

The use of bioinformatics tools for teaching genetics via inquiry

Hadas Gelbart

Advisor: Anat Yarden

Providing learners with opportunities to engage in activities similar to those carried out by scientists was addressed in a learning environment in genetics developed for high school biology students. The learning environment enables learners to apply their genetics knowledge, while giving them an opportunity to participate in a simulation of an authentic genetics research using bioinformatics tools. Using both qualitative and quantitative methodology approaches we were able to show that learning using the simulation enabled students to expand their genetics understanding. While using the tools and procedures, and recognizing the research heuristic used by geneticists in revealing gene function, students expanded their understanding of the relationships between molecular mechanisms and phenotype, and refined their understanding of certain genetic concepts. In a laboratory setting, two types of learners, Research-oriented and Task-oriented, were identified on the basis of the differences in the ways they seized opportunities to recognize the research practices, which in turn influenced their learning outcomes. The Research-oriented learners expanded their genetics knowledge more than the Task-oriented learners. In addition, the learning approach taken by the Research-oriented learners enabled them to recognize the epistemology that underlies authentic genetic research, while the Task-oriented learners referred to the research simulation as a set of simple procedural tasks. Thus, Task oriented learners should be encouraged by their teachers to cope with the scientists' steps, while learning genetics through the environment in a class setting. We are currently studying the challenges high school biology teachers face when enacting the simulation in their classrooms. Especially we focus on the teaching strategies of one of the teachers (a case study). This study can contribute to our understanding of the instructional tools and appropriate support that are needed for students in order to generate knowledge in a certain discipline in a way that better approximates the way geneticists generate knowledge in the discipline.