**Middle School Integrated Science Course 1**

The 6th grade middle school science course, based on an integrated grouping (as determined by the CDE) of Next Generation Science Standards will introduce students to the following concepts (arranged topically)[[1]](#footnote-1):

**Life Science**

###  [Structure and Function](http://www.nap.edu/openbook.php?record_id=13165&page=143)

* [All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).](http://www.nap.edu/openbook.php?record_id=13165&page=143)
* [Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.](http://www.nap.edu/openbook.php?record_id=13165&page=143)
* [In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.](http://www.nap.edu/openbook.php?record_id=13165&page=143)

### [Information Processing](http://www.nap.edu/openbook.php?record_id=13165&page=149)

* [Special sensory receptors respond to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.](http://www.nap.edu/openbook.php?record_id=13165&page=149)

### [Growth and Development of Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=145)

* [Animals engage in characteristic behaviors that increase the odds of reproduction.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
* [Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
* [Genetic factors as well as local conditions affect the growth of the adult plant.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
* [Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary)](http://www.nap.edu/openbook.php?record_id=13165&page=145)

[**Inheritance of Traits**](http://www.nap.edu/openbook.php?record_id=13165&page=158)

* [Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.](http://www.nap.edu/openbook.php?record_id=13165&page=158)

### [Variation of Traits](http://www.nap.edu/openbook.php?record_id=13165&page=160)

* [In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.](http://www.nap.edu/openbook.php?record_id=13165&page=160)

**Earth Science**

### [The Roles of Water in Earth's Surface Processes](http://www.nap.edu/openbook.php?record_id=13165&page=184)

* [Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.](http://www.nap.edu/openbook.php?record_id=13165&page=184)
* [Global movements of water and its changes in form are propelled by sunlight and gravity.](http://www.nap.edu/openbook.php?record_id=13165&page=184)

### [The Roles of Water in Earth's Surface Processes](http://www.nap.edu/openbook.php?record_id=13165&page=184)

* [Complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.](http://www.nap.edu/openbook.php?record_id=13165&page=184)

### [Weather and Climate](http://www.nap.edu/openbook.php?record_id=13165&page=186)

* [Because weather/climate patterns are complex, weather can only be predicted probabilistically.](http://www.nap.edu/openbook.php?record_id=13165&page=186)

### [The Roles of Water in Earth's Surface Processes](http://www.nap.edu/openbook.php?record_id=13165&page=184)

* [Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.](http://www.nap.edu/openbook.php?record_id=13165&page=184)

### [Weather and Climate](http://www.nap.edu/openbook.php?record_id=13165&page=186)

* [Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.](http://www.nap.edu/openbook.php?record_id=13165&page=186)
* [The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.](http://www.nap.edu/openbook.php?record_id=13165&page=186)

### [Global Climate Change](http://www.nap.edu/openbook.php?record_id=13165&page=196)

* [Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.](http://www.nap.edu/openbook.php?record_id=13165&page=196)

**Physical Science**

### [Definitions of Energy](http://www.nap.edu/openbook.php?record_id=13165&page=120)

* [Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.](http://www.nap.edu/openbook.php?record_id=13165&page=120)

### [Conservation of Energy and Energy Transfer](http://www.nap.edu/openbook.php?record_id=13165&page=124)

* [Energy is spontaneously transferred out of hotter regions or objects and into colder ones.](http://www.nap.edu/openbook.php?record_id=13165&page=124)
* [The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.](http://www.nap.edu/openbook.php?record_id=13165&page=124)
* [When the motion energy of an object changes, there is inevitably some other change in energy at the same time.](http://www.nap.edu/openbook.php?record_id=13165&page=124)

### [Defining and Delimiting an Engineering Problem](http://www.nap.edu/openbook.php?record_id=13165&page=204)

* [The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary)](http://www.nap.edu/openbook.php?record_id=13165&page=204)

### [Developing Possible Solutions](http://www.nap.edu/openbook.php?record_id=13165&page=206)

* [A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary)](http://www.nap.edu/openbook.php?record_id=13165&page=206)

**Earth and Human Activity**

### [Human Impacts on Earth Systems](http://www.nap.edu/openbook.php?record_id=13165&page=194)

* [Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things.](http://www.nap.edu/openbook.php?record_id=13165&page=194)
* [Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.](http://www.nap.edu/openbook.php?record_id=13165&page=194)

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| **MS Course 1** [[CA Integrated 4/2014 CDE](http://www.cde.ca.gov/pd/ca/sc/documents/ngsscagr6inttopicapr2014.doc)] **6th Grade** |
| [**MS. Structure, Function, and Information Processing**](http://www.nextgenscience.org/msls-sfip-structure-function-information-processing)[🡨 Note: This is a ‘[Topic Arrangement’](http://www.nextgenscience.org/sites/ngss/files/NGSS%20Combined%20Topics%2011.8.13.pdf) term] |
| PCI | [MS-LS1-1](http://www.nextgenscience.org/ms-ls1-1-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| DUM | [MS-LS1-2](http://www.nextgenscience.org/ms-ls1-2-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| EAE | [MS-LS1-3](http://www.nextgenscience.org/ms-ls1-3-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| OECE | [MS-LS1-8](http://www.nextgenscience.org/ms-ls1-8-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| [**MS. Growth, Development, and Reproduction of Organisms**](http://www.nextgenscience.org/msls-gdro-growth-development-reproduction-organisms)[MS-LS3-1, MS-LS4-5. 🡪 8th grade] |
| EAE | [MS-LS1-4](http://www.nextgenscience.org/ms-ls1-4-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| CEDS | [MS-LS1-5](http://www.nextgenscience.org/ms-ls1-5-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes |
| DUM | [MS-LS3-2](http://www.nextgenscience.org/ms-ls3-2-heredity-inheritance-and-variation-traits) | Heredity: Inheritance and Variation of Traits |
| [**MS. Earth’s Systems**](http://www.nextgenscience.org/msess-es-earth-systems) **[**MS-ESS2-1. 🡪 7, MS-ESS3-1 🡪 7, 8] |
| DUM | [MS-ESS2-4](http://www.nextgenscience.org/ms-ess2-4-earths-systems) | Earth's Systems [🡨 This is a ‘Topic Arrangement’ term] |
| [**MS. Weather and Climate**](http://www.nextgenscience.org/msess-wc-weather-climate) |
| PCI | [MS-ESS2-5](http://www.nextgenscience.org/ms-ess2-5-earths-systems) | Earth's Systems |
| DUM | [MS-ESS2-6](http://www.nextgenscience.org/ms-ess2-6-earths-systems) | Earth's Systems |
| AQDP | [MS-ESS3-5](http://www.nextgenscience.org/ms-ess3-5-earth-and-human-activity) | Earth and Human Activity |
| [**MS. Energy**](http://www.nextgenscience.org/msps-e-energy) **[**MS-PS3-1, MS-PS3-2 🡪 8th grade] |
| CEDS | [MS-PS3-3](http://www.nextgenscience.org/ms-ps3-3-energy) | Energy |
| PCI | [MS-PS3-4](http://www.nextgenscience.org/ms-ps3-4-energy) | Energy |
| EAE | [MS-PS3-5](http://www.nextgenscience.org/ms-ps3-5-energy) | Energy |
| [**MS. Human Impacts**](http://www.nextgenscience.org/msess-hi-human-impacts) **[**MS-ESS3-2 🡪 7th, MS-ESS3-4 🡪8th] |
| CEDS | [MS-ESS3-3](http://www.nextgenscience.org/ms-ess3-3-earth-and-human-activity) | Earth and Human Activity |
| [**MS. Engineering Design**](http://www.nextgenscience.org/msets-ed-engineering-design)[Addressed in 7th and 8th grade courses as well] |
| AQDP | [MS-ETS1-1](http://www.nextgenscience.org/ms-ets1-1-engineering-design) | Engineering Design |
| EAE | [MS-ETS1-2](http://www.nextgenscience.org/ms-ets1-2-engineering-design) | Engineering Design |
| AID | [MS-ETS1-3](http://www.nextgenscience.org/ms-ets1-3-engineering-design) | Engineering Design |
| DUM | [MS-ETS1-4](http://www.nextgenscience.org/ms-ets1-4-engineering-design) | Engineering Design |

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| [Science and Engineering Practices:](http://www.nap.edu/openbook.php?record_id=13165&page=41) |
| [PCI:](http://www.nap.edu/openbook.php?record_id=13165&page=59)  | Plan and carry out investigations | [CEDS](http://www.nap.edu/openbook.php?record_id=13165&page=67):  | Constructing explanations and designing solutions |
| [DUM](http://www.nap.edu/openbook.php?record_id=13165&page=56): | Develop and use models | [AQDP](http://www.nap.edu/openbook.php?record_id=13165&page=54):  | Ask questions and define problems |
| [EAE:](http://www.nap.edu/openbook.php?record_id=13165&page=71) | Engage in arguments from Evidence | [AID](http://www.nap.edu/openbook.php?record_id=13165&page=61):  | Analyzing and interpreting data |
| [OECE:](http://www.nap.edu/openbook.php?record_id=13165&page=59) | Obtain, evaluate, and communicating evidence | [UMCT](http://www.nap.edu/openbook.php?record_id=13165&page=64):  | Using mathematics and computational thinking |
| The ‘yellowed’ items and ‘Performance Expectations’ above should be used for instructor facilitated ‘whole class’ experiments/investigations. |

1. Note: In this original ‘draft’ form (.doc), many of the items cited above are hyperlinked to the NGSS website [<http://www.nextgenscience.org/> ] and to its supporting framework [[A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas ( 2012 )](http://www.nap.edu/catalog.php?record_id=13165) ]. [↑](#footnote-ref-1)