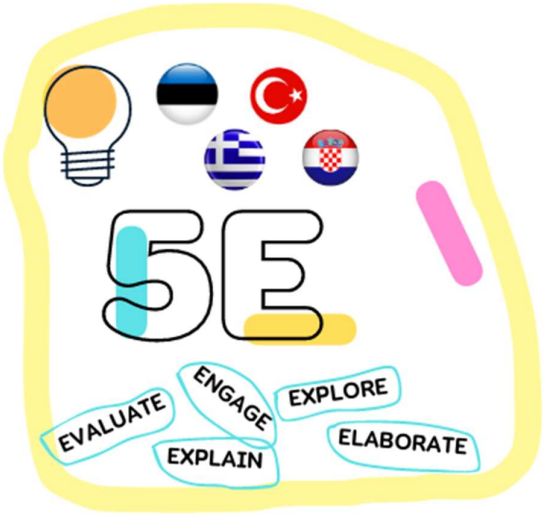
# Implementing the 5E Model




# Erasmus project “Empowering Students and Teachers with Innovative 5E Learning Model (engage, explore, explain, elaborate, evaluate)”

**The lesson plans were created with the use of digital tools during and after the Erasmus course at Cekdev Academy in Turkey**

# Lesson Plan: Chemical Properties of Metals

**Subject:** Chemistry
**Grade Level:** 10th Grade
**Topic:** Chemical Properties of Metals
**Duration:** 60 minutes
**Objective:**
Students will identify and describe the chemical properties of metals and understand how these properties relate to the reactivity of metals in different environments.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Spark curiosity and activate prior knowledge.

- **Prompt Discussion Questions:**
  - "What happens when a metal rusts?"
  - "Why do some metals explode in water, while others do nothing at all?"
- **Visual Prompt:**
  - Show a short (1–2 minute) video clip of sodium reacting explosively with water and copper doing nothing in the same scenario.
  - Ask: *"Why do different metals behave differently?"*

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### 🟢 EXPLORE (10–15 minutes)

**Objective:** Let students investigate metal reactivity through a structured activity.

- **Group Activity: "Predict the Reaction"**
  - Students are given a chart of various metals (sodium, calcium, magnesium, iron, copper) and a list of possible reactions:
    - Reaction with oxygen
    - Reaction with water
    - Reaction with acids
  - In small groups, students **predict** which metals react in each case, and **rank them** in terms of reactivity based on given clues (descriptions, past examples, etc.).
- **Optional (if lab permitted):**
  - Observe teacher demonstrations or conduct a **simulation** of metal reactions with acids and oxygen.

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### 🔵 EXPLAIN (15 minutes)

**Objective:** Build understanding of chemical reactions involving metals.

- **Direct Instruction (slides/board/chart):**
  - Explain key chemical properties of metals:
    - Reactivity with oxygen → formation of metal oxides
    - Reactivity with water → formation of hydroxides and hydrogen gas
    - Reactivity with acids → formation of salts and hydrogen gas
  - Introduce the **reactivity series** of metals.
  - Discuss **signs of chemical reactions**: gas production, heat, color change, etc.
- **Key General Equations:**
  - Metal + Oxygen → Metal Oxide
  - Metal + Acid → Salt + Hydrogen
  - Metal + Water → Metal Hydroxide + Hydrogen (for highly reactive metals)

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## 🟠 ELABORATE (15 minutes)

**Objective:** Apply knowledge in real-world and analytical contexts.

- **Case Study or Scenario Analysis:**
  - *"You are designing a water pipe. Should you use iron, copper, or magnesium? Why?"*
  - *"Why is gold used in electronics even though it's expensive?"*
- **Activity Options:**
  - **Mini-poster or one-pager:** Students create a visual summary of one metal's chemical properties, its place in the reactivity series, and common uses.
  - **Compare and Contrast:** Students create a Venn diagram comparing two metals' chemical behaviors.

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## ⚫ EVALUATE (10 minutes)

**Objective:** Assess student understanding through review and reflection.

- **Exit Ticket / Mini Quiz (4–5 questions):**
  - Multiple choice and short answer:
    1. What gas is released when metals react with acid?
    2. Which metal is more reactive: magnesium or copper?
    3. Write a word equation for iron reacting with oxygen.
    4. Why does sodium react violently with water?
    5. What chemical property allows aluminum to resist rusting?
- **Optional Reflective Question:**
  - "What surprised you the most about metal reactivity?"

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Materials Needed:

- Printed activity charts or digital copies
- Reactivity series reference
- Videos or images of metal reactions
- Quiz/exit ticket handouts
- Optional lab/demo materials if incorporating hands-on elements

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Assessment:

- Group activity participation and predictions
- Completion of the elaborate task (poster, scenario response)
- Exit quiz or reflective responses

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Extensions:

- Research and present on corrosion prevention
- Create a digital slideshow on metal reactivity in everyday life
- Conduct a virtual lab simulation on metal reactions

# Lesson Plan: Structure of the Atom

**Subject:** Chemistry
**Grade Level:** 10th Grade
**Topic:** Atomic Structure
**Duration:** 60–70 minutes
**Objective:**
Students will understand the structure of the atom, identify its subatomic particles (protons, neutrons, electrons), and describe their properties and locations. They will also explore how atomic number and mass relate to these particles.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Spark interest and uncover prior knowledge.

- **Quick Brainstorm / Discussion:**
  - Ask students: *"What do you think atoms are made of?"*
  - Follow-up: *"If atoms are so small, how do scientists even know what's inside them?"*
- **Visual Hook:**
  - Show a zoom-in animation (e.g., from a human body to molecules to atoms) ending with a basic atom model.
  - Ask: *"What do you notice about this model?"*

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### 🟢 EXPLORE (10–15 minutes)

**Objective:** Allow students to discover atomic components through a guided activity.

- **Activity: "Build an Atom" (Interactive or Paper-Based)**
  - Students use either an interactive simulation (like PhET's "Build an Atom") or a worksheet cutout set to:
    - Construct atoms of different elements (e.g., H, He, C, O, Ne).
    - Identify the number and position of protons, neutrons, and electrons.
- **Guiding Prompts:**
  - What changes when we increase the number of protons?
  - What happens when electrons don't match protons?
  - Where do each of the particles go in the atom?

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### 🔵 EXPLAIN (15–20 minutes)

**Objective:** Provide direct instruction and clarify atomic structure.

- **Mini-Lecture or Interactive Notes:**
  - **Subatomic Particles:**
    - Protons (+) – in the nucleus, determine atomic number
    - Neutrons (0) – in the nucleus, contribute to atomic mass
    - Electrons (–) – orbit the nucleus, equal to protons in a neutral atom
  - **Key Concepts:**
    - Atomic number = number of protons
    - Mass number = protons + neutrons
    - Isotopes = same protons, different neutrons
    - Ions = atoms with gained/lost electrons
- **Visual Aids:**
  - Diagrams comparing atoms of hydrogen, helium, lithium
  - Table linking atomic number, mass number, and subatomic particles

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## 🟠 ELABORATE (10–15 minutes)

**Objective:** Deepen understanding and apply knowledge in new ways.

- **Option 1: Create-a-Model Challenge**
  - In pairs, students draw and label atomic models of assigned elements.
  - Must include subatomic particles, charges, and numbers.
  - Bonus: include isotopes or ions for extension.
- **Option 2: Periodic Table Connection**
  - Provide a periodic table and ask:
    - What's the atomic number of oxygen?
    - How many neutrons are in carbon-12?
    - Which elements are likely to form ions?
- **Real-World Connection Prompt:**
  - "Why is understanding atoms important in medicine, energy, or technology?"

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## ⚫ EVALUATE (10 minutes)

**Objective:** Assess understanding and encourage reflection.

- **Exit Ticket / Mini-Quiz:**
  1. What are the three subatomic particles and where are they found?
  2. How is the atomic number of an atom determined?
  3. If an atom has 6 protons and 7 neutrons, what is its mass number?
  4. What is an ion?
- **Reflection Prompt (optional):**
  - *"What was the most surprising thing you learned about atoms today?"*

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Materials Needed:

- Atom model handouts or manipulatives
- Access to periodic tables (physical or digital)
- Slides or board notes on atomic structure
- Internet devices for PhET simulation (optional)
- Exit tickets / quiz slips

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Assessment:

- Participation in model-building or simulation
- Accuracy of atomic drawings or group posters
- Exit ticket or quiz responses

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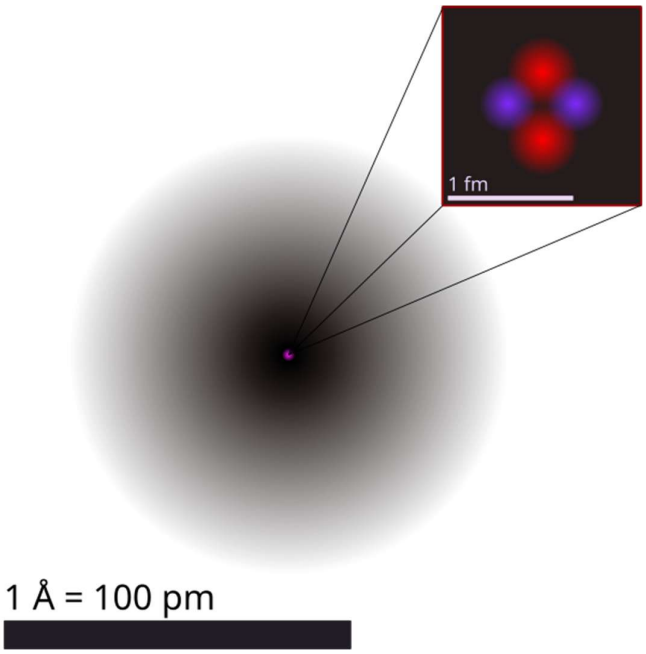
Extensions:

- Research an isotope and its use in real life (e.g., carbon-14, uranium-235)
- Watch and discuss a video on the history of atomic theory (e.g., from Dalton to Bohr)
- Begin introduction to electron shells and energy levels in the next lesson




The Atom

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Helium_atom_QM.svg

# Lesson Plan: Chemical Properties of Acids

**Subject:** Chemistry
**Grade Level:** 10th Grade
**Topic:** Chemical Properties of Acids
**Duration:** 60–70 minutes
**Objective:**
Students will investigate and describe the chemical properties of acids, including their reactions with metals, bases, and carbonates, and will understand the evidence of chemical change.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Spark curiosity and connect to real-world experience.

- **Class Discussion Prompt:**
  - *"What comes to mind when you hear the word 'acid'?"*
  - Show common household products (e.g., vinegar, lemon juice, soda) and ask: *"What do these have in common?"*
- **Quick Demo (Teacher-led):**
  - Drop a piece of magnesium ribbon into a dilute acid (e.g., hydrochloric acid).
  - Ask: *"What do you notice? What do you think is happening?"*

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### 🟢 EXPLORE (15–20 minutes)

**Objective:** Students investigate chemical reactions involving acids.

#### 🧪 Group Lab Activity: "Acids in Action"
Students rotate through **3 investigation stations**, observing and recording evidence of chemical reactions.

**Station 1: Acid + Metal**

- Reaction of hydrochloric acid with magnesium or zinc
- Observe bubbling (hydrogen gas release), temperature change

**Station 2: Acid + Base (Neutralization)**

- Vinegar + baking soda or citric acid + sodium bicarbonate
- Observe fizzing, bubbling, slight temperature change

**Station 3: Acid + Carbonate**

- Hydrochloric acid with calcium carbonate (chalk or marble chip)

- Observe bubbling ($CO_2$ gas), reaction rate

🧤 **Safety Note:** Goggles and gloves must be worn during all experiments.

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## ● EXPLAIN (15 minutes)

**Objective:** Clarify the chemical properties and reactions of acids.

- **Direct Instruction / Guided Notes:**
  - **Key Properties of Acids:**
    - Sour taste (do not taste in lab!)
    - Turn blue litmus paper red
    - React with metals to produce hydrogen gas
    - React with carbonates to produce $CO_2$
    - React with bases to form salt and water
  - **General Word Equations:**
    - Acid + Metal → Salt + Hydrogen gas
    - Acid + Carbonate → Salt + $CO_2$ + Water
    - Acid + Base → Salt + Water (Neutralization)
- Show animations or reaction diagrams to reinforce each type of reaction.

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## 🟠 ELABORATE (10–15 minutes)

**Objective:** Apply learning to new contexts and deepen understanding.

- **Student Task Options:**
  - **Chemical Detective:** Students are given "mystery reactions" with clues (e.g., fizzing, bubbling, gas release) and must identify the type of reaction and the acid involved.
  - **Real-World Link:** Discuss how antacids neutralize stomach acid, or how acid rain affects buildings (carbonate reaction).
- **Periodic Table Connection:**
  - Identify which metals commonly react with acids and why.

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## ● EVALUATE (10 minutes)

**Objective:** Check for understanding through review and reflection.

- **Exit Ticket / Quiz:**
  1. What gas is released when an acid reacts with a metal?
  2. What are the products of a neutralization reaction?
  3. What is observed when an acid reacts with a carbonate?
  4. Write a word equation for hydrochloric acid reacting with calcium carbonate.

5. How can you tell a chemical reaction has occurred?

- **Optional Reflection Prompt:**
  - *"Which reaction surprised you the most today, and why?"*

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Materials Needed:

- Hydrochloric acid (dilute)
- Vinegar, citric acid
- Magnesium ribbon, zinc pieces
- Baking soda, calcium carbonate (chalk)
- Beakers/test tubes, droppers, goggles, gloves
- Litmus paper, observation sheets
- Periodic table (for extension)

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Assessment:

- Lab observation notes
- Accuracy of word equations and reaction identification
- Exit ticket responses
- Participation in discussion and elaboration task

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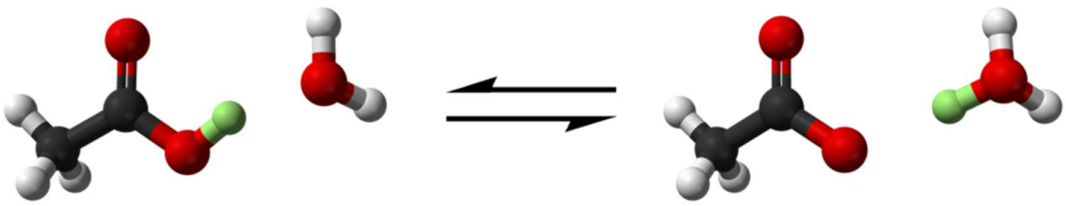
Extensions:

- Research the pH scale and how acidity is measured
- Explore the role of acids in digestion or in industrial applications
- Introduce pH indicators and conduct a mini-lab with red cabbage or universal indicator



Acetic acid

Source: Wikimedia Commons

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# Lesson Plan: Ion Reactions

**Subject:** Chemistry
**Grade Level:** 10th Grade
**Topic:** Ion Reactions (e.g., precipitation, neutralization, gas evolution)
**Duration:** 60–70 minutes
**Objective:**
Students will investigate the chemical properties of ion reactions, identify evidence of chemical change, and write balanced equations for ionic reactions including precipitation and neutralization reactions.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Capture students' interest and connect to prior knowledge.

- **Opening Question:**
  - *"Have you ever mixed two clear liquids and seen a solid suddenly appear? What do you think caused that?"*
- **Demonstration (Teacher-led):**
  - Mix aqueous solutions of **silver nitrate ($AgNO_3$)** and **sodium chloride (NaCl)**. A white **precipitate of silver chloride** forms.
  - Ask students:
    - *"Why did that happen?"*
    - *"Where did the solid come from?"*

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### 🟢 EXPLORE (15–20 minutes)

**Objective:** Guide students in observing and recording ion reactions.

#### 🧪 Lab Investigation: "Mix and Match Ions"

Students mix different combinations of salt solutions in test tubes and observe for:

- Precipitate formation
- Color change
- Temperature change
- Gas formation

**Sample Ion Pairs to Test:**

- $Na_2CO_3 + CaCl_2 \rightarrow$ white precipitate ($CaCO_3$)
- $BaCl_2 + Na_2SO_4 \rightarrow$ white precipitate ($BaSO_4$)
- $HCl + NaOH \rightarrow$ neutralization (no precipitate, temp change)
- $HCl + NaHCO_3 \rightarrow$ gas formation ($CO_2$ bubbles)

🧤 **Safety Note:** Students must wear goggles and gloves during all experiments.

Students fill out a chart for each reaction:

- What was mixed?
- Observations
- Type of reaction (precipitation, neutralization, gas evolution)

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## ● EXPLAIN (15 minutes)

**Objective:** Clarify what ion reactions are and how they behave.

- **Mini-Lecture / Guided Notes:**
  - **Ion Reactions Overview:**
    - Ions in solution interact to form:
      - Insoluble products (precipitates)
      - Gases (e.g., $CO_2$)
      - Water (in neutralization reactions)
  - **Key Concepts:**
    - Solubility rules (basic introduction)
    - Spectator ions and net ionic equations
    - Indicators of chemical change
- **Example Equations:**
  - $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$
  - $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

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## 🟠 ELABORATE (10–15 minutes)

**Objective:** Apply understanding in real-world or analytical contexts.

- **Group Activity: "Ion Detective"**
  - Provide mystery reaction data (e.g., *"A white solid formed when two clear liquids were mixed. The ions present were $Ba^{2+}$ and $SO_4^{2-}$."*)
  - Students must:
    - Identify the likely compound formed
    - Write a balanced net ionic equation
    - Classify the reaction type
- **Real-World Connection Prompt:**
  - *"How do these reactions relate to hard water and water treatment?"*

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## ● EVALUATE (10 minutes)

**Objective:** Assess student understanding and encourage reflection.

- **Exit Ticket / Quiz:**
    1. What is a precipitate?
    2. What are spectator ions?
    3. Write the net ionic equation for the reaction of $AgNO_3$ and NaCl.
    4. What is produced in a neutralization reaction?
    5. How can you tell a chemical reaction has occurred when ions are mixed?
- **Optional Reflection Prompt:**
    - *"Which ion reaction did you find most interesting today, and why?"*

---

Materials Needed:

- Aqueous solutions of:
    - $AgNO_3$, NaCl, $CaCl_2$, $Na_2CO_3$, $BaCl_2$, $Na_2SO_4$, HCl, NaOH, $NaHCO_3$
- Test tubes, droppers, goggles, gloves
- Lab sheets / observation tables
- Whiteboard or slides for notes and examples
- Access to a solubility chart (simplified version)

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Assessment:

- Lab observations and completion of chart
- Net ionic equations from group activity
- Exit ticket responses
- Participation in discussion and elaboration activity

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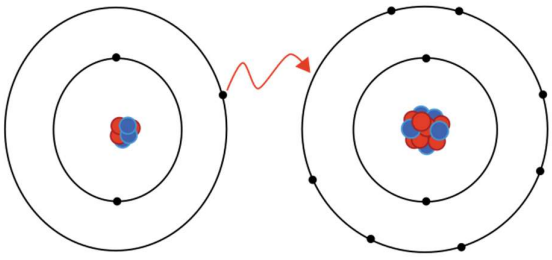
Extensions:

- Explore ionic equations with polyatomic ions
- Introduce titration as a method for analyzing acid-base neutralization
- Research real-life examples of precipitation reactions (e.g., kidney stones, soap scum)



Ionic bonding

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Ionic_bonding.svg

# Lesson Plan: Vertebrates

**Subject:** Biology
**Grade Level:** 7th Grade
**Topic:** Vertebrates
**Duration:** 60 minutes
**Objective:**
Students will be able to identify the five main groups of vertebrates, describe their characteristics, and classify animals based on these traits.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Activate prior knowledge and generate interest.

- **Prompt Discussion:**
  - Show images of a fish, bird, lizard, frog, and a lion.
  - Ask: *"What do all of these animals have in common?"*
  - *"How are they different?"*
- **Quick Activity:**
  - Ask students to name as many animals as they can in 1 minute.
  - Write down the animals and ask students if they think each has a backbone or not.

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### 🟢 EXPLORE (10–15 minutes)

**Objective:** Students investigate the classification of vertebrates through group observation.

### 🧠 Group Activity: "Sort the Vertebrates"

- Provide groups with a set of animal cards (photos and descriptions).
- Students sort the animals into **five vertebrate groups**:
  1. Fish
  2. Amphibians
  3. Reptiles
  4. Birds
  5. Mammals
- Students discuss and justify their choices using clues such as skin type, habitat, reproduction, and body temperature.

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### ⚫ EXPLAIN (15 minutes)

**Objective:** Provide direct instruction to clarify key concepts.

- **Mini-Lecture / Guided Notes:**
  - **Definition of vertebrate:** An animal with a backbone/spinal column.
  - **Characteristics of the 5 groups:**
    - **Fish** – gills, fins, live in water, cold-blooded
    - **Amphibians** – moist skin, live in water and on land, cold-blooded
    - **Reptiles** – dry scaly skin, lay eggs, cold-blooded
    - **Birds** – feathers, lay eggs, warm-blooded
    - **Mammals** – fur or hair, give birth to live young (mostly), warm-blooded
- Use a chart or table to compare the groups visually.

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## 🟠 ELABORATE (10–15 minutes)

**Objective:** Deepen understanding by applying knowledge in new ways.

- **Creative Activity: "Design a Vertebrate Zoo Exhibit"**
  - In small groups, students pick one vertebrate group.
  - They design a zoo exhibit that includes:
    - At least 2 animals from the group
    - Features of their environment
    - A fun fact or adaptation for each animal
  - Students present their exhibit ideas to the class (or post them around the room for a gallery walk).
- **Optional Extension:**
  - Use a virtual zoo tour (e.g., San Diego Zoo or Smithsonian Zoo) to identify vertebrates.

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## ⚫ EVALUATE (10 minutes)

**Objective:** Assess student understanding and allow reflection.

- **Exit Ticket Questions:**
  1. Name all 5 groups of vertebrates.
  2. What is one way reptiles and amphibians are different?
  3. What makes an animal a vertebrate?
  4. Name a warm-blooded vertebrate.
  5. Which group do humans belong to, and why?
- **Optional Reflection Prompt:**
  - *"If you could be any type of vertebrate, which would you be and why?"*

---

Materials Needed:

- Animal cards or printed images
- Large poster paper or whiteboards for zoo exhibit design

- Markers, glue, scissors (if using cut-and-paste cards)
- Guided notes sheet or Venn diagram (optional)
- Exit tickets

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Assessment:

- Accuracy of sorting activity
- Participation in zoo exhibit creation and presentation
- Exit ticket responses
- Observation during discussion and group work

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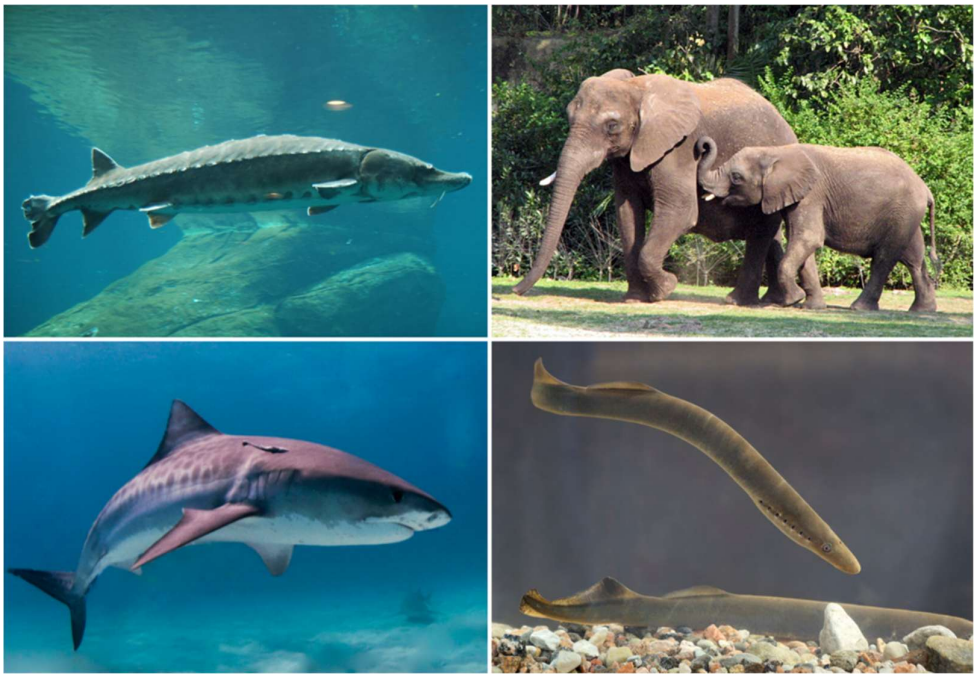
Extensions:

- Explore **invertebrates** and compare with vertebrates
- Watch a short documentary clip on animal classification
- Introduce the concept of endoskeleton vs exoskeleton



Examples of vertebrates

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Vertebrata_002.png

# Lesson Plan: Photosynthesis

**Grade Level**: 9–10
**Duration**: 45–60 minutes
**Topic**: Photosynthesis
**Objective**: Students will understand the process of photosynthesis, including the reactants, products, and its importance in the ecosystem.

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### 🧠 1. Engage (5–10 minutes)

**Objective**: Capture students' interest and assess prior knowledge.

**Activity**:

- Ask students:
  *"Have you ever wondered how plants eat without a mouth?"*
  Show a short, intriguing video or animation clip (1–2 minutes) that visually shows leaves "breathing" or responding to sunlight.

**Discussion Prompts**:

- What do plants need to survive?
- Where do they get their energy from?

**Materials**: Projector, video clip, whiteboard

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### 🔍 2. Explore (10–15 minutes)

**Objective**: Allow students to investigate and build curiosity.

**Activity**:
Hands-on experiment or virtual simulation:

- **Leaf Disc Lab**: Students place spinach leaf discs in a bicarbonate solution under light. Discs will float as oxygen is produced during photosynthesis.

**Steps**:

- Punch leaf discs from spinach.
- Put them in a syringe with sodium bicarbonate solution, remove air.
- Place under light source and time how long it takes for them to float.

**Alternative (no lab)**: Use a virtual lab simulation like from PhET or ExploreLearning.

**Materials**: Leaf discs, sodium bicarbonate, water, syringes, light source, stopwatch

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### 📘 3. Explain (10–15 minutes)

**Objective**: Clarify the scientific concepts using evidence and vocabulary.

**Teacher Input**:

- Go over the **chemical equation** of photosynthesis:
  $6CO_2 + 6H_2O + \text{light} \rightarrow C_6H_{12}O_6 + 6O_2$
- Explain the roles of chlorophyll, sunlight, water, and carbon dioxide.
- Use diagrams to show the parts of the plant involved (leaf, chloroplast, stomata).

**Vocabulary**: Photosynthesis, chloroplast, chlorophyll, stomata, glucose, carbon dioxide, oxygen

**Materials**: Slides, diagrams, notes handout

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### 🔬 4. Elaborate (10 minutes)

**Objective**: Extend learning to real-world applications and connections.

**Activity Options**:

- Discuss how photosynthesis relates to the **carbon cycle**.
- Group discussion: *"What would happen if photosynthesis stopped globally?"*
- Extension: Students research how photosynthesis efficiency impacts agriculture.

**Materials**: Articles, internet access, group discussion sheet

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### ✅ 5. Evaluate (5–10 minutes)

**Objective**: Assess student understanding in multiple ways.

**Formative Assessment**:

- **Exit ticket**: 3–2–1 strategy
  - 3 things you learned
  - 2 things that surprised you
  - 1 question you still have

**Summative Options**:

- Quiz with multiple-choice and short-answer questions.
- Draw and label the photosynthesis process with key components.

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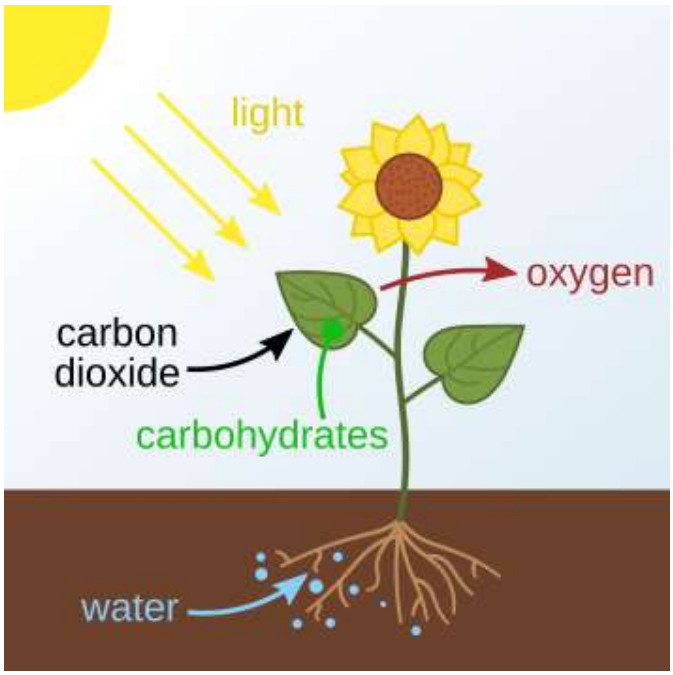
**Differentiation / Modifications**

- **Visual learners**: Diagrams, videos, and simulations
- **Kinesthetic learners**: Lab experiment
- **Struggling learners**: Graphic organizers and sentence starters
- **Advanced learners**: Research on photosynthesis in algae or artificial photosynthesis




Photosynthesis

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Photosynthesis_en.svg

# Lesson Plan: Area of a Triangle

**Subject:** Mathematics
**Grade Level:** 6th Grade
**Topic:** Area of a Triangle
**Duration:** 60 minutes
**Objective:**
Students will understand and apply the formula for finding the area of a triangle using base and height, and recognize how it relates to the area of a rectangle.

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### 🟡 ENGAGE (10 minutes)

**Objective:** Spark curiosity and link to prior knowledge.

- **Warm-Up Discussion:**
  - Show a rectangle and a triangle with the same base and height.
  - Ask: *"Which one do you think has a larger area? Why?"*
- **Real-Life Connection:**
  - Show images of triangle-shaped things (roofs, signs, slices of pizza, sails).
  - Ask: *"How would you find the area of a triangular surface like this?"*

---

### 🟢 EXPLORE (10–15 minutes)

**Objective:** Encourage hands-on discovery and pattern finding.

**✂ Activity: "Cut and Compare"**

- Give students a sheet with a rectangle and a triangle that share the same base and height.
- Students cut out the shapes and compare them.
- Ask:
  - *"Can we fit the triangle into the rectangle?"*
  - *"What fraction of the rectangle is the triangle?"*

➞ Students discover that the triangle is **half the area of the rectangle**.

---

### 🔵 EXPLAIN (15 minutes)

**Objective:** Introduce and clarify the formula for the area of a triangle.

- **Direct Instruction:**

    - Show how to calculate the **area of a rectangle**:
      Area = base × height
    - Then introduce the **triangle formula**:
      Area = ½ × base × height
- **Model Examples:**
    - Walk through a few examples with varying base and height values.
    - Emphasize **height is the perpendicular line from base to top** — not always the side of the triangle.
- Students complete a couple of guided practice problems with you on the board.

---

🟠 **ELABORATE (10–15 minutes)**

**Objective:** Deepen understanding through application and creativity.

- **Practice Activity: "Triangle City"**
    - Students are "architects" designing triangular plots of land.
    - Provide triangles with different dimensions on graph paper.
    - Students measure base and height (or are given the values), then calculate area for each plot.
    - Optional: Add a challenge triangle that is rotated or slanted to test their identification of base/height.
- **Real-World Task:**
    - Calculate how much paint/fabric/tile would be needed to cover a triangular area using their new skills.

---

🔴 **EVALUATE (10 minutes)**

**Objective:** Assess understanding through independent practice and reflection.

- **Exit Ticket / Mini-Quiz:**
    1. What is the formula for the area of a triangle?
    2. Find the area of a triangle with base 8 cm and height 5 cm.
    3. What happens if you use the side length instead of the height?
    4. True or False: The area of a triangle is always less than the area of a rectangle with the same base and height. Explain.
- **Optional Reflection:**
    - *"What was one thing that helped you understand triangle area today?"*

---

Materials Needed:

- Scissors, rulers
- Pre-printed rectangle and triangle cutouts
- Graph paper or blank paper
- Colored pencils or markers

- Triangle Area worksheet
- Exit tickets

---

Assessment:

- Accuracy of cut-and-compare activity
- Completion and correctness of guided practice problems
- Participation in “Triangle City” activity
- Exit ticket responses

---

Extensions:

- Introduce different types of triangles (scalene, isosceles, obtuse) and discuss if the formula still applies.
- Challenge problems with missing height or solving for base given the area.
- Integrate coordinate plane geometry: find area from vertices on a grid.

# Lesson Plan: Language Families

**Subject:** World Languages / Social Studies / Linguistics/ Estonian Language
**Grade Level:** 10th Grade
**Topic:** Language Families
**Duration:** 60 minutes
**Objective:** Students will be able to define what a language family is, identify major language families, and recognize connections between languages within the same family.

---

**ENGAGE (10 minutes)**

**Objective:** Spark curiosity and connect to prior knowledge.

- **Activity:** Show a short video clip or map animation demonstrating how languages have spread and evolved over time.
- **Discussion Prompt:**
  - "Why do some languages sound similar?"
  - "Have you ever noticed that some words in different languages look or sound alike?"
- **Hook Question:**
  "What do Italian, Spanish, and French have in common — and how might they be 'related'?"

---

**EXPLORE (15 minutes)**

**Objective:** Allow students to investigate language families through interaction.

- **Group Activity:**
  - Divide students into small groups.
  - Give each group a **language family (e.g., Indo-European, Uralic, Afro-Asiatic, Sino-Tibetan, Niger-Congo, etc.)**.
  - Provide each group with:
    - A mini fact sheet
    - A few words in different languages from that family
  - **Task:** Identify commonalities in the vocabulary, sound patterns, or regions.
- **Share-Out:** Each group shares one interesting pattern or observation with the class.

---

**EXPLAIN (10 minutes)**

**Objective:** Provide formal definitions and consolidate learning.

- **Teacher Presentation:**
  - Define a *language family* and explain how languages evolve from a common ancestor (*proto-language*).
  - Introduce key families: Indo-European, Uralic, Sino-Tibetan, Afro-Asiatic, Dravidian, Austroasiatic, etc.
  - Use a **language family tree** diagram to illustrate how modern languages stem from ancient roots.
- **Examples:**
  Show how Latin evolved into Romance languages (Spanish, French, Italian, etc.).

---

**ELABORATE (15 minutes)**

**Objective:** Deepen understanding and apply learning in new contexts.

- **Activity Options (choose one):**
  1. **Language Family Tree Project:** Students create a visual family tree for a language family.
  2. **"Guess the Family" Game:** Display unknown words and ask students to guess their family based on similarity.
  3. **Language Detective:** Provide simple phrases in related languages and have students deduce the connections.
- **Discussion:**
  "How does understanding language families help us understand history and migration?"

---

**EVALUATE (10 minutes)**

**Objective:** Assess understanding and retention.

- **Quick Quiz (exit ticket style):**
  - Define "language family."
  - Name two major language families.
  - Identify which family English belongs to.
  - True/False: Swahili and Mandarin belong to the same language family.
- **Reflection Prompt (Optional):**
  "What surprised you the most about language families today?"

---

Materials Needed:

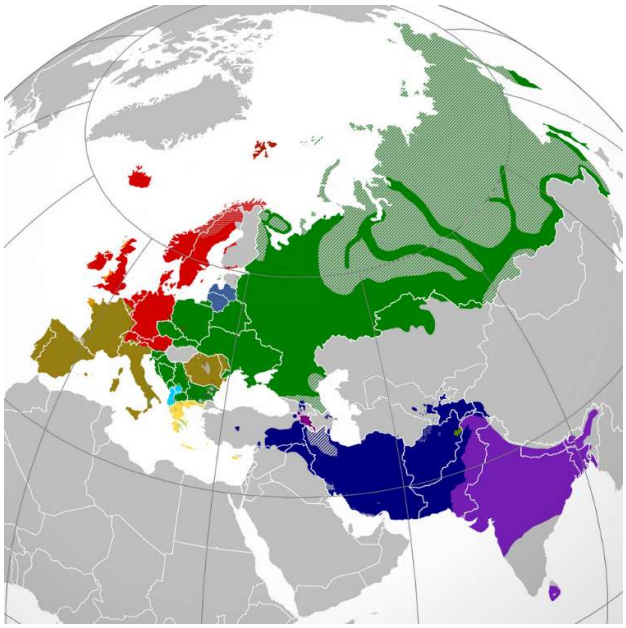
- Language family tree handouts or visuals
- Fact sheets and vocabulary samples
- Projector or screen for video
- Markers, chart paper (for group activities)

Assessment:

- Group participation and presentation
- Quiz responses
- Engagement in discussion and group work

Extension Ideas:

- Students research their own family's spoken language(s) and trace its origins
- Explore endangered language families or revitalization efforts
- Compare dialects within a single language and discuss divergence



The Indo-European Language Family

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Indo-European_Language_Family_Branches_in_Eurasia.png

# Lesson Plan: The Passive Voice (for ESL students)

**Subject:** English as a Second Language
**Grade Level:** 9th Grade
**Topic:** Passive Voice in English Grammar
**Duration:** 60 minutes
**Objective:** Students will be able to identify, understand, and create basic passive voice sentences in the present and past simple tenses.

---

**ENGAGE (10 minutes)**

**Objective:** Activate interest and prior knowledge using real-life context.

- **Visual Warm-Up:**
  Show pictures of different actions (e.g., a cake being baked, a house being painted, a letter being delivered).
- **Ask students:**
  - *"Who is doing the action?"*
  - *"What is happening in the picture?"*
  - Use one image to model:
    - Active: "The chef bakes the cake."
    - Passive: "The cake is baked by the chef."
- **Quick Poll or Thumbs Up/Down:**
  - Ask: "Is this sentence active or passive?" with examples on the board.

---

**EXPLORE (10 minutes)**

**Objective:** Let students notice patterns in passive sentences.

- **Group Matching Activity:**
  - Provide sentence strips: half in active voice, half in passive.
  - Students work in pairs to **match active with passive sentences**.
  - Use color coding: subjects (blue), verbs (green), objects (yellow).
- **Debrief Questions:**
  - What changes do you see?
  - Where is the verb? What happens to the subject?

---

**EXPLAIN (15 minutes)**

**Objective:** Teach the grammar structure clearly and with support.

- **Mini Lesson with Visuals and Chart:**

    - Structure: **Object + BE (am/is/are or was/were) + past participle (V3)**
        - *The door is opened.*
        - *The door was opened.*
- **Use visuals and sentence frames:**
    - *The ___ is/was + [past participle] + by ___.*
    - Focus only on **present simple** and **past simple** for now.
- **Verb Support:**
    - Provide a **past participle verb list** with pictures (e.g., eaten, built, cleaned).

---

**ELABORATE (15 minutes)**

**Objective:** Provide supported practice in real-life contexts.

- **Choose one or more of the following activities:**
    1. **Transform the Sentence:**
        - Students receive simple active sentences (e.g., "Maria writes a letter.") and rewrite them using a guided structure in passive form.
    2. **Classroom Actions Game:**
        - Perform or mime simple classroom actions (e.g., drop a book). Students describe using passive voice: *"The book was dropped."*
    3. **Passive Voice Bingo:**
        - Give students a bingo card with past participle verbs. Read passive voice sentences aloud. They mark the verb they hear.

---

**EVALUATE (10 minutes)**

**Objective:** Check for understanding and provide feedback.

- **Mini Quiz (visual or text-based depending on level):**
    - Choose the correct passive form.
    - Convert active to passive using sentence frames.
    - Identify if a sentence is active or passive.
- **Exit Ticket:**
    - Sentence starter: *"The homework __ (do) by the students."*
        - Ask them to fill in the correct passive form.

---

Materials Needed:

- Picture flashcards of actions
- Sentence strip sets (active/passive)
- Passive voice structure chart
- Bingo cards with past participles
- Colored markers or sticky notes
- Verb chart with pictures and translations (optional)

Assessment:

- Observation during activities
- Correct matching and sentence transformation
- Mini quiz results and exit ticket

Differentiation / Language Support:

- Provide **sentence frames** and **word banks**
- Allow use of **first language dictionaries**
- Use **visuals** and **gestures**
- Allow peer pairing with stronger language partners

Extension Ideas:

- Students write 3–5 passive sentences about their school or home life.
- Watch a short video (like a cooking show) and write passive sentences based on actions (e.g., “The onions are chopped”).

# Lesson Plan: The Estonian Parliament (Riigikogu)

**Subject:** Civics / Government / Social Studies
**Grade Level:** 11th Grade
**Topic:** The Structure and Role of the Estonian Parliament
**Duration:** 60 minutes
**Objective:** Students will understand the structure, functions, and responsibilities of the Estonian Parliament, including its role in the democratic process.

---

**ENGAGE (10 minutes)**

**Objective:** Spark curiosity and make real-world connections.

- **Warm-Up Discussion:**
  - Ask: *"Who makes the laws in Estonia?"*
  - Prompt students to share what they already know about the Riigikogu.
  - Display an image of the Estonian Parliament building and ask:
    - *"What do you think happens here?"*
- **Hook Video or News Clip:**
  - Show a short, recent video (1–2 mins) or news headline involving the Riigikogu (e.g., a debated law or decision).

---

**EXPLORE (10 minutes)**

**Objective:** Let students discover how the parliament functions through guided investigation.

- **Group Activity: "Parliament Puzzle":**
  - Divide students into small groups.
  - Give each group different pieces of info (e.g., elections, committees, roles of members, law-making process).
  - Each group summarizes their piece and presents it to the class.
- **Visual Aid:** Use a **simple diagram of the parliamentary process** to help students piece together the overall structure.

---

**EXPLAIN (15 minutes)**

**Objective:** Clarify key concepts with teacher-led instruction.

- **Direct Teaching + Slides or Handout:**
  - **Definition:** Riigikogu = Estonia's unicameral parliament (101 members).
  - **Key Functions:**
    - Making laws

        - Approving the budget
        - Supervising the executive
        - Electing key officials (President, Chancellor of Justice, etc.)
    - **Structure:**
        - Elected every 4 years by proportional representation
        - Includes various **committees** (e.g., Foreign Affairs, Finance)
        - Speakers and leadership roles
- **Real-Life Example:**
    - Briefly walk through how a law becomes official in Estonia (proposal → readings → vote → president's approval).

---

**ELABORATE (15 minutes)**

**Objective:** Deepen understanding by applying knowledge.

- **Simulation Activity: "You Are the Parliament":**
    - Students take on roles (e.g., MPs from different parties, Speaker of the Riigikogu).
    - Present a fictional bill (e.g., banning phones in schools or increasing youth mental health funding).
    - Hold a **mini parliamentary debate and vote**.
- **Optional Extension:** Assign party platforms to students based on real Estonian political parties.

---

**EVALUATE (10 minutes)**

**Objective:** Assess comprehension through reflection and practice.

- **Exit Quiz (5 questions):**
    - Multiple choice & short answer:
        - What is the Riigikogu?
        - How many members does it have?
        - Name one responsibility of the Riigikogu.
        - What type of electoral system is used?
        - What is one committee in the parliament?
- **Reflection Prompt:**
    - *"Why is the Riigikogu important in a democracy?"*

---

Materials Needed:

- Projector or screen
- Printed info cards for Explore activity
- Simulation role cards and fictional bill
- Parliament structure handout or slide

- Mini quiz/exit ticket

Assessment:

- Participation in group and simulation activities
- Exit quiz answers
- Understanding shown in group presentations and debate

Extensions:

- Assign students to research current members of the Riigikogu.
- Write a reflection or short opinion piece about a recent Estonian law.
- Plan a field trip or virtual tour of the Riigikogu building.

Riigikogu Session Hall

Source: Wikimedia Commons

URL: https://commons.wikimedia.org/wiki/File:Riigikogu_(2011).jpg

# Lesson Plan: Ancient Israel

**Subject:** History
**Grade Level:** 6th Grade
**Topic:** Ancient Israel – History, Beliefs, and Legacy
**Duration:** 60 minutes
**Objective:** Students will understand the origins, culture, and significance of Ancient Israel, including key figures, beliefs, and contributions to later civilizations.

---

**ENGAGE (10 minutes)**

**Objective:** Capture student interest and activate prior knowledge.

- **Warm-Up Questions (Think-Pair-Share):**
  - "Have you heard of the Ten Commandments?"
  - "What do you know about ancient religious groups or civilizations?"
  - "Why do some cultures or beliefs last for thousands of years?"
- **Visual Hook:**
  - Show a map of the ancient Near East with Ancient Israel highlighted.
  - Ask: "What do you think life was like for people living here thousands of years ago?"

---

**EXPLORE (10 minutes)**

**Objective:** Allow students to investigate Ancient Israel through hands-on and group activities.

- **Group Rotation Stations (choose 2–3 based on time):**
  1. **Artifact Station:** Photos of scrolls, pottery, or ancient Hebrew writing.
  2. **Map Station:** Trace the journey of Abraham or the Exodus route on a map.
  3. **Story Station:** Excerpt from a simplified version of a Bible story (e.g., David and Goliath or Moses).
- **Guiding Questions:**
  - What can we learn from this object or story?
  - What does it tell us about Ancient Israel?

---

**EXPLAIN (15 minutes)**

**Objective:** Build foundational knowledge of Ancient Israel with teacher-guided instruction.

- **Mini-Lecture with Visual Aids/Slides:**
  - Origins: Abraham and the covenant

    - Key Figures: Moses, King David, King Solomon
    - Sacred Texts: Torah and the Hebrew Bible
    - Beliefs: Monotheism, justice, law (e.g., Ten Commandments)
    - Kingdoms and Division: Israel and Judah
    - Diaspora and legacy in modern religions
- **Key Vocabulary Words:**
  *Covenant, monotheism, Torah, exile, prophet, synagogue*

---

**ELABORATE (15 minutes)**

**Objective:** Help students apply knowledge in a creative and reflective way.

- **Choice Activity (students pick one):**
    1. **"Life in Ancient Israel" Journal Entry:**
        - Write a short diary entry as a child living in Ancient Israel.
        - Include aspects like religion, family, daily life, or a festival.
    2. **Create a Timeline:**
        - Students create a visual timeline including major events like Abraham's journey, Moses and the Exodus, reign of King David and Solomon.
    3. **Symbol Design:**
        - Create a symbol that represents the beliefs or values of Ancient Israel (e.g., justice, faith, community).

---

**EVALUATE (10 minutes)**

**Objective:** Check understanding and allow for reflection.

- **Exit Ticket:**
    - 3 multiple-choice or short-answer questions:
        1. Who led the Israelites out of Egypt?
        2. What is one belief that made Ancient Israel unique?
        3. What is the name of the Jewish holy book?
- **Reflection Prompt:**
    - *"What is one thing you learned today that surprised you about Ancient Israel?"*

---

Materials Needed:

- Map of the ancient Near East
- Printed images of artifacts and texts
- Timeline templates and coloring supplies
- Exit tickets or quiz slips
- Visuals/slides for mini-lecture
- Handouts with key vocabulary

Assessment:

- Participation in station and group activities
- Completion of elaborate task (journal, timeline, or symbol)
- Responses on exit ticket

Extensions:

- Read a children's version of a Bible story and discuss its moral/message
- Compare Ancient Israel to another ancient civilization (e.g., Egypt or Mesopotamia)
- Watch a short video on the Ten Commandments or life in ancient times


Kingdoms of Judah and Samaria in the 9th century BCE

Source: Wikimedia Commons

URL:
https://commons.wikimedia.org/wiki/File:Kingdoms_of_Israel_and_Judah_map_830.svg

# Lesson Plan: Public Sector Economics

**Subject:** Economy/civics
**Grade Level:** 12th Grade
**Topic:** Public Sector Economics
**Duration:** 60 minutes
**Objective:** Students will understand the role of the public sector in the economy, including its functions, revenue sources, expenditures, and implications for economic stability and growth.

**Engage (10 minutes)**

1. **Introduction to Public Sector:** Begin with a brief discussion on what students understand about the public sector. Prompt them with questions like:
    - What is the role of government in the economy?
    - How does the government raise money?
    - Why does the government spend money?
2. **Current Events Discussion:** Present a current event related to public sector economics (e.g., government budget, taxation policy). Discuss its relevance and impact on the economy.

**Explore (15 minutes)**

3. **Concept Exploration - Functions of Public Sector:**
    - **Teacher-Led Presentation:** Introduce the functions of the public sector (e.g., provision of public goods, redistribution of income, regulation).
    - **Group Activity:** Divide students into groups. Assign each group a function of the public sector to research and present its importance and examples.

**Explain (10 minutes)**

4. **Revenue and Expenditure:** Explain how the government generates revenue (taxation, borrowing, etc.) and how it allocates expenditure (social services, infrastructure, defense). Discuss:
    - Types of taxes (direct vs. indirect)
    - Budget allocation process
    - Impact of fiscal policy on the economy

**Elaborate (15 minutes)**

5. **Case Study Analysis:** Provide a case study (e.g., a government policy decision) and ask students to analyze its economic implications. Encourage:
    - Critical thinking about costs and benefits
    - Discussion on stakeholder perspectives
    - Predictions on economic outcomes

**Evaluate (10 minutes)**

6. **Quiz or Discussion:** Conduct a brief quiz or discussion to assess understanding:
    - Multiple-choice questions on public sector functions
    - Scenario-based questions on fiscal policy impact

- Open-ended questions on economic implications of government decisions

**Conclusion (optional, remaining time)**

7. **Wrap-Up:** Recap the key points discussed during the lesson. Allow students to ask questions or share reflections on their learning.

**Homework (optional):**

- Research a government policy or initiative and write a short essay on its economic impact.

**Materials Needed:**

- Whiteboard and markers
- Handouts or access to online resources
- Case study materials

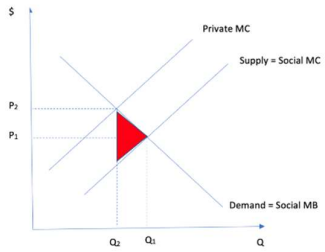
**Assessment:**

- Participation in group activities
- Quiz performance
- Quality of case study analysis

**Extensions:**

- Invite a guest speaker (e.g., economist, government official) to discuss real-world applications.
- Conduct a simulation of budget allocation to demonstrate fiscal decision-making.

This lesson plan aims to engage students actively in understanding public sector economics through exploration, explanation, elaboration, and evaluation, fostering a deeper understanding of government's role in the economy.




Positive production externality

Source: Wikimedia Commons

URL:
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