DIDACTIC POTENTIAL OF INTERDISCIPLINARY INTEGRATION IN TEACHING AMINO ACIDS

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This thesis explores the didactic potential of interdisciplinary integration in teaching the topic of amino acids in secondary school chemistry. Considering the complex and biofunctional nature of amino acids, their instruction requires not only chemical explanation but also biological, ecological, and health-related contextualization. The study analyzes how integrating chemistry with biology, health education, and environmental sciences enhances conceptual understanding, critical thinking, and applied knowledge. The proposed integrative approach promotes meaningful learning and strengthens students' scientific literacy. In contemporary education, the shift from fragmented knowledge transmission to integrated and competency-based learning has become a priority. Amino acids represent a key interdisciplinary concept connecting organic chemistry, biochemistry, nutrition, and life sciences. However, in many curricula, the topic is taught primarily from a structural and theoretical perspective [1].

The purpose of this study is to identify and substantiate the didactic opportunities of interdisciplinary integration in teaching amino acids and to develop methodological recommendations for organizing integrative chemistry lessons at the secondary education level. The findings of the study can be applied in lesson planning, curriculum development, and teacher training programs. The integrative model offers concrete instructional strategies, including context-based tasks, project-based learning activities, and collaborative inquiry methods. These approaches facilitate deeper understanding of molecular structure, biochemical functions, and real-life applications of amino acids in nutrition, medicine, and environmental processes. The novelty of the research lies in the systematic pedagogical justification of interdisciplinary integration specifically for the topic of amino acids. Unlike traditional approaches focused mainly on structural formulas and classification, the proposed model connects chemical theory with biological function and societal relevance. The study also introduces structured integrative tasks designed to develop analytical reasoning and cross-disciplinary transfer skills[2].

Interdisciplinary integration significantly enhances the teaching and learning of amino acids by moving beyond isolated chemical definitions and turning abstract concepts into meaningful, functional, and applicable knowledge. When amino acids are taught through connections with biology, nutrition science, and health education, students are able to understand not only what amino acids are (structure, functional groups, classification), but also why they matter (protein synthesis, enzyme activity, metabolism, balanced diet, medical relevance). This contextualization makes learning more coherent and helps students build strong conceptual links between molecular structure and biological function. Moreover, the integrative approach supports deeper conceptual understanding by encouraging students to compare, interpret, and explain phenomena using evidence from multiple disciplines. For example, discussing essential and non-essential amino acids within the context of nutrition and physiology strengthens students' ability to reason about cause–effect relationships, apply chemical principles to biological processes, and interpret real-life cases such as dietary deficiency, muscle growth, or metabolic disorders. At the same time, interdisciplinary tasks—such as analyzing food labels, designing a balanced nutrition plan, or modeling peptide bond formation promote active participation and increase student engagement through inquiry-based and problem-oriented learning. Finally, implementing an interdisciplinary model in chemistry education contributes to the formation of holistic thinking and higher-order skills, including critical thinking, scientific argumentation, and cross-disciplinary transfer. Students learn to view scientific knowledge as an interconnected system rather than separate topics, which directly supports the development of scientific literacy. As a result, learners become better prepared to apply their knowledge in complex real-world situations, make informed decisions related to health and environment, and communicate scientific ideas using clear, evidence-based explanations.

References

1. National Research Council. (2012). A framework for K–12 science education: Practices, crosscutting concepts, and core ideas. The National Academies Press.
2. Cooper, M. M., Corley, L. M., & Underwood, S. M. (2013). An investigation of college chemistry students' understanding of structure–property relationships. Journal of Research in Science Teaching, *50*(6), 699–721.