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The Iowa Secondary Energy Curriculum (ISEC) Project - Update on New Curriculum

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The Iowa Secondary Energy Curriculum (ISEC) Project - Update on New Curriculum

Kyle Gray, Jill Maroo, Sadik Kucuksari, Alan Czarnetzki
Iowa Secondary Energy Curriculum (ISEC) Project

Funding
● Grant from the Iowa Energy Center (iowaeda.com/iowa-energy-office/)

Duration
● 3 years starting in Fall 2020

Goal
● Develop new NGSS-aligned curricula on electrical energy
● Highlighting career opportunities in the energy sector
Project Team

**Academic Support**
- Alan Czarnetzki - Earth and Environmental Sciences
- Kyle Gray - Earth and Environmental Sciences & Science Ed
- Sadik Kucuksari - Electrical Engineering Technology
- Jill Maroo - Biology & Science Ed

**Development Teams**
- 14 teachers (Summer 1) - completed
- 25 teachers (Summer 2)
- UNI Undergrad Graphic Artist (Summers 1 & 2)

**Industry Partners**
- Cedar Falls Utilities
- Green Iowa AmeriCorps
- Iowa Association for Energy Efficiency
ISEC Project Goals

1) Create an updated energy curriculum focusing on electrical energy
2) Develop new lessons on electrical energy with the help of classroom teachers
3) Highlight career opportunities in the energy sector
4) Field-test the new curriculum
5) Disseminate new curricula to Iowa teachers
Project Timeline

**Summer 2021**
- ✓ Establish writing teams
- ✓ Develop lesson ideas
- ✓ Start writing lessons
- ✓ Complete draft #1 by August 2021

**Fall 2021 / Spring 2022**
- ✓ Field test lessons
- ✓ Evaluate feedback

**Summer 2022**
- ● Expand number of writing teams
- ● Revise lessons as informed by the field-testing
- ● Organize teaching resources
- ● Field trips to local industries

**Fall 2022 / Spring 2023**
- ● Field test revised lessons
- ● Evaluate feedback
- ● Disseminate curriculum
Curriculum Details

10 Units
- Aligned with NGSS
- Modular lessons
  - Used together or independently
- Introduce occupations in the energy sector
  - Varying education level requirements
- Custom comic/cartoon
  - Engagement or Assessment prompt
Middle School Unit Titles (Standard)

- **Let’s Rock and Coal** - Rock Cycle (MS-ESS2-1)
- **From Water To Electricity** - Hydropower (MS-ESS2-4)
- **We Need More Energy** - Generating 1.21MW (MS-ESS3-1)
- Trash Mountain - Reducing Landfill Waste (MS-ESS3-3)
- **Energy Demand** - Home Energy Audit (MS-ESS3-4)
High School Unit Titles (Standard)

- Energy Efficiency of Homes - Home Design (HS-ESS3-1)
- Why is Our Electric Bill So High? - Energy Costs (HS-ESS3-2)
- How Much Wind is Enough? - Wind Turbine Science (HS-ESS3-3)
- Energy and Its Uses - Energy Sources & Impacts (HS-ESS3-4)
- Electric Vehicles Everywhere and Not A Watt to Use - Electric Cars and Tradeoffs (HS-ESS3-4)
Phenomenon Examples

- Where will we generate all the new electricity for electric vehicles?
- How does Red Rock dam produce electricity?
- What determines the cost for electricity?
Comic Example 1
Comic Example 2

Do you think we could use this heat to make electricity?

Yes or we could continue using it to make s'mores

Truly a dilemma
Comic Example 3

Energy is produced

I assume mice carry the electricity through underground tunnels

Now you can play video games
Look at all this energy you're wasting, do you think electricity grows on trees?!

Yes it does, it grows on the tree that wizard enchanted!

Abracadabra I have solved the energy crisis.
Assessment Examples

- Clickbait Article
- Reduce Human Impacts (Claim-Evidence-Reasoning)
- House Plans for an Energy Efficient Home
- Modelling the Path of a Water Drop (Water Cycle)
Career Integration Examples

● Bell Ringers via powerpoint slides

● Jigsaw Group Assignment

● Stand Alone lessons
  ○ Videos
  ○ Guest Speakers
  ○ Career Quiz
Example - High Energy Bill

**Phenomenon** - Cost/Benefit of different renewable energy systems

**Standard** - HS-ESS3-2: Evaluate solutions for developing & managing energy & mineral resources using cost-benefit ratios

- Day 1 - Electric Bill
- Day 2 - Costs & Benefits of Natural Gas
- Day 3 - Costs & Benefits of Solar
- Day 4 - Costs & Benefits of Wind
- Day 5 - Costs & Benefits of Biomass
- Days 6-8 - Final Project
Day 1 - Energy Bills

Cost/Benefit Analyses
● Video
● Slides
● Explains the basics of a C-B Analysis

Bills
● How to read a bill
● Examples from
  ○ Home
  ○ Major companies

Day 1 - Electric Bill
Day 2 - Costs & Benefits of Natural Gas
Day 3 - Costs & Benefits of Solar
Day 4 - Costs & Benefits of Wind
Day 5 - Costs & Benefits of Biomass
Days 6-8 - Final Project
Days 2-4

Investigate different fuel sources

- Affordable
- Available
- Reliable
- Sustainable
- Example data sheet

Day 1 - Electric Bill
Day 2 - Costs & Benefits of Natural Gas
Day 3 - Costs & Benefits of Solar
Day 4 - Costs & Benefits of Wind
Day 5 - Costs & Benefits of Biomass
Days 6-8 - Final Project
Days 6-8

Final Assessment - Need 1.5 MW of electricity
- Which fuel source to use?
- Cost/Benefits
- Infosheet
- Slides
- Brochure/Poster
- Infographic
- Video/News Interview/Podcast

Day 1 - Electric Bill
Day 2 - Costs & Benefits of Natural Gas
Day 3 - Costs & Benefits of Solar
Day 4 - Costs & Benefits of Wind
Day 5 - Costs & Benefits of Biomass
Days 6-8 - Final Project
Development Team Opportunity

Development Team (Summer 2022)

● Openings still available for this summer (July 18-22)

● Stipends for…
  ○ Completing the summer workshop
  ○ Post-workshop editing

● Graduate Credit available at a reduced cost (~ $75)

● Interested?? Contact us (isec@uni.edu) for an application
Field Testing Opportunities

Field Testing Team
● Opportunities to field test materials
  ○ Round 1 - Fall 2021 & Spring 2022
  ○ Round 2 - Fall 2022 & Spring 2023(?)
● Open to all teaching our standards
● Stipend for participating
● Currently accepting applications at https://isec.uni.edu/
We would like to thank...

- The Iowa Energy Center for supporting this project
- Our Industry Partners
  - Cedar Falls Utilities
  - Green Iowa AmeriCorps
  - Iowa Association for Energy Efficiency
Contact Info

For more information, visit our website at https://isec.uni.edu/

Or contact Alan Czarnetzki at alan.czarnetzki@uni.edu or isec@uni.edu
Feedback and Questions

Questions?