Erasmus Project KA220

„QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM" (QUEST)

No. 2022-1-RO01-KA220-SCH-000088614.

GOOD PRACTICES IN STEM EDUCATION

PART II

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

Introduction

This best practice guide for teachers is designed to bring classic literature to life and blend Jules Verne's captivating stories with STEM (Science, Technology, Engineering and Mathematics) fields. Visionary author Jules Verne imagined fascinating worlds and advanced technologies for his time, providing a rich source of inspiration for contemporary education. Through ten lesson plans, the guide proposes STEM activities that combine literary knowledge with the exploration of scientific and technological concepts, inspired by the famous novels "20,000 Leagues Under the Sea", "Around the Earth in 80 Days" and "A Day in the life of an American in the year 2889".

Within each lesson plan, the themes and adventures presented in Verne's works become a starting point for interdisciplinary investigations that challenge students to develop their critical and creative skills. Students will explore the mysteries of the ocean depths with Captain Nemo, learn about travel and transportation around the world with Phileas Fogg, and speculate about the future of humanity and advanced technologies by imagining the world of 2889.

This guide aims to give teachers the tools to transform the classroom into a laboratory of exploration, where literature becomes a gateway to scientific discovery. The lessons included in this guide have been designed to encourage active learning, the integration of practical skills, and collaboration, giving students the opportunity to experiment, solve real-world problems, and understand how STEM concepts can be applied in a variety of contexts.

Thus, the guide aims to make reading a multidimensional experience, where imagination meets science, and adventure becomes an engine of knowledge.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

FUNDACIÓN SAN JUAN Y SAN PABLO, SPAIN

STEM ACTIVITIES

LESSON`S PLANS

TEACHERS

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 1

TEACHER: Susana Rico

DATE: 18/10/2023

TYPE OF LESSON: SCIENCE

TOPIC: TSUNAMI

NO. OF STUDENTS:

RESOURCES: Trays, beakers, alcohol, lighters, blue food colouring

BIBLIOGRAPHY:

Aim: Work on the concept of pressure differences and see how vacuums are formed.

Procedure:

1. Position a tray filled with water.
2. Add a few drops of blue food colouring to the water.
3. Add a little alcohol to a beaker, from wall to wall.
4. Ignite the alcohol by bringing a lighter close to it.
5. The glass is immediately placed upside down over the coloured water.
6. You can see how the coloured water in the tray rises, creating a tsunami effect.

Conclusions:

When the alcohol is ignited in the beaker, we are generating an increase in air temperature or a vacuum, that is, a drop in pressure. When we introduce the beaker into the cuvette, the water rises through it, balancing the pressures, both from within, which is the vacuum or the lowest pressure, like the outside pressure, which is atmospheric pressure, and being greater, rises to balance the pressures.

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STEM LESSON 1

Objetivo:

Trabajar el concepto de diferencias de presión y ver cómo se produce el vacío.

Material: bandejas, vasos de precipitados, alcohol, Mecheros, Colorante alimentario azul

Procedimiento:

- ✓ Se coloca una bandeja con agua
- ✓ Se echa unas gotas de colorante alimentario azul sobre el agua
- ✓ Se añade un poco de alcohol a un vaso de precipitados, homogeneizando las paredes
- ✓ Se prende el alcohol acercando un mechero
- ✓ Se coloca inmediatamente el vaso boca abajo sobre el agua coloreada
- ✓ Se observa como sube el agua coloreada de la bandeja provocando un efecto tsunami.

Conclusiones:

Cuando se prende el alcohol en el vaso de precipitados, estamos generando un aumento de temperatura del aire o un vacío, es decir una bajada de presión. Cuando introducimos el vaso de precipitados dentro de la cubeta, el agua sube por él, equilibrando las presiones, tanto de dentro, que es el vacío o la menor presión, como la de fuera que es la presión atmosférica, y al ser mayor, sube para equilibrar las presiones.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 2

TEACHER: Raquel Dionisio

DATE: 18/10/2023

TYPE OF LESSON: SCIENCE

TOPIC: OCEAN CURRENTS

NO. OF STUDENTS: 30

RESOURCES: Tall square or rectangular containers, blue/red food colouring, small plastic cups, tweezers/clips, augers/drills

Aim: Observe the process of ocean currents due to differences in temperature and density.

Procedure:

- ✓ Fill the container with water without filling it to the top.
- ✓ Take 2 small plastic cups and make a hole in the middle, at the bottom of them.
- ✓ The cups are hooked to the top of the container on both sides with clips.
- ✓ Water is heated and red dye is added.
- ✓ We take cold water from the refrigerator and add blue colouring.
- ✓ Add each one to the perforated cups.
- ✓ You can see how the currents are distributed.

Conclusions:

At a global level, the earth's climate is not linear, it is dynamic and in constant movement.

Temperature changes in the sea and this creates currents.

Hot water is less dense and rises and cold water is more dense and falls, creating an ocean current, due to differences in densities.

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The surface of the North Atlantic Ocean is cooled by Arctic winds, and in turn, the Gulf of Mexico Current moves warm water to the northeast. These currents are known as the Oceanic Conveyor Belt.

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STEM LESSON 2

CORRIENTES OCEÁNICAS

Objetivo:

Observar el proceso de las corrientes oceánicas, por diferencias de temperatura y densidad.

Material: Recipientes altos cuadrados o rectangulares**,** Colorante alimentario azul/rojo**,** Vasos plástico pequeños, Pinzas, Barrenas

Procedimiento:

- ✓ Se llena con agua el recipiente sin llenarlo hasta el borde.
- ✓ Se cogen 2 vasos de plástico pequeños y se les hace un agujero en el centro del fondo.
- ✓ Se enganchan los vasos en la parte superior del recipiente a ambos lados con las pinzas.
- ✓ Se calienta agua y se le echa colorante rojo
- ✓ Cogemos agua fría de la nevera y se le echa colorante azul
- ✓ Se añade cada uno en los vasos agujereados.
- ✓ Se observa cómo se distribuyen las corrientes.

Conclusiones:

A nivel mundial el clima de la tierra no es lineal, es dinámico, está en constante movimiento.

Los cambios de temperatura en el mar crean unas corrientes.

El agua caliente es menos denso y sube y el agua fría es más denso y baja, creando una corriente oceánica, por diferencias de densidades.

La superficie del océano Atlántico norte se enfría por los vientos del Ártico, a su vez la corriente del golfo de México mueve el agua caliente al noreste. A estas corrientes, se les conoce como el Cinturón Transportador Oceánico.

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STEM LESSON 3

TEACHER: Raquel Dionisio, Angélica Rodríguez

DATE: 18/10/2023

TYPE OF LESSON: SCIENCE AND MATHS WORKSHOP

TOPIC: ARCHIMEDES' PRINCIPLE, LIQUID DENSITY, OCEAN RESEARCH

NO. OF STUDENTS: 25

ACTIVITY 1 ARCHIMEDES' PRINCIPLE

Aim: Study the Archimedes principle or flotation, the relationship between weight and thrust, with the variation of densities of the liquid.

Material: : eggs, salt, spoons, tall glasses

Procedure:

- ✓ Half a large glass is filled with water
- ✓ An egg is added, and it is observed that it sinks
- ✓ Salt is added to the glass and it is observed that it now floats
- ✓ Now add fresh water to the glass of salt water until the egg stays in the centre.
- ✓ Heat the water and see what happens.

Conclusions:

Archimedes' principle of flotation is based on the relationship between weight (W) and buoyancy (B).

By varying the density of water with salt, it can be observed that:

- ✓ In fresh water the egg sinks W > B
- ✓ In salt water the egg floats B > W

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- ✓ When the densities of the water and the egg become equal, the egg stays in the centre of the water W = B
- ✓ When water is heated, the density of water decreases and the egg sinks; as it cools, the density of the water increases and the egg floats again.

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STEM LESSON 3

PRINCIPIO DE ARQUÍMEDES

Objetivo:

Estudiar el principio de Arquímedes o flotación, la relación del peso y empuje, con la variación de densidades del líquido.

Material: huevos. sal, cucharas, vasos altos

Procedimiento:

- ✓ Se llena medio vaso grande con agua
- ✓ Se echa un huevo, y se observa que se hunde
- ✓ Se va añadiendo sal al vaso y se observa que ahora flota
- ✓ Ahora se va añadiendo al vaso de agua salada, agua dulce hasta conseguir que el huevo se quede en el centro.
- ✓ Se calienta el agua y se observa qué pasa.

Conclusiones:

El principio de Arquímedes de la flotación se basa en la relación del Peso y el Empuje.

Variando la densidad del agua con sal.

Se puede observar que:

- ✓ En agua dulce el huevo se hunde P > E
- ✓ En agua salada el huevo flota E > P
- ✓ Cuando las densidades del agua y el huevo se igualan, el huevo se queda en el centro del agua P = E
- ✓ Cuando se calienta el agua, la densidad del agua disminuye, y el huevo flota y al enfriarse, la densidad del agua aumenta y el huevo vuelve a flotar.

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ACTIVITY 2 LIQUID DENSITY

Bottle of densities

Aim: To study the different densities of liquids, flotation and superposition of immiscible liquids (liquids that can't be mixed).

Material: Alcohol, Olive oil, Water, Tall cropped bottle, Small glass made of glass, Funnel, Pasteur pipette, Food colouring

Procedure:

1. Fill the small glass with oil.

2. Put the glass full of oil in the tall container.

3. Alcohol is carefully added through a funnel along the walls until the glass is covered.

4. Blue coloured water is added with a pasteur pipette very slowly until the oil comes out of the glass and slowly begins to rise.

5. More water is then added with the funnel.

6. Alcohol is added and 3 layers are created.

7. Another dye is added and it is observed that it only dyes the alcohol.

8. More colouring is added until it passes through the oil layer.

Conclusions:

- ✓ The difference in densities of liquids and the immiscibility (can't be mixed) of oil causes layers to overlap.
- ✓ The density of water is 1g/cm 3
- ✓ The density of the oil is approximately 0.85g/cm 3

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- ✓ The density of alcohol is approximately 0.78g/cm 3
- ✓ The water and alcohol mix, but the oil does not. The dyes are miscible in water and alcohol, but not in oil.

<u>DENSIDAD LÍQUIDOS</u> Botella de densidades

Objetivo: Estudiar las distintas densidades de los líquidos, la flotación y la superposición de los líquidos inmiscibles.

Material: Alcohol, Aceite oliva, Agua, Botella alta recortada, Vaso pequeño de cristal, Embudo, Pipeta pasteur, Colorante alimentario

Procedimiento:

- ✓ Se llena el vaso pequeño de aceite
- ✓ Se mete el vaso lleno de aceite en el recipiente alto
- ✓ Se añade alcohol con cuidado a través de un embudo por las paredes hasta cubrir el vaso
- ✓ Se añade agua coloreada de azul con una pipeta pasteur poco a poco hasta que el aceite salga del vaso y suba poco a poco
- ✓ Después se añade más agua con el embudo
- ✓ Se añade alcohol y se crean 3 fases.
- ✓ Se añade otro colorante y se observa que solo tiñe el alcohol.
- ✓ Se añade más colorante hasta atravesar la fase del aceite.

Conclusiones:

- ➢ La diferencia de densidades de los líquidos y la inmiscibilidad del aceite hace que se superpongan por fases
- ➢ La densidad del agua es 1g/cm3
- ➢ La densidad del aceite es 0,85g/cm3 aproximadamente
- ➢ La densidad del alcohol es 0,78g/cm3 aproximadamente
- ➢ El agua y el alcohol se mezclan, pero el aceite no.
- ➢ Los colorantes son miscibles en agua y alcohol, pero no en aceite.

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ACTIVITY 3 DEEP SEA BOTTLE

Aim: Create a bottle simulating the ocean floor.

Material: Small transparent bottles, sunflower oil, fine sand, water, blue food coloring, funnel, sea shells, fish stickers

Procedure:

- ✓ Fill the water bottle with the help of a funnel
- ✓ Add blue food coloring, cover and shake
- ✓ The sand is added with the help of a funnel
- ✓ Add the shells and stones
- ✓ Sunflower oil is added with the help of a funnel until the mixture fills the bottle.
- ✓ The bottle is closed
- ✓ The bottle is carefully laid down until everything settles according to its density.

Conclusions:

An ocean floor is simulated with sand, shells and coloured water, oil is added which does not mix and due to its lower density, it remains above the water; with its viscosity, it gives the appearance of waves when moving the bottle and gives the impression of the sky with the sun's reflection.

BOTELLA FONDO MARINO

Objetivo: Crear una botella simulando el fondo oceánico.

Material: Botellas pequeñas transparentes**,** Aceite girasol**,** Arena fina**,** Agua**,** Colorante alimentario azul**,** Embudo**,** Conchas moluscos**,** Pegatinas de peces

Procedimiento:

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- ✓ Se llena la botella de agua con la ayuda de un embudo
- ✓ Se añade colorante alimentario azul, se tapa y se agita
- ✓ Se añade la arena con con la ayuda de un embudo
- ✓ Se añade las conchas y piedras
- ✓ Se añade aceite de girasol con la ayuda de un embudo hasta completar la botella.
- ✓ Se cierra la botella
- ✓ Se tumba la botella con cuidado hasta que se coloca todo por densidades.

Conclusiones:

Se simula un fondo oceánico con la arena, conchas y agua coloreada, se pone el aceite que no se mezcla y por su densidad menor, se queda por encima del agua y con su viscosidad le da un aspecto de olas al mover la botella y recrea el cielo con el reflejo solar.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 4

TEACHER: Salvador Pons

DATE: 20/10/2023

TYPE OF LESSON: IT - Technology

TOPIC: DESIGN AND BUILD A SUBMARINE

NO. OF STUDENTS: 25

RESOURCES: plastic bottle, syringe, propylene hose, screws, balloons, flanges, glue gun

Goals:

Know the basic concepts of floating a boat and the forces that must be taken into account when designing any floating structure.

To do this, we will base ourselves on Archimedes' principle, through the algebraic calculation of volumes and densities.

The different types of densities of different materials and their importance in today's industry will be analyzed.

- Establish the basic principles of Archimedes: Volume displaced = weight supported.
- Calculate the volume of a regular geometric figure.
- Know the densities of metal, plastic and wood.
- Establish the equilibrium point of an object in an aqueous medium.
- Use of tools for making models: silicone gun, zip ties, etc.

Materials: plastic bottle, syringe, propylene hose, screws, balloons, flanges, glue gun

Procedure:

1. Think about different situations about densities of different materials.

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2. Calculate the area of a bottle.

3. Calculate the weight supported by a plastic bottle for its flotation, with this you can calculate the balance point of a submarine.

4. Assembly of the submarine.

a. To make the external parts of the submarine: rudders and periscope

b. Glue the made parts with silicone.

c. Put the floating balance weight in the bottle.

d. Drill a hole in the bottle to pass the propylene hose and connect them.

e. Connect the balloon to the tip of the propylene hose.

f. Control the volume of the balloon by handling the syringe and achieving the balance point, as well as the surface and immersion manoeuvres.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 4

Diseñar y construir un submarino

Objetivos:

- ✓ Conocer los conceptos básicos de flotación de un barco y las fuerzas que hay que tener en cuenta a la hora de diseñar cualquier estructura flotante.

- ✓ Para ello, nos basaremos en el principio de Arquímedes, mediante el cálculo algebraico de volúmenes y densidades.

- ✓ Se analizarán los distintos tipos de densidades de distintos materiales y su importancia en la industria actual.

1. Establecer los principios básicos de Arquímedes: Volumen desplazado = peso soportado.
2. Calcular el volumen de una figura geométrica regular.
3. Conocer las densidades del metal, plástico y madera.
4. Establecer el punto de equilibrio de un objeto en un medio acuoso.
5. Utilización de herramientas para la fabricación de maquetas: pistola de silicona,
6. bridas, etc.

Materiales: Botella de plástico**,** jeringuilla**,** manguera de propileno**,** tornillos**,** globos**,** bridas, pistola de silicona

Rocedimientos:

1. Pensar y discurrir distintas situaciones sobre densidades de distintos materiales.

2. Calcular el área de una botella.

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3. Calcular el peso soportado por una botella de plástico para su flotación, con eso se Consigue calcular el punto de equilibrio de un submarino.

4. Montaje del submarino

a. Realizar las partes externas del submarino: timones y periscopio

b. Pegar mediante silicona las partes realizadas.

c. Poner el peso de equilibrio de flotación en la botella.

d. Agujerear la botella para pasar la manguera de propileno y conectarlas.

e. Conectar el globo a la punta de la manguera de propileno.

f. Controlar el volumen del globo mediante el manejo de jeringuilla y conseguir el punto de equilibrio, así como las maniobras de salida a superficie e inmersión.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 5

TEACHER: Salvador Pons

DATE: 20/10/2023

TYPE OF LESSON: ICT & TECHNOLOGY

TOPIC: DESIGN AND BUILD A PERICOPE

NO. OF STUDENTS: 25

RESOURCES: Mirrors, Cardboard, Tape, Ruler, Scissors

Aim:

- ✓ Know the basic concepts of light refraction and how it works within a periscope.
- ✓ See the usefulness of a periscope and why it was designed in submarines.
- ✓ Use the Pythagorean theorem to perform algebraic calculations used to obtain rectangular isosceles triangles.
- ✓ Use techniques to measure, cut and glue / construct the periscope.

Materials: Mirrors, Cardboard, Tape, Ruler, Scissors,

Procedure:

1. We will observe how a periscope works and its physical properties.

2. We will obtain the placement angles of a periscope using the Pythagorean theorem

3. We will build a structure to house the mirror.

4. We will calculate the perimeter of an oval using mathematics.

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5. We will cut the main structure of the periscope out of cardboard based on the result obtained by the perimeter.

6. We will mark all the cutting points using rulers and then proceed to cut them.

7. We will assemble and glue its entire structure. and we will play with the constructed object.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 5

Diseñar y construir un periscopio

Objetivos:

- ✓ Conocer los conceptos básicos de de la refracción de la luz y como funciona dentro de un periscopio.
- ✓ Ver la utilidad de un periscopio y porque se diseñó en los submarinos.
- ✓ Utilizaremos el teorema de pitágoras para realizar cálculos algebraicos utilizados para la

obtención de triángulos isósceles rectángulos..

- ✓ Utilizaremos técnicas para medir, cortar, señalar y pegar para la construcción del objeto.

1. Observar e identificar el funcionamiento de un periscopio
2. Establecer los principios del Teorema de Pitágoras.
3. Obtener figuras matemáticas mediante el uso del pensamiento racional.
4. Utilizar las matemáticas para resolver problemas de construcción de objetos.
5. Aprender a marcar, medir y pegar correctamente.

Materiales: Espejos, Cartón, Cinta adhesiva, Regla, Tijeras

Procedimientos:

1. Observaremos cómo funciona un periscopio y sus propiedades físicas.

2. Obtendremos mediante el teorema de pitágoras los ángulos de colocación de un

periscopio

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3. Construiremos una estructura para alojar el espejo.

4. Calcularemos mediante las matemáticas el perímetro de un óvalo.

5. Cortaremos en cartón la estructura principal del periscopio en base al resultado obtenido por el perímetro.

6. Marcaremos todos los puntos de corte mediante la utilización de reglas y posteriormente procederemos al corte del mismo.

7. Montaremos y pegaremos toda la estructura del mismo.

8. Jugaremos con el objeto construido.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

SCHOOL ISTITUTO COMPRENSIVO DI VITTORIO-PADRE PIO, ITALY

STEM ACTIVITIES

LESSON`S PLANS

TEACHERS

FRANCESCO GADALETA

CLAUDIONE MATTEO

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STEM LESSON 6

TEACHERS: Francesco Gadaleta, Claudione Matteo

DATE: 14/03/24

TYPE OF LESSON: TOPIC: How a Steam Engine Works

NO. OF STUDENTS: 24

RESOURCES: these steam engines were fueled by coal.

BIBLIOGRAPHY: Law, Rodney James *James Watt and the Separate Condenser*, London H.M.S.O., 1969.

GENERAL AIMS: The Steam Engine

LESSON N.1 Steam Engine

No. of students 24

Teachers Francesco Gadaleta, Matteo Claudione.

Goals: Show students the motion of a steam engine, which uses the force produced by steam pressure to push a piston back and forth inside a cylinder to convert coal or wood into energy. This pushing force can be transformed, via a connecting rod and a crank, into energy.

Methods: Vision of slides, a short film and an experiment: making an air engine

Materials: 1-4 5cc syringes, Iron wire (15cm) to shape, Pliers and cutters, Pieces of wood prepared with rivets, cutter, sandpaper, plastic straws, dvd

Procedure:

The steam engine uses the force of pressurized steam to generate movement. Heat is typically produced by the external combustion of a fossil fuel such as coal or wood. Since it is not

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possible to burn materials at school, we will try to build a simple engine that will use a fluid, air, blown by us.

Resources: The engines powered by steam increased the ease of operating boats, ships, railways, factories, mills, mines and farms. And these steam engines were fueled by coal.

Bibliography: Law, Rodney James *James Watt and the Separate Condenser*, London H.M.S.O., 1969.

Activity1: The invention and evolution of the steam engine

Students will watch some slides about the invention and evolution of steam engine.

Then they will watch a short film how the steam engine works .

Activity 2: Create a compressed air engine

Take a syringe, remove the black cap to make the plunger slide easily. Then connect an iron wire to a DVD, which will rotate around an iron stick. Glue the end of the syringe to a rubber tube. Through the syringe, push compressed air onto a CD that will be placed on a piece of wood and will rotate on itself pushed by the compressed air of the syringe. This movement is similar to that of a steam engine, which is moved by the heat provided by burnt coal. Here are some examples of steam engines.

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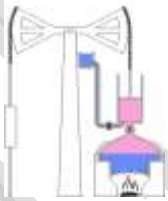
QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

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How it works

The steam engine uses the force of pressurized steam to generate movement. Heat is typically produced by the external combustion of a fossil fuel such as coal or wood.

Video on how it works **https://youtu.be/9mhYnQGZJuM?feature=shared**

In summary, here are the components of this engine:

1. Boiler: Water is heated in a boiler to a very high temperature, until it turns in high pressure steam.
2. Piston: The steam is piped into a cylinder, where it pushes a piston back and forth.
3. Crank and connecting rod: The movement of the piston is transmitted to wheels or other systems to generate rotary motion.

Conclusion

Importance of the steam engine (10 minutes)

The steam engine was one of the most important technological advancements in History, as it made the Industrial Revolution possible.

Activities: Build a model of a steam engine in class.

Since it is not possible to use flames and containers with pressurized fluids at school, we will try to build a simple engine that will use a fluid, air, blown by us.

Here is the link to see how to do it. We will provide assistance.

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Evaluation

Questionnaire on the Steam Engine

1. What were the main modes of transportation on land and sea before the invention of the steam engine?

2. What is a "connecting rod and crank"? What is its function?

3. Hero of Alexandria used steam to build a kind of toy: what was it called? How did it work?

4. Who invented the first steam engine used to pump water out of mines?

5. What role did Thomas Newcomen play in the evolution of the steam engine?

6. What was James Watt's major contribution to the development of the steam engine?

7. Who built the first steam locomotive?

8. Where and when was the first railway in Italy inaugurated?

9. Who built the first steamship? What was it called?

10. Is the steam engine an internal or external combustion engine?

11. In your opinion, why wouldn't it be possible to use a steam engine today?

PROCEDURE: Evaluation/Assessment
Kahoot: How does a steam engine work?

Questions:

1.What is the main source of heat for a steam engine?

A. Solar energy

B. Combustion of fossil fuels

C. Wind energy

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D. Nuclear energy

2. Which part of the steam engine converts the alternative motion of the piston into rotary motion?

A. Boiler

B. Condenser

C. Crank and connecting rod

D. Piston

3. Who invented the first steam engine capable of large-scale application in the extraction of water from mines?

A. Thomas Savery

B. Thomas Newcomen

C. James Watt

D. Richard Trevithick

4. What is the function of the condenser in a steam engine?

A. To heat water

B. To generate steam

C. To convert steam back into water

D. To lubricate the moving parts

5. Which of the following is NOT a component of a steam engine?

A. Boiler

B. Piston

C. Condenser

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D. Turbine

6. Who built the first steam locomotive?

A. Thomas Savery

B. Thomas Newcomen

C. James Watt

D. Richard Trevithick

7. What was the name of the first steamboat?

A. Clermont

B. Savannah

C. Great Eastern

D. Titanic

8. Which invention made the Industrial Revolution possible?

A. The Diesel engine

B. The spinning jenny

C. The cannon

D. The steam engine

9. Who built the first steamboat?

A. Thomas Savery

B. Thomas Newcomen

C. Robert Fulton

D. Richard Trevithick

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10. Which engine worked with low pressure? The engine of…

A. Thomas Savery

B. James Watt

C. Robert Fulton

D. Richard Trevithick

Answers:

1. B 2.C 3. B 4. C 5. D 6. D 7. A 8. D 9. C 10. A

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LESSON N.6 MOTORE A VAPORE

N. 24 studenti

INSEGNANTI: Francesco Gadaleta, Matteo Claudione.

Obiettivi:

Mostrare agli studenti il movimento compiuto dalla macchina a vapore, che usa la forza prodotta dalla pressione del vapore per spingere un pistone avanti e indietro all'interno di un cilindro per convertire il carbone o la legna in eneregia. Questa forza di spinta può essere trasformata, tramite una biella e una manovella in energia.

Methods: Visione di diapositive, un cortometraggio e un esperimento: realizzare un motore ad aria

Materiali:

1. 4 siringhe da 5cc
2. Fil di ferro (15cm) da sagomare
3. Pinze e troncatrici
4. Pezzi di legno predisposti con rivetti
5. taglierina
6. carta vetro
7. cannucce di plastica
8. dvd

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Procedimento: Visione di diapositive, un cortometraggio e un esperimento: realizzare un motore ad aria

Resources: I motori alimentati a vapore hanno reso più semplice la gestione di imbarcazioni, navi, ferrovie, fabbriche, mulini, miniere e fattorie. E questi motori a vapore erano alimentati a carbone.

Bibliography: Law, Rodney James *James Watt and the Separate Condenser*, London H.M.S.O., 1969.

Attività 1: L'invenzione e l'evoluzione del motore a vapore

Visione di slides e di un filmato relativo al motore a vapore.

Attività 2: Creare un motore ad aria compressa

Procedimento

Prendere una siringa, togliere il tappino nero per far scorrere lo stantuffo facilmente. Poi si collega un filo di ferro a un dvd, che ruoterà intorno un bastoncino di ferro . Si incolla la parte terminale della siringa ad un tubicino di gomma, Attraverso la siringa si spingerà dell'aria compressa su un cd che sarà appoggiato ad un pezzo di legno e girerà su se stesso spinto dall'aria compressa della siringa. Questo movimento è simile a quello che svolge un motore a vapore, che è mosso dal calore fornito dal carbone bruciato.

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STEM LESSON 7

ARCHIMEDES' PRINCIPLE:

Goals:

Know the basic concepts of density , the buoyancy principle can also be stated by saying that a body sinks or floats when its density is respectively greater or less than that of the liquid in which it is immersed. To do this, we will base ourselves on Archimedes' principle, through the algebraic calculation of volumes and densities.

Methods: Watching a short video with subtitles about Archimedes' Principle and involving students with experiments.

Materials: A glass cylinder, colored water, oil and alcohol, finally an ice cube

Procedure:

1. Think about different situations about densities of different materials.

2. Calculate the Archimedes' Principle.

3. Show three different situations:

If the weight force is greater than the Archimedes' thrust, then the body sinks.

If the weight force is less than Archimedes' thrust, then the body floats.

If two forces are equal then the body remains in equilibrium in any position within the fluid.

Resources: https://www.youtube.com/watch?v=4tnPfnuY42I

Bibliography: https://www.youtube.com/watch?v=wChr0hCga5g

https://www.britannica.com/science/Archimedes-principle

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Activity 1 Viewing a short film about Archimedes' Principle

description of Archimedes' principle through viewing a short film about Archimedes' principle

Activity 2 Teaching two concepts of density and specific weight with an experiment.

Slowly pour coloured water, oil and finally alcohol into a glass cylinder. Show the three elements that are stratified with different colours, because each has a specific weight.

Then a small ice cube is inserted that has a specific weight intermediate between water and oil.

Students will understand that the ice cube with its specific weight will float on the water but it will be immersed in the oil and alcohol.

Its density is higher than alcohol and oil and the ice cube floats on the water.

The Archimedes Principle:

Tower of liquids (Colored water, Oil, Alcohol)

In this cylinder we have three liquids that have arranged themselves in this way. Why? ***Which is the heaviest?***

In physics, we prefer to say which is the densest, that is, which has the greatest weight if we compare the same volume!

Water is denser than oil, and oil is denser than alcohol.

What might happen if I immerse an ice cube in the tower? What does this mean? Ice is denser than alcohol and oil but less dense than water. Immerse a piece of wax and a piece of polystyrene.

But what happens when we immerse a body in a liquid?

(Experiment with Dynamometer, hanging body and graduated cylinder)

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How much does the hanging object weigh? (write on the board)

How much does the object immersed in the fluid weigh? (write on the board)

The immersed object weighs less than the same object immersed. Why? What has taken away weight from the object? ...The water. So an object immersed in a liquid becomes lighter because it receives a push from the water. How much will this push be? It will be equal to the weight of the liquid displaced!

1.An object will float when the liquid it displaces, as it submerges, reaches a weight equal to the weight of the object itself.

So a ship floats, even though it is made of iron, because it displaces an amount of liquid that has its own weight.

2.So in conclusion what does the Archimedes Principle say?

An object immersed in a fluid, such as water, oil, alcohol but also air, receives a push upwards equal to the weight of the fluid displaced by the object itself.

3.Repeating: an object will float if the weight of the water it can displace is equal to or greater than its weight.

Activity with plasticine and a basin full of water

Take a ball of plasticine and immerse it in water: it sinks. It sinks because it has a higher density than water, just like the metal of ships. Now, however, let's try to shape a cup, a small boat and we will be able to observe that the same amount of plasticine now floats. Why? ….. Because it now displaces a greater amount of water. Try also to see how many coins it can support in addition to its weight…

Conclusion:

In this lesson we learned the Archimedes Principle, which explains how objects float in water. We saw that the upward thrust exerted by the water is responsible for the floating of objects. I hope you enjoyed the paper boat experiment and that you now have a better understanding of this important scientific principle!

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

Questionnaire on Archimedes' Principle

1. In Jules Verne's novel " Around the World in 80 Days " what means of transport did Phileas Fogg use?

2. Which scholar first studied the buoyancy of objects?

a) When and where was he born?

b) What subjects did he study?

c) What else is he remembered for, besides his principle on buoyancy?

3. What famous question did the King of Syracuse ask him, which led him to his discovery about buoyancy?

4. How did he solve the problem?

5. What is the density of a substance?

6. What is the difference between specific weight and density? (These are related concepts, but not the same.)

7. Is hot water or cold water denser?

8. If I hang a non-floating object from a dynamometer and then immerse it in a liquid, what will happen to its weight reading on the dynamometer?

9. Where is it easier to swim, in the sea or in a pool? Why?

10. Which one weighs more, a litre of water or a litre of oil? Explain why?

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Kahoot: Archimedes' Principle (10 Questions)

Introduction:

Hi everyone! Are you ready to test your knowledge of Archimedes' principle? Test your memory in this fun and challenging 10-question Kahoot quiz!

Questions:

1.Who discovered the Buoyancy (Floating) principle?

(A) Archimedes

(B) Pythagoras

(C) Socrates

(D) Plato

2.In which liquid does an object sink easilier, water or oil?

(A) Water

(B) Oil

(C) They are the same

(D) It depends on the object

3.What happens when we immerse an ice cube in a glass of water?

(A) It sinks

(B) It floats

(C) It dissolves

(D) It breaks

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4.Why does an object immersed in a fluid become lighter?

(A) Because the fluid is lighter than air

(B) Because the fluid pushes it upwards

(C) Because the fluid attracts it downwards

(D) Because the object loses mass

5.What is the force that pushes an object immersed in a fluid upwards?

(A) Gravity

(B) Archimedes' force

(C) Friction force

(D) Elastic force

6.What condition allows an object to float?

(A) The weight of the object is equal to the weight of the displaced fluid

(B) The weight of the object is greater than the weight of the displaced fluid

(C) The weight of the object is less than the weight of the displaced fluid

(D) The weight of the object is zero

7.Why does an iron ship float?

(A) Because it is empty

(B) Because it is made of a special material

(C) Because it displaces a large volume of water

(D) Because it is pushed by the wind

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8.What determines whether an object sinks or floats?

(A) Its shape

(B) Its material

(C) Its density

(D) Its color

9.Which experiment demonstrates Archimede's principle?

(A) Spring experiment

(B) Pendulum experiment

(C) ball of plastiline experiment

(D) Inclined plane experiment

10.Which of the following statements is FALSE?

(A) An object which is denser than water, sinks

(B) An object which is less dense than water, floats

(C) Archimedes' force is always equal to the weight of the object

(D) The density of water is greater than the density of oil

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LEZIONE N.7 PRINCIPIO DI ARCHIMEDE:

OBIETTIVO: Applicare Il principio di Archimede, mostrare la relazione tra peso specifico e volume di un corpo. Conoscere i concetti base della densità.

Metodi: Guardare un breve video con sottotitoli sul principio di Archimede e coinvolgere gli studenti con esperimenti.

Materiali: Un cilindro di vetro, acqua colorata, olio e alcol, infine un cubetto di ghiaccio

Procedimento:

1. Pensare a diverse situazioni sulle densità di diversi materiali.

2. Calcolare il principio di Archimede.

3. Mostrare tre diverse situazioni:

Se la forza peso è maggiore della spinta di Archimede, allora il corpo affonda.

Se la forza peso è minore della spinta di Archimede, allora il corpo galleggia.

Se due forze sono uguali, allora il corpo rimane in equilibrio in qualsiasi posizione all'interno del fluido.

Risorse: https://www.youtube.com/watch?v=4tnPfnuY42I

Bibliografia:

https://www.youtube.com/watch?v=wChr0hCga5g

https://www.britannica.com/science/Archimedes-principle

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Attività 1 Visione di un breve filmato sul principio di Archimede

Descrizione del principio di Archimede tramite la visione di un breve filmato sul principio di Archimede

Attività 2 Insegnamento di due concetti di densità e peso specifico con un esperimento.

Versare lentamente acqua colorata, olio e infine alcol in un cilindro di vetro. Mostrare i tre elementi che sono stratificati con colori diversi, perché ognuno ha un peso specifico.

Quindi viene inserito un piccolo cubetto di ghiaccio che ha un peso specifico intermedio tra acqua e olio.

Gli studenti capiranno che il cubetto di ghiaccio con il suo peso specifico galleggerà sull'acqua ma sarà immerso nell'olio e nell'alcol.

La sua densità è superiore a quella dell'alcol e dell'olio e il cubetto di ghiaccio galleggia sull'acqua.

Materiali:

Per l'attività: Asta per sospensioni, dinamometro, oggetto da sospendere, se c'è il cilindro rosso e il suo contenitore trasparente, pezzo di cera, pezzo di polistirolo, Cubetto di ghiaccio

Per l'esperimento: 4 Palline di plastilina, 4 bacinelle, Acqua, monetine

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STEM LESSON 8

How Wind Turbines Generate Electricity

LESSON N.3 Wind turbines

N. of **students** 24 students

Teachers: Mr Francesco Gadaleta, Mr. Matteo Claudione.

Goals:

The primary goal of wind turbines is to convert the kinetic energy of the wind into electrical energy. By leveraging advanced aerodynamic designs, wind turbines maximize energy conversion efficiency while minimizing environmental impact.

Methods: Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.

Materials: electrical circuit, two magnets, fan, a compass, electrical cable.

Procedure:

- ✓ When the wind blows, it pushes the blades, making them turn.
- ✓ The blades are connected to a generator through a shaft. When the blades turn, the shaft turns with them and drives the generator.
- ✓ The generator transforms the movement of the blades into electrical energy.

Bibliography: https://research-hub.nrel.gov/en/publications/wind-energy-bibliography

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Activity1: A direct current electric motor has magnets and an electric circuit inside... if we rotate it, we can get current. If I bring the circuit close to the magnets, nothing happens. But if I move it... I produce electric current.

So: when an electric circuit moves in the vicinity of a magnetic field, an electric current is produced. If I move magnets near a circuit, I get electric current. Attach a fan to the electrical circuit you will see the fan work.

Activity 2: I need a compass. Now I will run electric current through an electrical cable near a compass. The needle moves, so something has produced a magnetic field: the electric current flowing through the electrical cable. This is called the magnetic effect.

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Students will watch a video about Wind Turbines-

Video about the Wind Turbine https://www.youtube.com/watch?v=qSWm_nprfqE

What is electricity?

We have seen how a wind turbine works, but how does it produce electricity? Now we need to understand how electricity is generated.

But what is electricity?

In every atoms (Fig. 1), there are electrons and protons. Electrons have a negative charge, while protons have a positive charge.

In nature, objects have the same number of electrical charges. If they are different, they attract each other. If they are the same, they repel each other.

Procedure:

1. When the wind blows, it pushes the blades, making them turn.
2. The blades are connected to a generator through a shaft. When the blades turn, the shaft turns with them and drives the generator.
3. The generator transforms the movement of the blades into electrical energy.

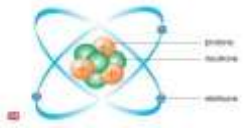

Fig. 1

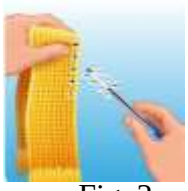

Fig. 2

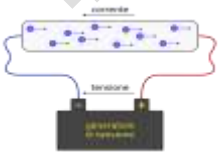

Fig. 3

Fig. 4

Bibliography:

https://research-hub.nrel.gov/en/publications/wind-energy-bibliography.

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Electricity and Wind Turbines: A Kahoot!

Question 1: What tiny particles make up atoms and have a negative charge?

(a) Protons (b) Electrons (c) Neutrons

Question 2: What kind of charge do protons have?

(a) Negative (b) Positive (c) No charge

Question 3: In nature, objects with the same electrical charges tend to...

(a) Attract each other (b) Repel each other (c) Not interact

Question 4: What experiment involves a balloon, hair, and static electricity?

(a) Experiment 1 with balloon and girl

(b) Experiment 2 (the shuttle)

(c) Experiment 3

Question 5: Unlike static charges, electric current is a...

(a) Flow of electrons (b) Stationary charge (c) Positive charge

Question 6: What metal is commonly used for wires that conduct electric current?

(a) Iron

(b) Copper

(c) Aluminum

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Question 7: The magnetic effect is caused by electric current flowing through a wire and can be observed with a...

(a) Compass

(b) Thermometer

(c) Light bulb

Question 8: According to the text, who discovered that electric current can produce a magnetic field?

(a) Alessandro Volta (b) Hans Christian Oersted (c) Marie Curie

Question 9: When a circuit moves near a magnet, what is produced?

(a) Heat (b) Light (c) Electric current

Question 10: In a direct current electric engine, what happens when electricity flows through the circuit?

(a) It heats up

(b) It creates a magnetic field

(c) It produces sound (d) it runs

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LEZIONE N.8 Pale eoliche

N. studenti: 24 studenti

Insegnanti: Francesco Gadaleta, Matteo Claudione.

Obiettivi:

Lo scopo principale delle pale eoliche è di convertire l'energia cinetica del vento in energia elettrica. Sfruttando progetti aerodinamici avanzati, le pale eoliche massimizzano l'efficienza di conversione energetica riducendo al minimo l'impatto ambientale.

Metodi: Le pale eoliche funzionano secondo un principio semplice: invece di utilizzare l'elettricità per produrre il vento, come un ventilatore, le pale eoliche utilizzano il vento per produrre elettricità. Il vento fa girare le pale simili a un'elica di una turbina attorno a un rotore, che fa girare un generatore, che crea elettricità.

Materiali: circuito elettrico, due magneti, ventilatore, una bussola, cavo elettrico.

Procedimento:

- Quando soffia il vento, spinge le pale facendole girare.
- Le pale sono collegate ad un generatore tramite un albero. Quando le pale girano, l'albero gira con loro e aziona il generatore.
- Il generatore trasforma il movimento delle pale in energia elettrica.

Bibliografia: https://research-hub.nrel.gov/en/publications/wind-energy-bibliography

Attività 1: Un motore elettrico a corrente continua ha dei magneti e un circuito elettrico al suo interno... se lo facciamo ruotare, possiamo ricevere corrente. Se avvicino il circuito ai magneti non succede nulla. Ma se lo sposto... produco corrente elettrica.

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Quindi: quando un circuito elettrico si muove in prossimità di un campo magnetico, viene prodotta corrente elettrica. Se sposto i magneti vicino ad un circuito, ottengo corrente elettrica. Collega una ventola al circuito elettrico e vedrai la ventola funzionare.

Attività 2: Ho bisogno di una bussola. Ora farò passare la corrente elettrica attraverso un cavo elettrico vicino a una bussola. L'ago si muove, quindi qualcosa ha prodotto un campo magnetico: la corrente elettrica che scorre attraverso il cavo elettrico. Questo è chiamato effetto magnetico.

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2022-1-RO01-KA220-SCH-000088614

QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

SCHOOL SZKOŁA PODSTAWOWA

NR 2 ZAMOŚĆ, POLAND

STEM ACTIVITIES

LESSON`S PLANS

TEACHERS

PATRYCJA SZOT

BARBARA MAZUR

ANGELICA DZIOCH

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STEM LESSON 9

PLAN 1

TEACHER: Patrycja Szot

DATE: May 23,2024

TYPE OF LESSON: SCIENCE, mixed

TOPIC: Paper Clip Motor

NO. OF STUDENTS: 15

METHODS: Students to be arranged into groups of 4. One kit goes to each group.

RESOURCES:

Materials: Magnet wire (green or red coat work best since students can see contrast after sanding), D cell batteries, C cell batteries, Magnet, Paperclips, Popsicle sticks, Sandpaper, Rubber bands, pennies

GENERAL AIMS: In this activity, students will learn how electric motors work. Students will be introduced to the concepts of energy transfer by assembling a motor that converts electric energy to rotational energy.

Classroom Set-Up

- ✓ Before class: Get instruction pages ready. Cut wire to length (~35in), 1 per student
- ✓ Students should be arranged into groups of 4. One kit goes to each group.

Classroom

- ✓ Introduction (10 minutes): Who are we as a group? Role model introduction How did you get to where you are? What do you do with your school ? What hobbies do you have?

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- ✓ Topic Introduction: What do you know about magnets? What is a motor? Some examples? What is electricity?
- ✓ Learning Experience: How does a motor work (PowerPoint slides)
- ✓ Elicitation: Have the students sketch out how they would create a motor. What components will they need?
- ✓ Assemble the electric motor (PowerPoint slides)
- ✓ Wrap-Up: Sharing Experiences Questions to ask the whole class
- ✓ Elicitation. What do you need to create a motor? What does each component do? Each group can say one component
- ✓ Connections & Close Questions to ask class: How can you make the motor go faster? What could you use the motor for?

Students will:

- ✓ Explore how magnets have poles
- ✓ Learn about magnetic fields
- ✓ Build an electric motor

PROCEDURE: Evaluation/Assessment

oral summary, conversation between teacher leading the lesson, teachers observing the lesson and part-taking students, Kahoot check of the Lesson content

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

PLAN LEKCJI 9

CZAS TRWANIA: 45 min .

CEL

Po ukończeniu tej lekcji uczniowie będą mogli zbudować robota bazowego, połączyć komputera do klocka EV3, a następnie pobrać i uruchomić programy sterujące zachowanie robota .

PREPARAT: Dowiedz się, jak podłączać komputer do klocka EV3. Obejrzyj Programowanie Szybki start wideo w celu uzyskania wskazówek. Rozdaj jeden zestaw EV3 Core Set na dwa, abytrzech uczniów .

OPCJONALNIE: tektura, tekstylia i inne materiały do personalizacji

PROCEDURA

1 . Uczniowie budują robota-nauczyciela robota, korzystając z instrukcji budowania

(dołączonej do zestawu podstawowego 45544) lub zintegrowanego z oprogramowaniem

Instrukcje są dostępne za pośrednictwem łącza Driving Base na stronie drugiej każdego samouczka.

UWAGA: Upewnij się, że wszyscy uczniowie mogą zbudować część modelu podczas ćwiczenia.

OPCJONALNIE:

1.Skutecznym sposobem umożliwienia uczniom przejęcia odpowiedzialności za robota jest aby spersonalizować go za pomocą dodatkowych elementów LEGO® i innych materiałów

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2.Jako klasa przejdźcie przez proces łączenia komputera z klockiem EV3 i uruchomienie pierwszego programu, lub skieruj uczniów do Programming Quick Uruchom wideo, co pomoże im samodzielnie podłączyć urządzenia .

3.Uczniowie używają oprogramowania do programowania, aby tworzyć proste programy, które:

Podczas lekcji uczniowie mogą wchodzić w interakcje z rubrykami Wprowadzenie do robotyki, za pomocą oceny koleżeńskiej lub samooceny i może rejestrować swoje postępy, zaznaczając pole, który najlepiej odzwierciedla ich poziom pracy. Pomóż swoim uczniom doskonalić się, pisząc komentarz do każdego z nich w kolumnie Notatki podczas cyklu lekcji.

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

STEM LESSON 10

TEACHER: Barbara Mazur

DATE: May 23,2024

TYPE OF LESSON:SCIENCE,

TOPIC: Proteins – characteristic reactions and properties of proteins.

NO. OF STUDENTS: 14

METHODS: presentation, experiments

RESOURCES: PowerPoint presentation, laboratory equipment (test tubes, test tube rack, pipette, baguette, beakers), chemical substances and reagents (pigeon feather, cottage cheese, natural yogurt, hydrochloric acid), interactive whiteboard.

BIBLIOGRAPHY: Empiriusz – school application

GENERAL AIMS:

Pupil: 15

1. Knows the concept of characteristic reactions;

2. Can discuss the characteristic reactions of proteins (reaction xanthoprotein);

3.Can design experiments to investigate properties proteins (hydrochloric acid)

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METHODS OF WORKING WITH THE STUDENT

Verbal – serving – talk, mutual learning – What do I already know?Tell your partner, Viewing – guided observation – demonstration – model work, Practical activities – creative action.

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Verbal – serving – talk, mutual learning – What do I already know?Tell your partner, Viewing – guided observation – demonstration – model work, Practical activities – creative action.

ACTIVITY 1: An introduction to proteins. To inform students by giving them a demonstration followed by a practical activity for them to complete. Registration, objectives, risk assessment and set up for practical work.

ACTIVITY 2: Teacher demonstration and student practical: preforming experiments to detect proteins, investigate their properties, split the task into a series of 5 mini spot demonstrations to guide students through the main stages.

PROCEDURE: Evaluation/Assessment

oral summary, conversation between teacher leading the lesson, teachers observing the lesson and part-taking students, Kahoot check of the Lesson content

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QUELQUES VOYAGES EXTRAORDINAIRES FROM JULES VERNE TO STEM

PLAN LEKCJI 10

NAUCZYCIEL: Barbara Mazur

DZIAŁ Z PODSTAWY PROGRAMOWEJ: Substancje chemiczne o znaczeniu biologicznym.

TEMAT: Białka – reakcje charakterystyczne i właściwości białek.

Cele kształcenia:

UCZEŃ:

1.Rejestruje wyniki doświadczeń w różnej formie, formułuje obserwacje,

wnioski oraz wyjaśnienia.

2. Przestrzega zasad bezpieczeństwa i higieny pracy.

Cele lekcji (wymagania szczegółowe).

UCZEŃ:

1. Zna pojęcie reakcji charakterystycznych; ksantoproteinowa);

3.Umie zaprojektować doświadczenia pozwalające zbadać właściwości białek (kwasem solnym)

METODY NAUCZANIA: prezentacja, doświadczenia wykonane na Empiriuszu, doświadczenia chemiczne

FORMY PRACY: indywidualna, grupowa.

MATERIAŁY I ŚRODKI DYDAKTYCZNE: prezentacja Power Point

sprzęt laboratoryjny (probówki, statyw do probówek, pipeta, bagietka, zlewki), substancje i odczynniki chemiczne (pióro gołębie, twaróg, jogurt naturalny, kwas solny), tablica interaktywna.

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STEM LESSON 11

TEACHER: Angelica Dzioch

DATE: May 23,2024

TYPE OF LESSON: **SCIENCE,** introductory

TOPIC: SP Robots – Building and Setup

NO. OF STUDENTS: 15

RESOURCES: EV3 Core Set per two to three students . Optional: cardboard, textiles, and other materials for personalizing the robots, interactive whiteboard, Power Point presentation

BIBLIOGRAPHY: Programming Quick Start Video,

OBJECTIVE: After completing this lesson, students will be able to build the Driving Base, connect

the computer to the EV3 Brick, and download and run programs that control the

robot's behavior .

DURATION 45 mins .

PREPARATION:

Understand the process of connecting a computer to the EV3 Brick . Watch the Programming Quick Start Video for guidance . Distribute one EV3 Core Set per two to three students . Optional: cardboard, textiles, and other materials for personalizing the robots .

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METHODS OF WORKING WITH THE STUDENT

Verbal – serving – talk, mutual learning – What do I already know?Tell your partner, Viewing – guided observation – demonstration – model work, Practical activities – creative action.

PROCEDURE

Students build the Robot Educator Driving Base using the Building Instructions booklet (included with the 45544 Core Set) or the software-integrated Building Instructions available via the Driving Base link on page two of each tutorial .

Note: Ensure that all students get to build part of the model during the activity.

OPTIONAL: An effective way of allowing students to take ownership of their robot is to have them personalize it using additional LEGO® elements and other materials. By doing this, they can turn their robot into a puppy, elephant, or even a fantasy creature .

2 . As a class, go through the process of connecting the computer with the EV3 Brick and running the first program, or direct the students to the Programming Quick , Start Video, which will help them to connect the devices themselves .

3 . Students use the programming software to make simple programs that:

- ✓ Make their robot play a sound that is appropriate to their creature LEGO, the LEGO logo, MINDSTORMS and the MINDSTORMS logo are trademarks of the/sont des marques de commerce du/son marcas registradas de LEGO Group. ©2015, 2016 The LEGO Group. 062615.
- ✓ Make their robot display an image or their own text in the EV3 Brick Display
- ✓ Make their robot flash the Brick Status Light .

DISCUSSION QUESTIONS

ROBOT BEHAVIOR: What problems did you encounter when constructing the

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Driving Base?

Might have used the wrong components in a step and had to go back and change the model, or had difficulty finding parts, especially the smaller ones.

Program Flow: What did you have to do to change either the Sound or Brick

Display image?

Click the top right hand corner of the programming block and select a file.

Discovery: What did you find out when you connected the EV3 Brick to the computer?

- ✓ The EV3 Software asked for a firmware update.
- ✓ You must insert the USB cable the correct way up.

ASSESSMENT

During the lesson, students can interact with the Introduction to Robotics rubrics, using peer or self-assessment, and can record their progress by marking the box that best reflects their level of work . Help your students to improve by writing a comment for each of them in the Notes column during the lesson cycle . LEGO, the LEGO logo, MINDSTORMS and the MINDSTORMS logo are trademarks of the/sont des marques de commerce du/son marcas registradas de LEGO Group. ©2015, 2016 The LEGO Group. 062615

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PLAN LEKCJI 11

CEL

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CZAS TRWANIA 45 min .

PREPARAT

Dowiedz się, jak podłączać komputer do klocka EV3.

OBEJRZYJ

Programowanie Szybki start wideo w celu uzyskania wskazówek. Rozdaj jeden zestaw EV3 Core Set na dwa, aby trzech uczniów .

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"Everything one man can imagine, one day another will achieve."

JULES VERNE

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