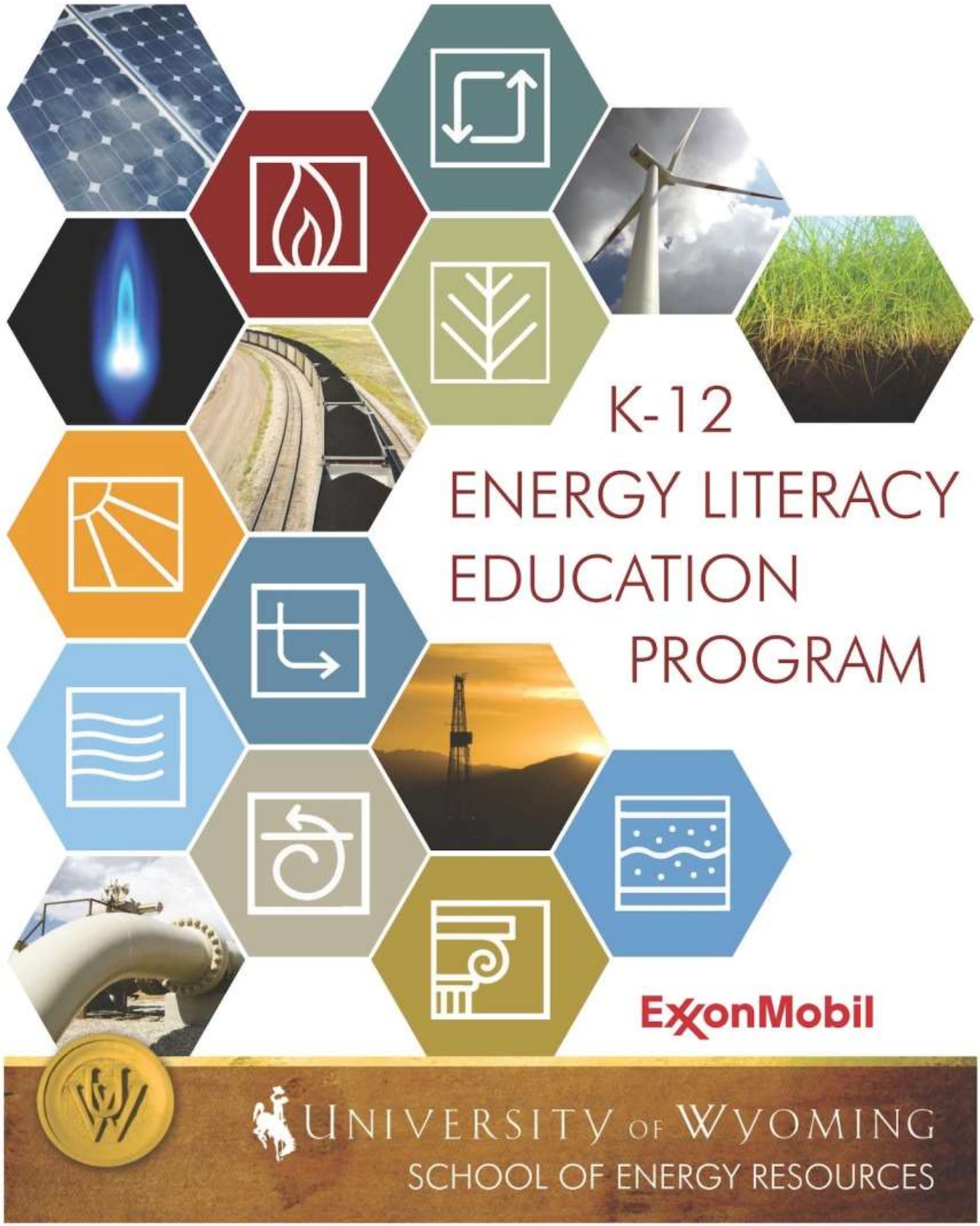

DRAFT – August 2015

School of
Energy Resources

UNIVERSITY
OF WYOMING

ENERGY & SOCIETY CURRICULUM

Energy - Environment - Economy

INTEGRATED SCIENCE AND SOCIAL STUDIES CURRICULUM FOR UPPER HIGH SCHOOL ENVIRONMENTAL STUDIES

Available online at:

http://www.uwyo.edu/ser/energy-literacy

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INTRODUCTION

Energy shapes Wyoming's past, present, and future and is an integral part of our K-12 science and social studies curricula. Wyoming's unique relationship with energy deserves a place in our schools with an innovative curriculum to address such an expansive and, important topic. This semester long course is designed to introduce Wyoming's high school juniors and seniors to the many facets of energy education by first making it relevant locally and then understanding our state's place in a national and global context. This eight unit curriculum, aligned with state of Wyoming and national academic standards, supports the Department of Energy mission of promoting energy literacy while using place-based, Wyoming-specific examples. The interdisciplinary approach integrates science, social studies, language arts, and math to encourage 21st century skill development including critical thinking and application.

Introductory units include an overview of energy production, the geology of energy, and human dimensions of energy development past and present. The next section of units introduces more specifics of energy in Wyoming by reviewing case studies on coal, oil and gas, and wind development in the state. The final unit touches on the future of energy to prompt the next generation of problem solvers to start thinking about creative ways to keep moving Wyoming into the 21st century.

STANDARDS

NEXT GENERATION SCIENCE STANDARDS

- **Disciplinary Core Ideas**
  - Earth and Space Science
  - Engineering
  - Physical Science
  - Engineering
- **Crosscutting Concepts**
  - Patterns
  - Cause and effect
  - Stability and change
  - Energy and matter
  - Scale, proportion, and quantity
  - Structure and function
  - Systems and system models
- **Science and Engineering Practices**
  - Obtaining, evaluating, and communicating information
  - Engaging in arguments from evidence
  - Analyzing and interpreting data
  - Using mathematical and computational thinking
  - Developing and using models
  - Planning and carrying out investigations
  - Constructing explanations/Designing solutions
- **Connection to Nature of Science**
- **Connection to Engineering, Technology, and Applications**

WYOMING SCIENCE STANDARDS

- **SC11.1** – Concepts and Processes
- **SC11.1.4** – Interdependence of Organisms: Investigate the interrelationships and interdependence of organisms, including the ecosystem concept, energy flow, competition for resources, and human effects on the environment.
- **SC11.1.5** – Matter, Energy, and Organization in Living Systems: Explain the unidirectional flow of energy and organic matter through a series of trophic levels in living systems
- **SC11.1.6** – Behavior and Adaptation: Examine behavior as the sum of responses of an organism to stimuli in its environment, which evolves through adaptation, increasing the potential for species survival. Identify adaptations as characteristics and behaviors of an organism that enhance the chance for survival and reproductive success in a particular environment.
- **SC11.1.7** – Geochemical Cycles: Describe the Earth as a closed system and demonstrate a conceptual understanding of the following systems: Geosphere, etc.
- **SC11.1.8** – Origin and Evolution of the Earth System: Investigate geologic time through comparing rock sequences, the fossil record, and decay rates of radioactive isotopes.
- **SC11.1.12** – Conservation of Energy and Increase in Disorder: Demonstrate an understanding of the laws of conservation of mass and energy within the context of physical and chemical changes. Realize the tendency for systems to increase in disorder.
- **SC11.1.13** – Energy and Matter: Demonstrate an understanding of types of energy, energy transfer and transformations, and the relationship between mass and energy.
- **SC11.2** – Science as Inquiry
- **SC11.2.1** – Students use research scientific information and present findings through appropriate means.
- **SC11.2.2** – Students use inquiry to conduct scientific investigations to 1) pose problems and identify questions and concepts to design and conduct an investigation, 2) collect, organize, analyze, and appropriately represent data, 3) give priority to evidence in drawing conclusions and making connections to scientific concepts, 4) Clearly and accurately communicate the result of the investigation
- **SC11.2.3** – Students clearly and accurately communicate the result of their own work as well as information from other sources.
- **SC11.2.5** – Students properly use appropriate scientific and safety equipment, recognize hazards and safety symbols, and observe standard safety procedures.
- **SC11.3** – History and Nature of Science in Personal and Social Decisions
- **SC11.3.1** – Students examine the nature and history of science 1) As scientific knowledge evolves, it impacts personal, social, economic, and political decisions, and 2) The historical misuse of scientific information to make personal, social, economic, and political decisions.
- **SC11.3.2** – Students examine how scientific information is used to make decisions. 1) Interdisciplinary connections of the sciences and connections to other subject areas and career opportunities, 2) The role of science in solving personal, local, national, and global problems, 3) The origins, limitations, and conservation of natural resources, including Wyoming examples.

WYOMING SOCIAL STUDIES STANDARDS

- **SS12.3.1** – Analyze the impact of supply, demand, scarcity, prices, incentives, competition, and profits on what is produced, distributed, and consumed.
- **SS12.3.3** – Analyze and evaluate the impact of current and emerging technologies at the micro and macroeconomic levels (e.g., jobs, education, trade, and infrastructure) and their impact on global economic interdependence.
- **SS12.3.4** – Explain how financial and government institutions make economic decisions (e.g., banking, investment, credit, regulation, and debt).

- **SS12.3.5** – Evaluate how values and beliefs influence microeconomic and macroeconomic decisions.
- **SS12.4.1** – Describe patterns of change (cause and effect) and evaluate how past events impacted future events and the modern world.
- **SS12.4.2** – Analyze the development and impact of tools and technology and how it shaped history and influenced the modern world.
- **SS12.4.3** – Given a significant current event, critique the actions of the people or groups involved; hypothesize how this event would have played out in another country.
- **SS12.4.4** – Describe the historical interactions between and among individuals, groups, and/or institutions (e.g., family, neighborhood, political, economic, religious, social, cultural, and workplace) and their impact on significant historical events.
- **SS12.4.5** – Using primary and secondary sources, apply historical research methods to interpret and evaluate important historical events from multiple perspectives.
- **SS12.5.1** – Use geographic tools and reference materials to interpret, analyze, evaluate, and synthesize historical and geographic data to demonstrate an understanding of global patterns and interconnectedness.
- **SS12.5.2** – Describe regionalization and analyze how physical characteristics distinguish a place, influence human trends, political and economic development, and solve immediate and long-range problems.
- **SS12.5.3** – Analyze, interpret, and evaluate how conflict, demographics, movement, trade, transportation, communication, and technology affect humans' sense of place.
- **SS12.5.4** – Analyze how environmental changes and modifications positively and negatively affect communities and the world both economically and socially
- **SS12.6.1** – Analyze, evaluate, and/or synthesize multiple sources of information in diverse formats and media in order to address a question or solve a problem.
- **SS12.6.2** – Assess the extent to which the reasoning and evidence in a text supports the author's claims.
- **SS12.6.3** – Use digital tools to research, design, and present social studies concepts
- **SS12.6.4** – Evaluate and integrate accurate, sufficient, and relevant information from primary and secondary sources to support writing.

COMMON CORE MATH STANDARDS

- **CCSS.MATH.CONTENT.HSS.IC.B** – Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
- **CCSS.MATH.CONTENT.HSF.LE.A.3** – Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
- **CCSS.MATH.CONTENT.HSF.IF.B.4** – For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
- **CCSS.MATH.CONTENT.HSF.LE.A.1.B** – Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

COMMON CORE LANGUAGE ARTS STANDARDS

- **CCSS.ELA-LITERACY.W.11-12.1** – Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
- **CCSS.ELA-LITERACY.W.11-12.2** – Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- **CCSS.ELA-LITERACY.W.11-12.3** – Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
- **CCSS.ELA-LITERACY.W.11-12.4** – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **CCSS.ELA-LITERACY.W.11-12.8** – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **CCSS.ELA-LITERACY.W.11-12.9** – Draw evidence from literary or informational texts to support analysis, reflection, and research.
- **CCSS.ELA-LITERACY.RI.11-12.1** – Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain
- **CCSS.ELA-LITERACY.RI.11-12.7** – Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
- **CCSS.ELA-LITERACY.SL.11-12.1** – Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- **CCSS.ELA-LITERACY.SL.11-12.2** – Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
- **CCSS.ELA-Literacy.RST.11-12.2** – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **CCSS.ELA-Literacy.RST.11-12.3** – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.