

# Foundation of Energy

Subject: Career Development and Career and Technical Education

Grade: 09

Expectations: 62

Breakouts: 224

## (a) Introduction.

1. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and success in current or emerging energy professions.
2. The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.
3. energy through the production, transmission, processing, and use of energy. Students will apply these concepts and perform investigations and experiments at least 40% of the time using safe practices.
4. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
5. Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

## (b) Knowledge and Skills Statements

- (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
  - (A) evaluate the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession;
    - (i) evaluate the importance of dressing appropriately
    - (ii) evaluate the importance of speaking politely
    - (iii) evaluate the importance of conducting oneself in a manner appropriate for the profession
  - (B) cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;
    - (i) cooperate as a member of a group in an effort to achieve a positive collective outcome
    - (ii) contribute as a member of a group in an effort to achieve a positive collective outcome
    - (iii) collaborate as a member of a group in an effort to achieve a positive collective outcome



(B) examine past market and employment trends in the energy sector;

(i)

- (D) demonstrate an understanding of the use and conservation of resources and proper disposal or recycling of materials.
  - (i) demonstrate an understanding of the use of resources
  - (ii) demonstrate an understanding of conservation of resources
  - (iii) demonstrate an understanding of proper disposal or recycling of materials
- (4) The student uses critical thinking and problem solving to make informed decisions within and outside the classroom. The student is expected to:
  - (A) communicate and present valid conclusions from energy information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;
    - (i) communicate valid conclusions from energy information extracted from various sources
    - (ii) present valid conclusions from energy information extracted from various sources
  - (B) explain the impacts of energy discoveries by a variety of historical and contemporary scientists and entrepreneurs on current societal attitudes;
    - (i) explain the impacts of energy discoveries by a variety of historical scientists on current societal attitudes
    - (ii) explain the impacts of energy discoveries by a variety of contemporary scientists on current societal attitudes
    - (iii)

(vi)

- (iv) develop data retrieval skills related to energy production by researching information about how each [energy] source is used to produce electrical energy
- (v) develop data retrieval skills related to energy use by researching information about energy sources, including renewable sources
- (vi) develop data retrieval skills related to energy use by researching information about energy sources, including non-renewable sources
- (vii)

- (iv) explain transformations among various energy forms, including mechanical energy
  - (v) explain transformations among various energy forms, including electrical energy
  - (vi) explain transformations among various energy forms, including light energy
  - (vii) demonstrate transformations among various energy forms, including potential energy
  - (viii) demonstrate transformations among various energy forms, including kinetic energy
  - (ix) demonstrate transformations among various energy forms, including chemical energy
  - (x) demonstrate transformations among various energy forms, including mechanical energy
  - (xi) demonstrate transformations among various energy forms, including electrical energy
  - (xii) demonstrate transformations among various energy forms, including light energy
- (C) analyze the role of gravity in transforming energy;
- (i) analyze the role of gravity in transforming energy
- (D) investigate and calculate the relationship between work, potential energy, and kinetic energy;
- (i) investigate the relationship between work, potential energy, and kinetic energy
  - (ii) calculate the relationship between work, potential energy, and kinetic energy
- (E) examine various types of energy transfer mechanisms, determine the original form of energy and what form that energy is being transformed into, and use examples to analyze and calculate the relationships among work, kinetic energy, and potential energy;
- (i) examine various types of energy transfer mechanisms
  - (ii) determine the original form of energy and what form that energy is being transformed into
  - (iii) use examples to analyze the relationships among work, kinetic energy, and potential energy
  - (iv) use examples to calculate the relationships among work, kinetic energy, and potential energy
- (F) describe and apply the law of conservation of energy; and
- (i) describe the law of conservation of energy
  - (ii) apply the law of conservation of energy
- (G) use basic calorimetry to determine the amount of energy stored in substances such as coal.
- (i) use basic calorimetry to determine the amount of energy stored in substances
- (7) The student understands the basics of fluid mechanics related to energy discovery, production, and transportation. The student is expected to:
- (A) identify fluids used as fuels, including liquids and gases;
    - (i) identify fluids used as fuels, including liquids
    - (ii) iv gac3 6.3 ( o)33.cloated t

- (B) identify fluids used in the discovery, production, and transportation of energy sources;
    - (i) identify fluids used in the discovery of energy sources
    - (ii) identify fluids used in the production of energy sources
    - (iii) identify fluids used in the transportation of energy sources
  - (C) explain capillary action and relate it to energy production; and
    - (i) explain capillary action
    - (ii) relate [capillary action] to energy production
  - (D) explain, using formulas, how pressure and temperature affect the behavior of fluids.
    - (i) explain, using formulas, how pressure affects the behavior of fluids
    - (ii) explain, using formulas, how temperature affects the behavior of fluids
- (8) The student understands how and where energy is produced and identifies Texas energy resources. The student is expected to:
- (A) research the location of energy resources and power production plants in Texas;
    - (i) research the location of energy resources in Texas
    - (ii) research the location of power production plants in Texas
  - (B) compile information on the history of energy production in Texas and describe its past and current importance to the U.S. economy;
    - (i) compile information on the history of energy production in Texas
    - (ii) describe [the] past importance [of the history of energy production] to the U.S. economy
    - (iii) describe [the] current importance [of the history of energy production] to the U.S. economy
  - (C) investigate the role of technology in the future development of energy usage;
    - (i) investigate the role of technology in the future development of energy usage
  - (D) identify ways to conserve energy;
    - (i) identify ways to conserve energy
  - (E) map the major sources of energy used in Texas;
    - (i) map the major sources of energy used in Texas
  - (F) assess the impact of the various energy sources on the economy in Texas;
    - (i) assess the impact of the various energy sources on the economy in Texas
  - (G) analyze how supply and demand impacts Texas's economy in relation to energy; and
    - (i) analyze how supply impacts Texas's economy in relation to energy
    - (ii) analyze how demand impacts Texas's economy in relation to energy
  - (H) compare and contrast the impact of energy sources and supply and demand in Texas with national and global data.
    - (i) compare and contrast the impact of energy sources and supply and demand in Texas with national data
    - (ii) compare and contrast the impact of energy sources and supply and demand in Texas with global data





- (B) describe and compare the energy efficiency of renewable and non-renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind;
  - (i) describe the energy efficiency of renewable energy derived from natural sources
  - (ii) describe energy efficiency of non-renewable energy derived from natural sources
  - (iii) describe the energy efficiency of renewable energy derived from alternative sources
  - (iv) describe the energy efficiency of non-renewable energy derived from alternative sources
  - (v) compare the energy efficiency of renewable and non-renewable energy derived from natural and alternative sources
- (C) examine the benefits and hazards of using renewable and non-renewable energy sources;
  - (i) examine the benefits of using renewable energy sources
  - (ii) examine the benefits of using non-renewable energy sources
  - (iii) examine the hazards of using renewable energy sources
  - (iv) examine the hazards of using non-renewable energy sources
- (D) research methods by which benefits can be increased and hazards reduced in the use of renewable and non-renewable energy sources;
  - (i) research methods by which benefits can be increased in the use of renewable energy sources
  - (ii) research methods by which benefits can be increased in the use of non-renewable energy sources
  - (iii)

(G) analyze changing social perspectives and how they can influence scientific practices.

(i) analyze changing social perspectives

(ii) analyze how [changing social perspectives] can influence scientific practices

(11) The student knows how energy impacts the student's life and the role energy plays in international relations, the environment, standards of living, and the economy. The student is expected to:

(A) analyze the impact energy has on the environment;

(i) analyze the impact energy has on the environment

(B) research and discuss the ethical and social issues surrounding Earth's energy resources;

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- (xi) analyze the impact of the measures taken by other countries to use energy to improve air quality
- (xii) analyze the impact of the measures taken by other countries to use energy to extend life expectancy
- (xiii) analyze the effectiveness of the measures taken by other countries to use energy to reduce greenhouse gases

(xiv) analyze the effectiveness of the measures taken to extend life expectancy

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