

# **Demonstration of a game-like simulation of a complex biological system, the immune system, designed to help learners integrate fragmentary knowledge**

Brian Kahn  
United Nations International School  
New York, New York, USA  
bkahn@unis.org

Software that allows learners to integrate fragmentary knowledge has a powerful role in education. This is especially true in science and medicine, where complex models of systems and processes are taught to students, but invariably leave many students with only a partial understanding of what they should know. Only when they can apply their understanding to a challenging and preferably exciting task does the integration of this knowledge into a full understanding take place. Game-like simulations of complex systems, such as the immune system, fulfill this requirement. In this simulation, students are engaged by the dynamic display of constantly moving cells and information, and the need for active intervention. The session will provide an opportunity for ED-MEDIA Conference participants to explore the effectiveness of this strategy for consolidating student knowledge and understanding.

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A good example of a complex system would be the immune system, in which many cell types interact through a variety of surface molecules and diffusible chemical signals.

Software will be demonstrated that allows students to experiment with different combinations of sequences of interactions between the cells of the immune system so as to defeat one of three selectable diseases: smallpox, cholera or tuberculosis. The state of the system is continuously displayed, and extensive on-screen feedback is provided for both right and wrong choices.

The learner can try different strategies for defeating the diseases, except where HIV enables opportunistic diseases to overwhelm the immune system in untreated HIV+ individuals, when the disease cannot be defeated.

The software, *ImmuneWorkshop*, has been trialed both at New York University and with students at the United Nations International School in New York.

The instructor can determine the level of difficulty by the choice of questions that are put to the student. In this way, a student with an elementary knowledge of the immune system can be asked relatively straightforward questions, while a student with a more sophisticated knowledge can be asked more difficult ones. Depending on the level of the question, the student can select the type and amount of information to be shown on the screen.

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