

TEACHING THE TOPIC "BIOGENIC ELEMENTS AND THEIR IMPORTANCE IN THE HUMAN BODY" TO SCHOOLCHILDREN USING THE CASE STUDY METHOD*Tilewova Gulzira Bazarbay kizi**KSU, 2- year Master Student*

Abstract : This article explores the implementation of the **case study method** in teaching the topic “Biogenic Elements and Their Importance in the Human Body” to schoolchildren. By engaging students with real-life scenarios, such as health-related issues caused by element deficiencies, educators can promote deeper understanding, critical thinking, and active participation. The method allows students to connect theoretical knowledge of elements like iron, calcium, iodine, and others with practical health and nutrition concerns. This learner-centered approach proves especially effective in biology and health science education, fostering curiosity and long-term retention of material.

Keywords: biogenic elements, case study method, human body, science education, schoolchildren, active learning, teaching biology, health and nutrition, macroelements, microelements, iron deficiency, educational methods

Biogenic elements are chemical elements essential for the structure and functioning of all living organisms, including humans. These elements, such as carbon, hydrogen, oxygen, nitrogen, calcium, phosphorus, and iron, play critical roles in biological processes—from building DNA and proteins to enabling muscle function and oxygen transport. Understanding their functions is vital for schoolchildren as part of biology and health education, helping them connect the science they learn in the classroom to their own well-being. However, teaching this topic using traditional lecture-based methods may result in passive learning and a lack of engagement.[1,23] Students may memorize facts without fully understanding how these elements affect their health and daily life. To address this, educators can implement the **case study method**—a student-centered, problem-solving approach that uses real-life situations to spark interest and encourage deeper understanding.

This method is especially effective for middle and high school students, as it develops their ability to analyze information, work in teams, and make evidence-based decisions. By presenting students with health-related cases involving biogenic elements, such as iron deficiency anemia or calcium loss in bones, teachers can guide them to explore the importance of nutrition, body function, and disease prevention in an interactive and meaningful way. The aim of this article is to demonstrate how the case study method can be applied to teach biogenic elements effectively in school, enhancing both scientific literacy and critical thinking skills.[2,33]

Teaching scientific topics like biogenic elements in a meaningful and engaging way requires creative, student-centered approaches. Students often find it difficult to connect abstract biological or chemical concepts to their everyday lives. Therefore, effective teaching of this topic should aim not only to deliver factual content but also to help learners understand the relevance of these elements to their own health and well-being. Below are several pedagogically sound methods that can be used to effectively teach this topic to schoolchildren, especially in middle and secondary school settings.

The case study method places students in the role of problem-solvers. Instead of passively receiving information from the teacher, students are given real-life or hypothetical scenarios that involve a biological issue or health problem related to a deficiency or imbalance of a biogenic element. The students must work in groups to analyze the case, identify the underlying biological issue, research the necessary information, and propose solutions. For example, students might be presented with a case involving a teenager who is constantly tired and has pale skin. Through guided questions, they discover that the individual likely has iron deficiency anemia, and they investigate the role of iron in oxygen transport and energy production.[3] This allows students to apply their knowledge, understand the human body's dependence on trace elements, and see how a simple nutrient deficiency can have wide-reaching effects. The case study method develops critical thinking, collaboration, and the ability to apply theoretical knowledge in practical, real-world contexts. It also fosters empathy and health awareness, encouraging students to take more interest in their own nutrition and wellness.

Concept mapping is a visual tool that helps students organize and relate information. Students create diagrams that show the relationships between different biogenic elements, their biological functions, the systems or organs they affect, the symptoms of deficiencies, and food sources. For example, a student might start with the central concept "Biogenic Elements" and branch it out to "Macroelements" and "Microelements." From "Calcium," a line might lead to "Bones," "Teeth," "Muscle Contraction," and "Blood Clotting." Another branch might lead to "Deficiency → Osteoporosis." [4,45] This method supports long-term retention and understanding by encouraging students to actively process and link pieces of information. It's especially helpful for visual learners and promotes higher-order thinking skills by illustrating how different pieces of the biological puzzle fit together.

Role-playing can be a powerful way to bring the content to life. Students can be assigned roles such as a doctor, nutritionist, patient, or scientist. For example, one student plays a doctor explaining to a patient why they need more iodine in their diet to prevent thyroid issues, while another plays the patient who asks questions about their symptoms and treatment options. This approach builds communication and empathy while reinforcing content knowledge in an interactive and fun way. It also encourages shy students to participate in class by giving them a structured and creative format to express themselves.[5,21] Role-playing is especially effective in teaching the health implications of biogenic element deficiencies, making the science personal and relatable.

If the school has access to a science lab, practical demonstrations and experiments can greatly enhance students' understanding of biogenic elements. While some elements (like oxygen or iron) can be directly observed or inferred through simple experiments, others may

be illustrated through analogies or models. A classic and simple example is the “Iron in Cereal” experiment. Students crush fortified cereal, mix it with water, and use a magnet to extract visible iron particles—clearly demonstrating the presence of iron in everyday food. Teachers might also use bone models or simulations to show how calcium and phosphorus contribute to bone density. Hands-on learning engages students’ senses and curiosity, helping them to internalize scientific principles in ways that lectures alone often cannot. It also reinforces scientific inquiry skills, such as observation, hypothesis testing, and analysis.

In conclusion, incorporating methods such as the case study approach transforms the learning environment. It turns science education into an interactive journey of discovery, where students are not just learners, but investigators, problem-solvers, and future caretakers of their own health. Empowering students with this knowledge equips them not only to succeed in exams but to lead informed, healthy, and responsible lives.

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