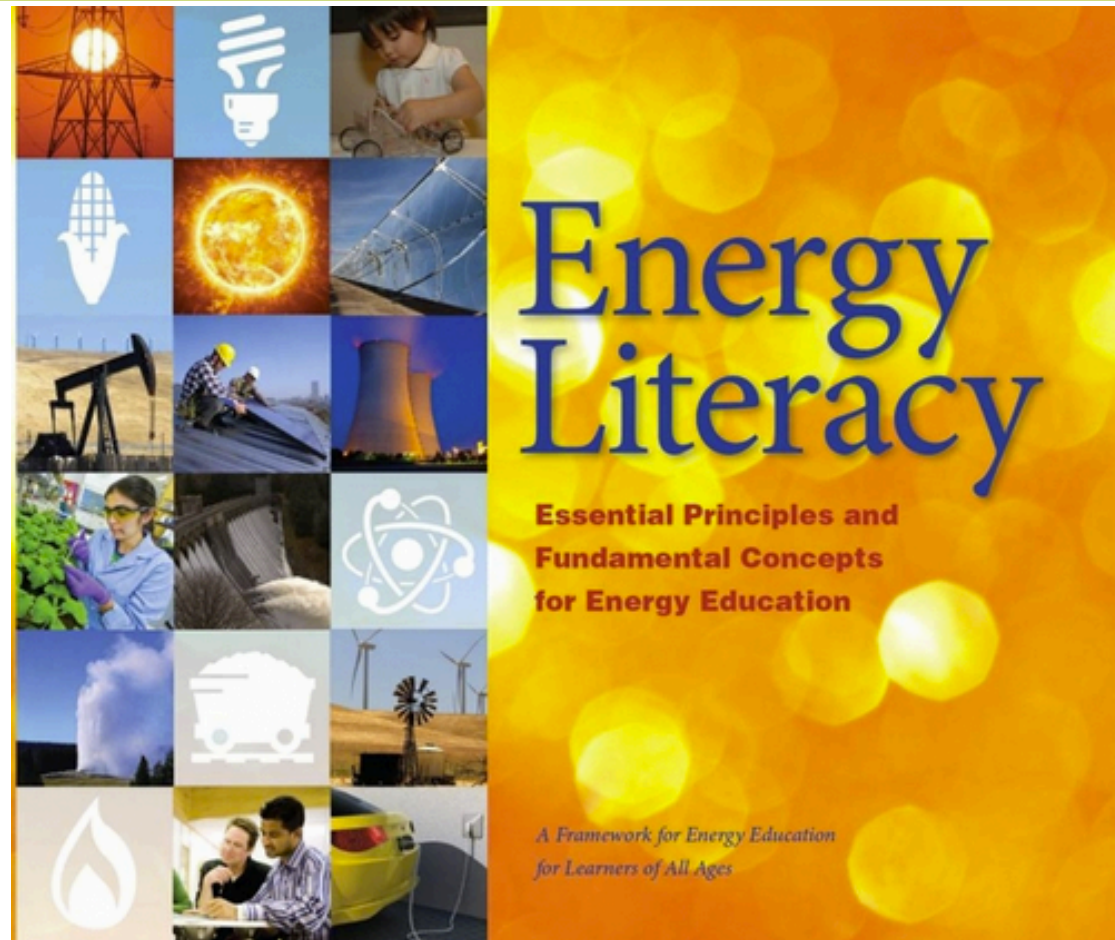
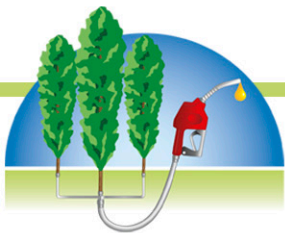


# Contributing to K12 Energy Literacy

## Science and Engineering Bioenergy Concepts



Source:energy.gov



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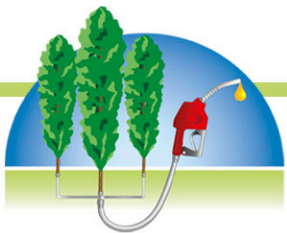
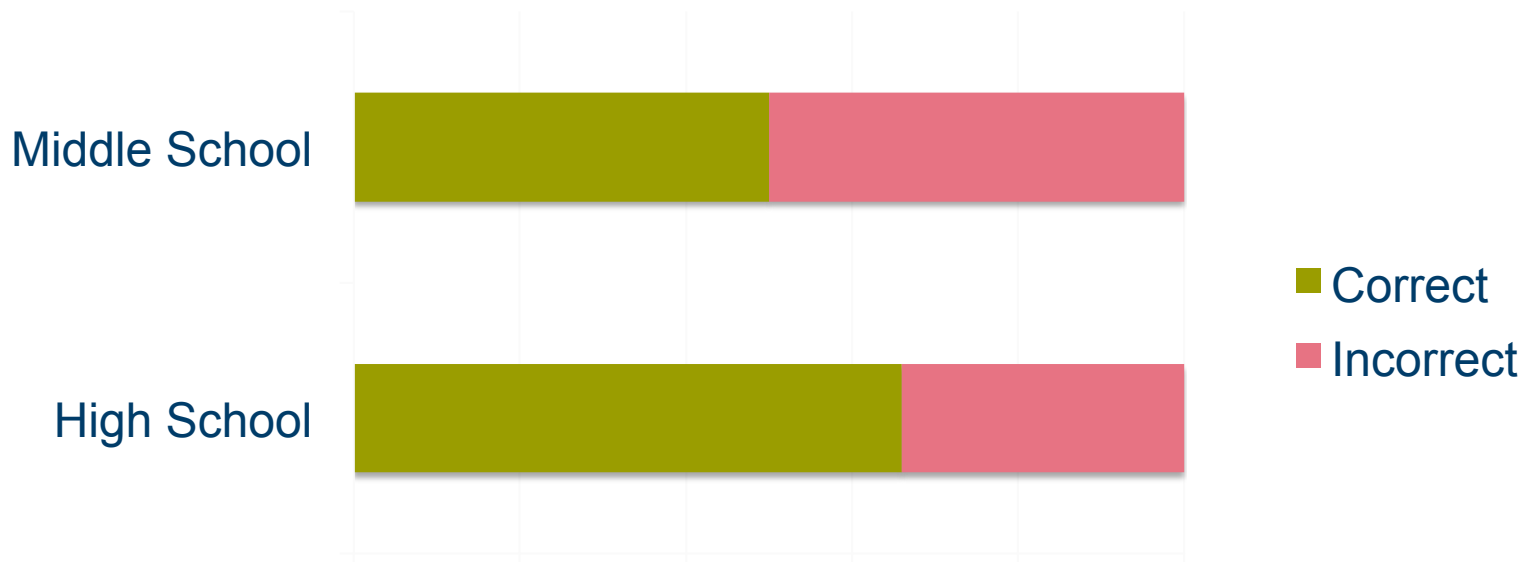


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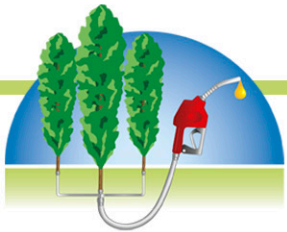
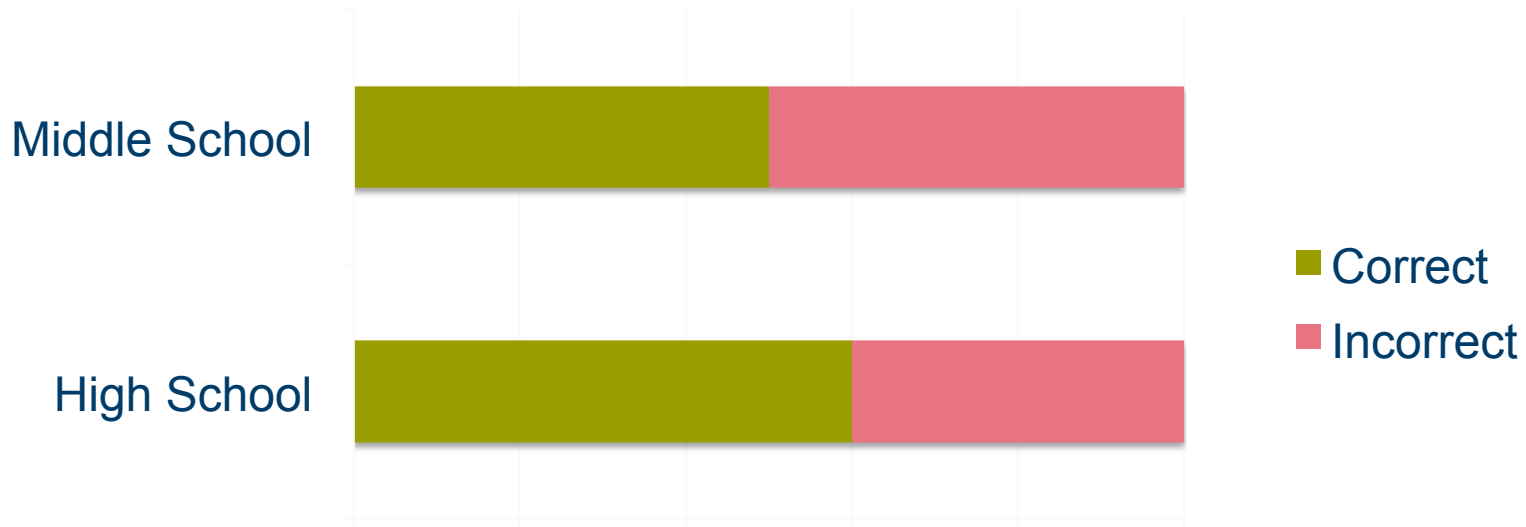
# What do K12 Students Know About Energy?

## What does the term 'renewable energy' mean?



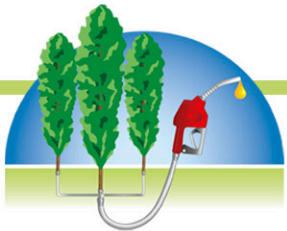
# What do K12 Students Know About Energy?

## Why can't we just switch to electric cars when we run out of fossil fuels?



# Bioenergy Literacy Study

- Delphi study
- 21 participants
- Involvement with USDA NIFA projects
- Diverse backgrounds:  
Science, engineering, education
- Multiple rounds of feedback leading to consensus



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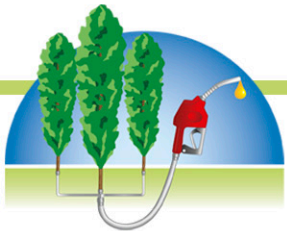
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# Bioenergy Literacy Framework

Concept	Rating	SD
<b>Energy Requirements:</b> Quantity and type of energy needed	4.88	.35
<b>Energy Consumption:</b> Current and historical energy sources	4.88	.35
<b>Climate Change:</b> Historical record and consequences	4.88	.52
<b>Nature of Engineering:</b> Role of engineering in bioenergy	4.62	.52
<b>Energy Fundamentals:</b> Work, energy, conversions	4.63	.52
<b>Lifecycle Assessment:</b> Environmental impacts cradle to grave	4.50	.52
<b>Photosynthesis:</b> How light energy is stored in plants	4.38	.46
<b>Conversion Principles:</b> Types of conversions	4.38	.52
<b>Chemical Cycles:</b> Water, carbon, nitrogen cycles	4.25	.35
<b>Ecosystems:</b> Ecology and human impact	4.25	.52

# Impact on Curriculum Development

- Before framework
  - Bioenergy specific concepts
  - Focus on the details
  - Generations of biofuels
- After framework
  - Build basic energy knowledge
  - Put bioenergy in context
  - Increased emphasis on engineering



# Dissemination

- Pilot activities with teachers from rural, underserved schools with underserved populations
- AHB website
- Teacher workshops in major NW metro areas
- National websites



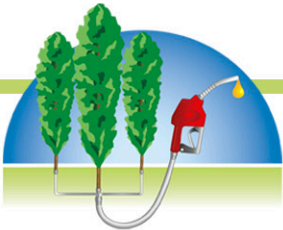
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# Workshops



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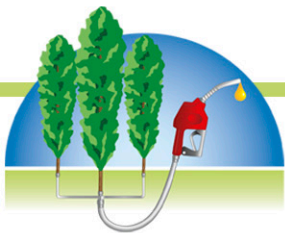
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# Sample Workshop

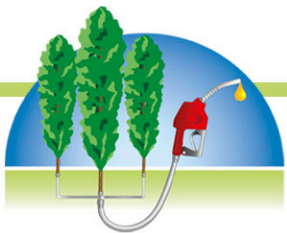
- **First Generation Biofuels**  
Fermentation
- **Second Generation Biofuels**  
Cellulosic Ethanol
- **Third Generation Biofuels**  
Algae
- **Advanced Bioenergy**  
Microbial Fuel Cell
- **Bio-products**  
Biodegradable plastics



# Bioenergy Literacy in Context

- Supports DoE energy literacy framework
- Supports climate literacy framework
- Compatible with Next Generation Science Standards
- Provides a framework to integrate engineering into science education

Made possible by USDA NIFA Grant #68005-30407



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