

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10	1: Genetics	Change Form and Function	Identities and Relationships	We will inquire into how changes in DNA may alter the form and function of who we are.	**Factual:** Who were the scientists that have contributed to the modern understanding of DNA and to the ability to manipulate genes? **Conceptual:** How does DNA replicate and how does DNA work with RNA in protein synthesis?	Students will describe DNA as a polymer made up of two strands forming a double helix - Students will state that DNA is made from four types of nucleotides; each nucleotide consists of a common sugar and phosphate group with one of four different bases attached to the sugar - Students will describe the genome as the entire DNA of an organism - Students will explain that the genome interacts extensively with the environment to influence the development of the

					Conceptual: How can Punnett Squares help us determine the possible offspring genotypes and phenotypes? **Debatable:** Is the use of GMO corn beneficial to feed a growing human population or are they a disaster waiting in happen?	phenotype - Students will explain the following terms: chromosome, gene, variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype - Students will explain the following terms: chromosome, gene, variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype - Students will discuss the potential importance for medicine of our increasing understanding of the human genome. - Students will recognise how the genome influences the development of an organism, to include a simple treatment of protein synthesis - Students will explain monogenic inheritance - Students will suggest the results of monogenic crosses - Students will state that most phenotypic features are the result of multifactorial rather than monogenic inheritance - Students will describe the work of Mendel in discovering the basis of genetics and recognise the difficulties of understanding inheritance before the mechanism was discovered. - Students will describe that most genetic variants have no effect on the phenotype, some variants contribute to the phenotype and, rarely, a single variant will control an aspect of the phenotype - Students will describe the impact of selective breeding on food plants and domesticated animals - Students will describe the main stages of the process of genetic engineering - Students will explain some of the possible benefits of using genetic engineering in modern agriculture and medicine - Students will discuss some of the practical and ethical issues of using genetic engineering in modern agriculture and medicine.some of the practical and ethical issues of using genetic engineering in modern agriculture and medicine.
10	2. Rates of Reaction	Change Interaction and Energy	Globalization and Sustainability	We will inquire into how we can change the rate of a reaction through manipulating molecular interactions and/or available energy, and the benefits this may have on manufacturing processes.	**Factual:** What are catalysts and how do they speed up reactions? **Conceptual:** How can the change in temperature, concentration, pressure, etc... affect the rate of reactions? **Conceptual:** How do bonds that elements create allow for particular reactions? **Debatable:** Is speed of reaction always the best indicator for industrial progress?	- Students will suggest practical methods for determining the rate of a given reaction - Students will interpret rate of reaction graphs - Students will describe the effect of changes in temperature, concentration, pressure, and surface area on rate of reaction - Students will explain the effects of changes in temperature, concentration and pressure in terms of frequency and energy of collision between particles - Students will explain the effects of changes in the size of the pieces of a reacting solid in terms of surface area to volume ratio - Students will describe the characteristics of catalysts and their effect on rates of reaction - Students will describe the role of catalysts in reactions - Students will explain catalytic action in terms of activation energy - Students will recall that enzymes act as catalysts in biological systems. - Students will recall the orbital energy levels.
10	3. Flight	Systems Balance and Movement	Scientific and Technical Innovation	We will inquire into how various flight systems have innovated to allow flight through balance and movement. Exploiting forces of physics has led to innovation/has allowed flight...	**Factual:** How can the understanding of Newton's laws and Bernoulli's principle help us to understand how objects can fly? **Conceptual:** What can be done to counteract a helicopter blades causing a helicopter to rotate and how can changing the flaps of an airplane's wings help in take-off and landing? **Debatable:** Can the future of air travel be sustained without the continued use of fossil fuels?	-Students will state the basic quantities of gravity, gravitational force, gravitational field strength and weight, and know the units for each of these -Students will describe resultant force in relation to weight, the contact force of the ground, and the buoyancy force exerted by fluids. -Students will describe density and its relationship to mass, volume and buoyancy. -Students will describe the concept of pressure -Students will state the units for density and pressure. -Students will apply the variation of pressure with depth to calculate the resultant buoyancy force. -Students will apply Archimedes principle and the formula B = gV to solve problems involving buoyancy and apply this formula to find whether an object will float or fly -Students will apply the above to lighter-than-air craft including hot air, hydrogen and helium balloons and airships. -Students will state the terms aerostat and aerodyne for lighter-than-air and heavier-than-air flying craft respectively. -Students will describe Bernoulli's principle qualitatively and apply it to heavier-than-air craft such as aeroplanes, helicopters and gliders. Include both propeller driven planes as well as jet planes. -Students will explain why helicopter blades cause the craft to rotate, and how this can be counteracted. -Students will explain how an aerosol provides lift in terms of both Newton's third law and Bernoulli's principle. -Students will explain Newton's third law as the principle behind rocket propulsion. -Students will explain the law of conservation of linear momentum as a way of expressing Newton's third law. Apply this to calculating the speed attained by rockets. -Students will suggest an investigation for the efficiency of design for a rotor or turbine made from one or more aerofoils. -Students will suggest an investigation of the factors that affect the rate of falling on a rotating helicopter blade. -Students will summarize the effect of long haul flights on the increase of greenhouse gases and global warming.
10	4. Environmental Sustainability	Systems Consequences and Interactions	Globalization and Sustainability	We will inquire into how our interactions with systems can have unexpected consequences.	**Factual:**What are the Sustainable Development Goals? **Conceptual:** How can a model be created with stores, flows, inputs, and outputs? **Conceptual:** What are the pros and cons of using models to determine the impacts of sustainability? **Debatable:** Can systemic structures change patterns of behavior?	- Students will learn how to use the compass method to analyze results of sustainable models. - Students will explain how more sustainable practices can keep systems away from the Tragedy of the Commons. - Students will determine whether ignorance is a solvable problem. - Students will evaluate whether technology can help to manage sustainable development. - Students will discuss whether the current human culture represents the pinnacle of human achievement.
