

COMMUNITY UNIT SCHOOL DISTRICT 200

Earth Science High School – Grades 10, 11, 12 Regular Level – Two Semesters Elective

- 1. Subject Expectation (State Goal 11)** **The student will understand the processes of scientific inquiry and technological design, investigate questions, conduct experiments and solve problems.**

Essential Learning 1 (Learning Standard A)	Know and apply the concept, principles and processes of scientific inquiry
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| Critical Content | <p>11.A.4b a. conduct controlled experiments or simulations to test hypothesis</p> <ul style="list-style-type: none"> • analyze earth surface maps <p>11.A.4c b. collect, organize, and analyze data accurately and precisely</p> <ul style="list-style-type: none"> • analyze data from weather maps • analyze data from topographic maps <p>11.A.4d c. apply statistical methods to the data to reach and support conclusions</p> <ul style="list-style-type: none"> • relate and discuss isobar and pressure maps <p>11.A.4e d. formulate alternative hypotheses to explain unexpected results</p> <p>11.A.4f e. use available technology, report, display and defend to an audience conclusions drawn from investigations</p> <p>11.A.5a f. formulate hypotheses referencing prior research and knowledge</p> <ul style="list-style-type: none"> • develop a hypothesis to describe the densities of different types of water • develop a hypothesis to describe the greatest amount of deposition and erosion that takes place on a stream table based on your knowledge of river systems <p>11.A.5c g. conduct systematic controlled experiments to test selected hypotheses</p> <p>11.A.5e h. report, display, and defend results of investigations to audiences that may include professionals and technical experts</p> <ul style="list-style-type: none"> • identify the effects of adding calcium carbonate to lakes to neutralize acid rain in Northern lakes and discuss why this should or should not be done • debate the effects of CO₂ in the atmosphere and how this affects the concept of global warming |
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Essential Learning 2 (Learning Standard B)	Know and apply the concepts, principles and processes of technological design
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| Critical Content | 11.B.3d | a. | test the prototype using available material, instruments, and technology and record the data <ul style="list-style-type: none"> • identify altitude and azimuth sexton |
| | 11.B.4c | b. | develop working visualizations of the proposed solution designs (e.g. blueprints, schematics, flowcharts, cad-cam, animation) <ul style="list-style-type: none"> • construct building relief maps to enhance visualization • create models of mountain building and faulting |
| | 11.B.5f | c. | using available technology to prepare and present findings of the tested design solution to an audience that may include professional and technical experts <ul style="list-style-type: none"> • after completing the labs on environmental issues (e.g. acid rain and global warming), the students present their findings using PowerPoint |

2. Subject Expectation (State Goal 12) The student will understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.

Essential Learning 1 (Learning Standard A)	Know and apply concepts that explain how living things function, adapt, and change
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| Critical Content | 12.A.3c | a. | compare and contrast how different forms and structures reflect different functions <ul style="list-style-type: none"> • analyze ocean life forms |
| | 12.A.4b | b. | describe the structure of organization of cells and tissues that underline basic life functions including nutrition, respiration, cellular transport, biosynthesis, and reproduction <ul style="list-style-type: none"> • summarize a process of photosynthesis in the development of organisms, the ocean food chain, and the carbon cycle |
| | 12.A.4c | c. | describe processes by which organisms change over time using evidence from the fossil record <ul style="list-style-type: none"> • compare and contrast geologic time and fossil records |

Essential Learning 2 (Learning Standard B)	Know and apply concepts that describe how living things interact with each other and with their environment
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| Critical Content | 12.B.4a | a. | compare physical, ecological, and behavioral factors that influence interactions and interdependence of organisms <ul style="list-style-type: none"> • analyze ocean food chain |
| | 12.B.5a | b. | analyze and explain biodiversity issues and the causes and effects of extinction <ul style="list-style-type: none"> • compare and contrast fossil records |
| | 12.B.5b | c. | compare and predict how life forms can adapt to changes in the environment by applying concepts of change and constancy |

Essential Learning 3 (Learning Standard C)	Know and apply concepts that describe properties of matter and energy and the interactions between them
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| Critical Content | 12.C.4a | a. | use kinetic theory, wave theory, quantum theory and laws of thermodynamics to explain energy transformations <ul style="list-style-type: none"> • review oceans currents and El Nino effect |
| | 12.C.5b | b. | analyze the properties of materials <ul style="list-style-type: none"> • discuss erosion, glaciations, rock cycle • discuss weather |
| | | * | c. examine the wave properties of light as it relates to telescope observation of space |
| | | * | d. examine the uses of electromagnetic radiation as it relates to space exploration |

Essential Learning 4 (Learning Standard D)	Know and apply concepts that describe force and motion and the principles that explain them
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| Critical Content | 12.D.5a | a. | analyze factors that influence the relative motion of an object <ul style="list-style-type: none"> • discuss stream tables • review glacial erosion and deposition • describe motion of planets and satellites • compare and contrast movement of objects in ocean waves and currents |
| | 12.D.5b | b. | analyze the effect of gravitational, electromagnetic, and nuclear forces on a physical system <ul style="list-style-type: none"> • discuss sediment sorting • evaluate mass wasting • describe glaciation • compare and contrast star formation and life cycle |

Essential Learning 5 (Learning Standard E)	Know and apply concepts that describe the features and processes of the Earth and its resources
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| Critical Content | 12.E.3b | a. | describe interactions between solid earth, oceans, atmosphere, and organisms that have resulted in ongoing changes of Earth <ul style="list-style-type: none"> • evaluate water biodiversity • discuss land and water interaction in relation to weather (e.g. winds, precipitation, climate trends) • review how atmospheric temperature influences a variety of different earth processes (e.g. weathering, erosion, precipitation) |
| | 12.E.4a | b. | explain how external and internal energy sources drive earth processes <ul style="list-style-type: none"> • discuss plate tectonics • compare and contrast convection cycles in air, water, and mantle of earth • review radioactive decay of earth core materials |
| | 12.E.4b | c. | describe how rock sequences and fossil remains are used to interpret the age and changes in the earth <ul style="list-style-type: none"> • discuss geologic time ranges |
| | 12.E.5 | d. | analyze the processes involved in naturally occurring short-term and long-term earth events <ul style="list-style-type: none"> • earthquakes • glaciations |

- floods
- plate tectonics and mountain building
- * e. understand the relationship of the physical, chemical, and biological characteristics and properties of the oceans

Essential Learning 6 (Learning Standard F)	Know and apply concepts that explain the composition and structure of the Universe and Earth's place in it
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| Critical Content | <p>12.F.2c a. identify easily recognizable star patterns (e.g. constellations)</p> <p>12.F.3a b. simulate, analyze, and explain the effects of gravitational force in the solar system</p> <ul style="list-style-type: none"> • discuss gravitational forces between planets • review lunar cycle and tides • explain elliptical orbits of planets <p>12.F.3b c. describe the organization and physical characteristics of the solar system</p> <ul style="list-style-type: none"> • explain arrangement of solar system • compare and contrast geocentric vs. heliocentric • compare and contrast sun composition and structure <p>12.F.3c d. compare and contrast the sun as a star with other objects in the Milky Way Galaxy</p> <ul style="list-style-type: none"> • evaluate star evolution <p>12.F.4a e. explain theories, past and present, for changes observed in the universe</p> <ul style="list-style-type: none"> • discuss Big Bang Theory <p>12.F.5a f. compare the processes involved in the life cycle of stars and evaluate the supporting evidence</p> <ul style="list-style-type: none"> • explain and discuss thermonuclear fusion • compare and contrast life cycle of main sequence vs. giant stars • explain and discuss Hertzsprung-Russell diagram <p>12.F.5b g. describe the size and age of the universe and evaluate the supporting evidence</p> <ul style="list-style-type: none"> • discuss alteration of star charts due to expanding universe • discuss Big Bang Theory of universe formation |
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3. Subject Expectation (State Goal 13) The student will understand the relationships among science, technology and society in historical and contemporary contexts.

Essential Learning 1 (Learning Standard A)	Know and apply the accepted practices of science
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| Critical Content | <p>13.A.3c a. explain what is similar and different about observational and experimental investigations</p> |
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- 13.A.4a b. estimate and suggest ways to reduce the degree of risk involved in science activities
 - discuss and evaluate lab safety issues
- 13.A.4d c. explain how peer review helps to assure the accurate use of data and improves the scientific process
 - discuss the scientific method and how it ensures replication of results and findings
- 13.A.5a d. design procedures and policies to eliminate or reduce risk in potentially hazardous science activities
 - review safety contracts
- 13.A.5c e. explain the strengths, weaknesses, and uses of research methodologies including observational studies, controlled laboratory experiments, computer modeling, and statistical analysis
 - discuss the use of planetarium for observational study
 - evaluate the use of computer modeling for triangulation of earthquakes
- 13.A.5d f. explain, using a practical example such as cold fusion, why experimental replication and peer review are essential to scientific claims
 - review a scientific research journal publication and Nobel Prize nomination process

Essential Learning 2 (Learning Standard B)	Know and apply concepts that describe the interaction between science, technology and society
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| Critical Content | <ul style="list-style-type: none"> 13.B.3b a. identify important contributions to science and technology that have been made by individuals and groups from various cultures <ul style="list-style-type: none"> • discuss Archeoastronomy 13.B.3d b. analyze the interaction of resource acquisition, technological development and ecosystem impact <ul style="list-style-type: none"> • discuss marine oil exploration and mineral acquisition 13.B.4b c. analyze a particular occupation to identify decisions that may be influenced by the knowledge of science <ul style="list-style-type: none"> • discuss the role of the meteorologist 13.B.4d d. analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements <ul style="list-style-type: none"> • evaluate coal use • evaluate limestone use 13.B.5b e. analyze and describe the processes and effects of scientific and technological breakthroughs <ul style="list-style-type: none"> • seafloor spreading and plate tectonics • storm/tornado/hurricane prediction • cfc's & ozone relationship • development and advancement of the telescope • development and advancement of ocean exploration equipment (e.g. scuba, sonar, submersibles) • spacecraft (e.g. Hubble telescope, space shuttle, space station, weather satellites, robotic rovers) • radioactive dating (e.g. carbon -14 dating) |
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- 13.B.5d f. analyze the costs, benefits, and effects of scientific and technological policies at the local, state, national, and global levels
- evaluate Illinois wind farms
 - discuss solar energy use
- 13.B.5e g. assess how scientific and technological progress has affected other fields of study, careers, and job markets and aspects of everyday life
- discuss flood control
 - evaluate hybrid cars
 - review earthquake prevention and preparation