



TOPIC: HUMAN MUSCULAR SYSTEM

SUBJECT: BIOLOGY

LEVEL/AGE: 2nd grade/13-14 YEARS OLD

FORE KNOWLEDGE: Human Skeleton (2nd grade), Mitochondrion, Cellular respiration, Carbohydrates and energy (1st grade)

LENGTH: 5 PAGES (DURATION : 90 MIMUTES)

LEARNING OUTCOMES

At the end of this lesson, the students should know:

- The biological role of the muscular system
- The structure and function of skeletal muscles
- The relation of oxygen to energy and motion
- The cooperation of the muscular system with the respiratory and circular system
- Performance-enhancing drugs/Doping
- Nutrition and exercise are the main factors for the good health of the muscular system



RESOURCES

Educational software,
plastic model of muscle,
PowerPoint presentation,
microscope

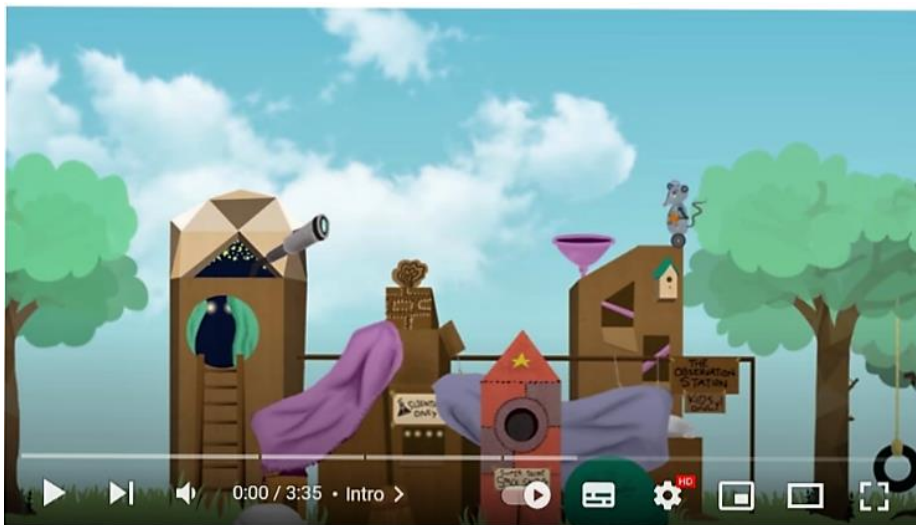
TEACHING METHODS

Lecture course, microscopic observation, videos,
worksheets

ACTIVITIES

INTRODUCTION (5 minutes)

The lesson starts with an animation video, "[How do our bodies move?](#)" by SciShow Kids.



The video emphasizes the cooperation of the muscular and skeleton systems, named the musculoskeletal system and nervous system, to produce voluntary movement.

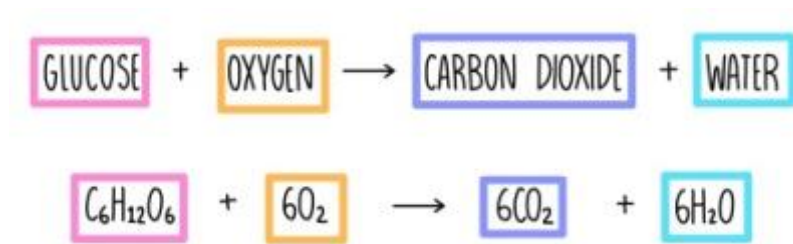
THEORY PART (20 minutes)

We mainly focus on skeletal muscles, muscle fibre and the actin-myosin interactions to muscle contraction. We use the microscope to observe the alternative light and dark actin-myosin bands on slides, which make the muscle look striped or striated. We also use the plastic model to learn about the shape and the structure of a muscle and the tendons. For a better understanding, we watch a video about the human muscular system, "[Muscular system 101 – The human muscular system and types of muscles](#)" by Free School.

HANDS-ON PART (40 minutes)

1st activity (20 minutes): The students work on [BioDigital Human](#) which is an interactive 3D software platform for visualizing anatomy. They choose the muscular system (female/male) and they can manipulate it (zoom in/out, rotate, paint, extract or fade the organs, search for information).

2nd activity (10 minutes): We recall the process of cellular respiration and the need for oxygen for energy production from the degradation of glucose molecules. We emphasize the equation of cellular respiration, which is the most essential process in organisms.

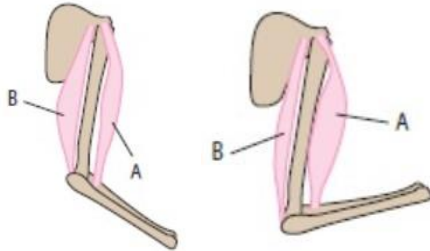


We watch the video with the title: ["What happens inside your body when you exercise?"](#) by the British Heart Foundation.

3rd activity (10 minutes): Initiated by a WADA (World Anti-Doping Agency) spot ["Who we are"](#), we get informed on free-doping sports. Using a PowerPoint presentation, we learn and discuss the harmful effects of drugs on athletes' health.

EXERCISE PART (15 minutes)

1. THE FOLLOWING PHOTOS SHOW US 2 OPPOSITE MOVEMENTS OF THE ELBOW JOINT, EXTENSION AND FLEXION, RESPECTIVELY.



DESCRIBE THE FUNCTION OF THE A AND B MUSCLES IN BOTH CASES.

2. CIRCLE THE RIGHT ANSWER.

A. AFTER AEROBIC EXERCISES, WE EAT:

1. LETTUCE 2. CUCUMBER 3. BREAD

BECAUSE WE NEED TO:

1. REPLACE THE AMOUNT OF GLYCOGENE 2. HYDRATE OUR BODY 3. INCREASE THE PROTEIN LEVEL

B. IF WE WANT FOOD RICH IN PROTEINS TO EMPOWER OUR MUSCLES, WE EAT:

1. EGGS 2. VEGETABLES 3. RED MEAT

C. WHICH OF THE FOLLOWING DISORDERS REFER TO MUSCLES?

1. FRACTURE 2. CRAMP 3. ARTHRITIS

AND WHEN IT HAPPENS, WE NEED TO CONSUME:

1. WATER 2. SUGAR 3. SALT

CONCLUSION (5 minutes)

Check the right answers - Students' assessment.

SYNTHESIS/SUMMARY (5 minutes)

Important meanings - Keywords

Skeletal muscles, muscle fibres, cellular respiration, energy, doping, nutrition, aerobic exercise, muscle contraction and movement.

BIBLIOGRAPHY

- SciShow Kids. (2015, June 16). *How do our bodies move?* [Video]. YouTube. <https://www.youtube.com/watch?v=j918PoWWaB0>
- Free School. (2021, January 23). *Muscular System 101 - The Human Muscular System and Types of Muscles - FreeSchool 101* [Video]. YouTube. <https://www.youtube.com/watch?v=Q0keyWVR0b4>
- BioDigital. (n.d.-b). *Human Anatomy and Disease in Interactive 3D | BioDigital Human Platform*. BioDigital 2020. https://human.biodigital.com/view?id=production/maleAdult/male_system_muscular_18&lang=en
- British Heart Foundation. (2017, April 3). *What happens inside your body when you exercise?* [Video]. YouTube. <https://www.youtube.com/watch?v=wWGulLAa000>
- World Anti-Doping Agency. (n.d.). *Who we are*. World Anti Doping Agency. <https://www.wada-ama.org/en/who-we-are>