

Environmental Science Institute
The University of Texas at Austin
Exploring Outer Space Fiction vs. Fact
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This file contains suggestions for how to incorporate information from this CD-ROM into curriculum using Texas Essential Knowledge and Skills for Science

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§112.2. Science, Kindergarten.

(b) Knowledge and skills.

(8) Science concepts. The student knows the difference between living organisms and nonliving objects. The student is expected to:

(A) identify a particular organism or object as living or nonliving; and **People are alive. Spaceships are not.**

(B) group organisms and objects as living or nonliving. **Have students come up with a list of possible things that could be sent to space e.g. People, dogs, hammers, food. Then have them sort the items into lists of living or not living.**

(9) Science concepts. The student knows that living organisms have basic needs. The student is expected to:

(A) identify basic needs of living organisms; **People need air to live. Without air, they suffocate. (slide 31-32)**

§112.3. Science, Grade 1.

(b) Knowledge and skills.

(6) Science concepts. The student knows that systems have parts and are composed of organisms and objects. The student is expected to:

(D) identify parts that, when put together, can do things they cannot do by themselves, such as a working camera with film, a car moving with a motor, and an airplane flying with fuel. **Spaceships need an enormous amount of fuel to get to space (slide 48-51). Ask the students what would happen if the spaceship had no fuel, too little fuel, and enough fuel.**

(8) Science concepts. The student distinguishes between living organisms and nonliving objects. The student is expected to:

(A) group living organisms and nonliving objects; and **Have students come up with a list of possible things that could be sent to space e.g. People, dogs, hammers, food. Then have them sort the items into lists of living or not living.**

(B) compare living organisms and nonliving objects. **Compare the items from each list generated above.**

(9) Science concepts. The student knows that living organisms have basic needs. The student is expected to:

(A) identify characteristics of living organisms that allow their basic needs to be met; and **People need air to live. Without air, they suffocate. (slide 31-32)**

§112.4. Science, Grade 2.

(b) Knowledge and skills.

(6) Science concepts. The student knows that systems have parts and are composed of organisms and objects. The student is expected to:

(A) manipulate, predict, and identify parts that, when separated from the whole, may result in the part or the whole not working, such as flashlights without batteries and plants without leaves; **Spaceships need an enormous amount of fuel to get to space (slide 48-51). Ask the students what would happen if the spaceship had no fuel, too little fuel, and enough fuel.**

(7) Science concepts. The student knows that many types of change occur. The student is expected to:

(D) observe, measure, and record changes in weather, the night sky, and seasons. **Satellites and the space station orbit the Earth (slides 4-7). The position of the international space station is located at <http://science.nasa.gov/temp/StationLoc.html> Directions on where to look for the space station can be sent home, so students can watch it move across the sky at night.**

(8) Science concepts. The student distinguishes between living organisms and nonliving objects. The student is expected to:

(A) identify characteristics of living organisms; and **People need air to live. Without air, they suffocate. (slide 31-32)**

§112.5. Science, Grade 3.

(b) Knowledge and skills.

(6) Science concepts. The student knows that forces cause change. The student is expected to:

(A) measure and record changes in the position and direction of the motion of an object to which a force such as a push or pull has been applied; and **Gravity is an important force on Earth and in space (slide 5-24) Talk with the students about their experience with swimming underwater. Tell them that when they move very slowly underwater, it feels like it does in space. Have them**

hypothesize what would happen when they would do certain things in space like release an object or release air from a balloon.

(11) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(C) identify the planets in our solar system and their position in relation to the Sun; and Slides 35 talk about Mars and its thin atmosphere.

(D) describe the characteristics of the Sun. The Sun's gravitational force is large. The surface of the Sun is not smooth; there are explosions on its surface (slides 9-10)

§112.6. Science, Grade 4.

(7) Science concepts. The student knows that matter has physical properties. The student is expected to:

(B) conduct tests, compare data, and draw conclusions about physical properties of matter including states of matter, conduction, density, and buoyancy. The Neutral Buoyancy Lab uses the buoyant force of water to counteract that of gravity to create the sensation of free fall (slide 22-24).

(11) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(C) identify the Sun as the major source of energy for the Earth and understand its role in the growth of plants, in the creation of winds, and in the water cycle. There is a nice picture of the sun on slide 9.

§112.7. Science, Grade 5.

(b) Knowledge and skills.

(6) Science concepts. The student knows that some change occurs in cycles. The student is expected to:

(A) identify events and describe changes that occur on a regular basis such as in daily, weekly, lunar, and seasonal cycles; The position of the international space station is located at <http://science.nasa.gov/temp/StationLoc.html>. Directions on where to look for the space station can be sent home, so students can watch it move across the sky at night. Discuss how the daily rotation of the Earth and the orbit of the space station create the apparent motion.

(8) Science concepts. The student knows that energy occurs in many forms. The student is expected to:

(A) differentiate among forms of energy including light, heat, electrical, and solar energy; **Refute the myth that solar power from space is a viable energy option (slide 39-43).**

(D) verify that vibrating an object can produce sound. **Have the students hypothesize what would happen if there was no medium through which sound could propagate its vibrations. Perhaps an experiment could be performed in which a cup had a hole in it so that a straw could be inserted into it with an air tight connection. Have a student place the cup to his/her ear and cover the other ear. Have another student lightly tap the cup to produce a sound. Then have a student suck the air out of the cup through the straw and see if a good enough vacuum can be produced so that the student cannot hear a sound (slide 32-34).**

(12) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(D) identify gravity as the force that keeps planets in orbit around the Sun and the moon in orbit around the Earth. **Slides 5-24 provide information on gravity in space.**

§112.22. Science, Grade 6.

(6) Science concepts. The student knows that there is a relationship between force and motion. The student is expected to:

(A) identify and describe the changes in position, direction of motion, and speed of an object when acted upon by force; **Motion in space is often counterintuitive because of our experience with motion on Earth (slides 26-29). Have students predict what would happen in space if for instance a person were to release an object, throw an object, or pour some liquid out.**

(9) Science concepts. The student knows that obtaining, transforming, and distributing energy affects the environment. The student is expected to:

(C) research and describe energy types from their source to their use and determine if the type is renewable, non-renewable, or inexhaustible. **Solar power is a renewable energy source. Talk about the feasibility of using space solar power (slide 39-43).**

(13) Science concepts. The student knows components of our solar system. The student is expected to:

(B) describe types of equipment and transportation needed for space travel. **Special equipment is needed to get to space and survive the harshness (slide 7-38, 44-46, 48-51).**

(14) Science concepts. The student knows the structures and functions of Earth systems. The student is expected to:

(C) describe components of the atmosphere, including oxygen, nitrogen, and water vapor, and identify the role of atmospheric movement in weather change. **Mars has a very thin atmosphere (slide 35). Does it have weather?**

§112.23. Science, Grade 7.

(b) Knowledge and skills.

(6) Science concepts. The student knows that there is a relationship between force and motion. The student is expected to:

(B) demonstrate that an object will remain at rest or move at a constant speed and in a straight line if it is not being subjected to an unbalanced force; and **Free fall and gravity (slide 13-24).**

(14) Science concepts. The student knows that natural events and human activity can alter Earth systems. The student is expected to:

(C) make inferences and draw conclusions about effects of human activity on Earth's renewable, non-renewable, and inexhaustible resources. **Solar power is a renewable energy source. Talk about the feasibility of using space solar power (slide 39-43).**

§112.24. Science, Grade 8.

(b) Knowledge and skills.

(7) Science concepts. The student knows that there is a relationship between force and motion. The student is expected to:

(A) demonstrate how unbalanced forces cause changes in the speed or direction of an object's motion; and **Talk with the students about the different forces that occur in space. When an object is in orbit, the object does not feel the forces on it and experiences free fall (slide 13-15). Without the action of gravity, things in orbit would move in a straight line rather than an orbit (slide 15).**

(B) recognize that waves are generated and can travel through different media. **Sound waves can propagate through space**

because there is a little medium. Mars has a thin atmosphere. Can it transmit sound waves? (slide 33-35).

(13) Science concepts. The student knows characteristics of the universe. The student is expected to:

(B) explain the use of light years to describe distances in the universe; and A light year is the distance that light can travel in a year. Even if we could travel 100 faster than light, the nearest star would be 10 years away and the next galaxy, many lifetimes (slide 53). To help the students understand the use of time as a distance measurement, time some of them running known distances. Figure out how far the student can run per minute. Have the student run other distances and use the student-minute to measure.

112.42. Integrated Physics and Chemistry.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

(4) Science concepts. The student knows concepts of force and motion evident in everyday life. The student is expected to:

(A) calculate speed, momentum, acceleration, work, and power in systems such as in the human body, moving toys, and machines; have students calculate the speed needed to get into orbit (slide 8).

(B) investigate and describe applications of Newton's laws such as in vehicle restraints, sports activities, geological processes, and satellite orbits; how can a satellite's orbit be explained by Newton's Laws? (slide 14). Gravity is a force that acts at a distance. All matter attracts each other. We can never be fully free of Earth's gravitational effects. Why doesn't everything revolve around the Earth? Other gravitational fields attract matter as the Earth's gravitational grip lessens with distance (slide 15).

(5) Science concepts. The student knows the effects of waves on everyday life. The student is expected to:

(A) demonstrate wave types and their characteristics through a variety of activities such as modeling with ropes and coils, activating tuning forks, and interpreting data on seismic waves; **Are there sounds in space? Yes (slide 33-34). Are there sounds on Mars? Yes (slide 35).**

(6) Science concepts. The student knows the impact of energy transformations in everyday life. The student is expected to:

(D) investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells; **Solar power is a renewable energy source. Talk about the feasibility of using space solar power (slide 39-43).**

(7) Science concepts. The student knows relationships exist between properties of matter and its components. The student is expected to:

(A) investigate and identify properties of fluids including density, viscosity, and buoyancy; **Why is a huge pool used to simulate space? Water's buoyancy counteracts the force of gravity (slide 22-24).**

§112.43. Biology.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; **Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.**

(11) Science concepts. The student knows that organisms maintain homeostasis. The student is expected to:

(C) analyze the importance of nutrition, environmental conditions, and physical exercise on health; and **In the absence of pressure, people suffocate (slide 30-31).**

§112.44. Environmental Systems.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:

(C) document the use and conservation of both renewable and non-renewable resources; Solar power is a renewable energy source. Talk about the feasibility of using space solar power (slide 39-43).

(8) Science concepts. The student knows that environments change. The student is expected to:

(A) analyze and describe the effects on environments of events such as fires, hurricanes, deforestation, mining, population growth, and municipal development; If our atmosphere was as thin as that of Mars what changes would you expect? (slide 35) more solar radiation=more mutations in DNA (cancers), higher temperature fluctuations.

§112.45. Chemistry.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

§112.46. Aquatic Science.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

§112.47. Physics.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

(4) Science concepts. The student knows the laws governing motion. The student is expected to:

(B) analyze examples of uniform and accelerated motion including linear, projectile, and circular; How does a satellite stay in orbit? (slide 15).

(C) demonstrate the effects of forces on the motion of objects; Contrast the forces on Earth and the forces in space (slide 18-19).

(E) identify and describe motion relative to different frames of reference. Does a person in orbit feel like s/he is traveling in a circle? No, in their frame of reference, they are in free fall (slide 12) so s/he does not feel any acceleration.

(8) Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:

(A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction,

and interference; Are there sounds in space? Yes (slide 33-34).
Are there sounds on Mars? Yes (slide 35).

§112.48. Astronomy.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving skills to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

(7) Science concepts. The student knows how mathematical models, computer simulations, and exploration can be used to study the universe. The student is expected to:

(E) analyze the impact of the space program on the collection of data about the Earth and the universe. The costs and benefits of space exploration are described on slides 44-47.

(9) Science concepts. The student knows that planets of different size, composition, and surface features orbit around the Sun. The student is expected to:

(D) relate the role of gravitation to the motion of the planets around the Sun and to the motion of moons and satellites around the planets. How does a satellite stay in orbit? (slide 15).

(10) Science concepts. The student knows how life on Earth is affected by its unique placement and orientation in our solar system. The student is expected to:

(A) compare the factors essential to life on Earth such as temperature, water, mass, and gases to conditions on other planets; Mars has 2% the atmosphere of Earth (slide 35). What implications does this have?

§112.49. Geology, Meteorology, and Oceanography.

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) evaluate the impact of research on scientific thought, society, and the environment; Find out how many students believe each of the myths presented. After discussing the science, talk with students about how the new information changed their views. Ask them if they think it is important to have accurate thinking about scientific things. Discuss the scientific method with respect to these myths.

(4) Science concepts. The student knows the Earth's unique characteristics and conditions. The student is expected to:

(A) research and describe the Earth's unique placement in the solar system; and Mars has an atmosphere that is 2% of Earth's (slide 35).

(B) analyze conditions on Earth that enable organisms to survive. Organisms on Earth have atmospheric pressure to keep them from suffocating (slide 31). Also, carbon dioxide does not pool around the mouths of respiring creatures when they rest (slide 30).

(9) Science concepts. The student knows the role of natural energy resources. The student is expected to:

(B) analyze issues regarding the use of fossil fuels and other renewable, non-renewable, or alternative energy resources; and Solar power is a renewable energy source. Talk about the feasibility of using space solar power (slide 39-43).

(13) Science concepts. The student knows the role of energy in governing weather and climate. The student is expected to:

(A) describe the transfer of heat energy at the boundaries between the atmosphere, land masses, and oceans resulting in layers of different temperatures and densities in both the ocean and atmosphere; Mars has a thin atmosphere and no surface water (slide 31). Does it have weather?