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Enhancing Interdisciplinary Learning in Chemistry through Python Programming: A Focus on Molecular Biology Concepts

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Abstract

This work explores the integration of Python programming into chemistry education to strengthen interdisciplinary relationships with biology, particularly in the context of molecular biology concepts. Traditional chemistry classes often lack sufficient coverage of nucleic acid and protein biosynthesis, leading to challenges in understanding genetic information transfer. Python programming is an innovative approach to addressing this gap, offering students the opportunity to simulate, visualize and analyze various biological processes in DNA. Interactive learning environments and project-based activities allow students in both disciplines to develop computational skills, while collaborative projects promote inter-disciplinary interactions and teamwork, fostering a holistic understanding of biological phenomena. Integrating Python programming into the teaching of chemistry not only enhances students' comprehension of complex molecular processes but also equips them with valuable computational tools essential for modern scientific research. The methodology was verified in practice with ten teachers over two school years (2019 – 2021), with teachers expressing their opinions through an electronic feedback questionnaire. The results of the questionnaires were evaluated to determine whether the methodology is in line with the educational program and with set academic goals, and whether the tasks develop knowledge at higher levels of Bloom's taxonomy. Teachers praised the methodology for its ability to develop skills such as critical thinking, cooperation, and argumentation, but also identified students' initial unfamiliarity with the method as a problem, although students were interested in solving such tasks and enjoyed the new approach.

Keywords: cross-discipline; interactive learning; nucleic acid; protein biosynthesis; feedback