

## **Wyoming Energy for You - Active Engagement**

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**Abstract:** Do you know that the world we live in is dependent on energy from natural resources, mostly oil and natural gas? Do you know that Wyoming is ranked number two in the US for total energy production, number four in natural gas reserves, and number eight in crude oil reserves? In this active engagement session, you will discover the story of Wyoming oil and natural gas, where did it start, and where it is going. You will also explore the story from oil and gas generation, exploration, drilling, production, to processing. You will participate in hands-on educational activities including investigating different energy resources. This also includes learning about reservoir rock and fluid properties. In addition to performing fun experiments on how to explore for oil and gas, drill vertical and horizontal wells, produce oil and gas naturally or with pumps, inject carbon dioxide to improve the oil and gas recovery while cleaning the environment, and finally participate in the peak oil survival game. Join us for a hands-on adventure, exploring Wyoming energy potential!

## **FOCUS**

This active session is focused on energy education for younger members of the general public. This activity also focuses on discovering the story of oil and natural gas exploration, reservoir, drilling, completion, production, and enhanced oil recovery. Also, this session addresses how energy is critical, where petroleum fits in the energy world, and a hands-on lesson showing how a petroleum engineering discipline works.

## **LEARNING OBJECTIVES**

Attendees will be able to positively identify where and how petroleum is used in their everyday lives. They will learn in a hands-on environment, performing simple, guided experiments to demonstrate various properties of oil and gas and illustrate the concepts that govern how we explore for and produce oil and natural gas for consumption. Specifically, the learning objectives are:

- 1- Differentiate between renewable and non-renewable energy resources and list the main resources in Wyoming.
- 2- Evaluate the importance of oil and gas products in our daily lives and judge the affordable prices of oil.
- 3- Classify different types of rocks that construct the earth layers and execute rock sampling from a producing zone.
- 4- Investigate exploration techniques and predict seismic waves response in different rocks.
- 5- Explore reservoir rocks and fluids properties and plan to maximize the primary recovery.
- 6- Drill a mysterious rock sample and investigate the vital drilling fluid properties.
- 7- Examine the best practices for hole cleaning and drill string tripping.
- 8- Debate the importance of hydraulic fracturing (fracking).
- 9- Assemble a production string for naturally flowing formations and explore the need for artificial lift pumpjacks.
- 10- Investigate how CO<sub>2</sub> flooding improve the recovery while cleaning the environment and plan to survive in the peak oil game.

## **INSTRUCTIONAL STRATEGIES**

In this activity, we will be using active learning pedagogy through the use of instructional demonstration aids, lecture, and handouts. Volunteers will be asked to participate in different activities.

## OUTLINE

This activity requires at least 60 minutes.

Topic	Activities	Time (minutes)
Energy Resources	Energy resources, oil products and price, oil and gas in Wyoming, and petroleum engineering disciplines	10
Petroleum Exploration	Rock types, take a sample, and seismic waves	5
Reservoir Engineering	Rock properties (porosity), fluid properties (emulsion), and primary recovery	10
Drilling Engineering	Drill mysterious sample, 3D tools, drill string tripping, hole cleaning, drilling fluid components, and properties.	10
Completion Engineering	Fracking debate, and fracking experiment.	10
Production Engineering	Producing soda naturally and with pumpjacks	5
Enhanced Oil Recovery	CO <sub>2</sub> flooding experiment and peak oil survival game.	10

## RMS ASEE TARGET AUDIENCE

This session targets K-12 students and educators. It also targets prospective engineering students and their families who would like to explore the petroleum engineering discipline.

## PRESENTER CREDENTIALS

Dr. Tawfik Elshehabi is an associate lecturer at the Department of Petroleum Engineering, College of Engineering and Applied Science, University of Wyoming. Dr. Elshehabi received all his degrees in petroleum engineering with a specialization in drilling engineering. He worked in the oilfield before pursuing an academic career in petroleum engineering, and he has an extended list of publications. He also participated in the UW Summer High School program in 2018 and delivered a course titled “Wyoming Energy 4 You” to high school students from around Wyoming.

## REQUIREMENTS

The instructor will bring all the needed hands-on experiment and the supplemental hand-outs. Participants do not need to bring anything for this session. The practical number of participants for this session is between 20 and 30. If possible, this session can be delivered at the drilling simulator in the new simulator location at the Engineering Education and Research Building EERB # 233.