Electron Transport Chain Activity: ATP Production in Mitochondria

Middle School (NGSS Aligned) Teacher Guide

Overview

This guide supports implementation of the Electron Transport Chain Activity: ATP Production in Mitochondria using the 5E instructional model.

Learning Objectives

- Students will model how cells make ATP energy
- Students will explain why we need oxygen to live
- Students will identify what makes energy production faster or slower

Standards Alignment

- **MS-LS1-7:** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism
- **SEP:** Developing and Using Models
- **DCI:** LS1.C: Organization for Matter and Energy Flow in Organisms
- **CCC:** Energy and Matter

Prerequisites

- Understanding that cells need energy
- Basic knowledge of mitochondria

Time Estimate

15 minutes

Materials Needed

- Computer with internet access
- Student Activity Sheet

Teaching Tips by Phase

Phase 1: ENGAGE (5-10 minutes)

- Start with the phenomenon or problem presented
- Elicit student predictions and prior knowledge
- Create cognitive dissonance if possible
- Build excitement for investigation

Phase 2: EXPLORE (15-20 minutes)

- Allow students to investigate with minimal guidance
- Circulate and ask probing questions
- Encourage systematic data collection
- Note common discoveries and difficulties

Phase 3: EXPLAIN (10-15 minutes)

- Have students share their findings first
- Build on their observations to introduce concepts
- Address misconceptions directly
- Connect to broader biological principles

Phase 4: ELABORATE (10 minutes)

- Apply knowledge to new scenarios
- Make real-world connections
- Encourage deeper investigation
- Support transfer of learning

Phase 5: EVALUATE (5-10 minutes)

- Use varied assessment strategies
- Focus on conceptual understanding
- Provide immediate feedback
- Plan follow-up based on results

> **Remember:**
>
> The goal is student discovery through guided inquiry. Resist the urge to explain concepts before students have explored them!
