Tactile Models and Games as Learning Tools for Topics of Molecular and Cell Biology

Nelma Regina Segnini Bossolan
Instituto de Física de São Carlos, Universidade de São Paulo (IFSC-USP)

The cell structure and the dynamics of its functioning are basic topics for the understanding of phenomena on a larger scale in living organisms and for which research in science teaching has suggested several strategies based on the use of images, games, computational simulations and tactile models, among other types of external representations. Our science education research group, over the last 17 years, has developed and evaluated educational materials for teaching these topics, aimed at all levels of school. Among these materials, we highlight the tactile models for the assembly of nucleic acid, amino acids and proteins molecules, as well as a board game that deals with the process of protein synthesis. These materials were evaluated with students from the final grades of elementary and high school, in the context of the Natural Sciences Curriculum of the State of São Paulo, as well as students from two higher level courses, one of them Licentiate’s program in Exact Sciences. Activities were planned with a problem-solving approach and carried out in small groups. Tactile models of nucleic acid aided elementary students in understanding the role of these molecules in the transmission of hereditary traits. The game of protein synthesis, which depicts this process in a schematic eukaryotic cell where the participants aim to synthesize a particular protein, promoted the development of skills such as “decision making” and “making anticipations” among high school students, in addition of expanding their knowledge about the biological functions of these molecules. The tactile models of amino acids and proteins used by students of higher education promoted their spatial perception of these molecules, allowing the prediction of intra- and intermolecular interactions. It is important to emphasize the importance of these educational resources in the construction of more functional mental models of cells and of intracellular processes.

Keywords: tactile models, mental model, DNA, protein, science teaching, rule-based game

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