'Disease Science Investigators' take on D.C. epidemic

November 14 2013, by Tiffany L Trent

Characters from the Disease Science Investigators game.

For the first time, young scientists can help contain a disease outbreak in Washington, D.C.—in a game, that is.

Disease Science Investigators: DC, known as DSI:DC for short, guides students through the steps of identifying and containing a disease outbreak in Washington, D.C., through a CSI: Crime Scene Investigation-like scenario. In the virtual environment of the game, players must take samples and conduct lab tests to determine the origin of the outbreak and

advise the mayor and other city officials about next steps.

Guides for teachers and users are available with an investigators' manual online with the game.

Science, technology, engineering, and mathematics (STEM) are all important to the game. Knowledge of pre-algebra, algebra, biology, and populations and ecosystems are all specifically needed to play. The primary goal is for middle school students to study infectious diseases, computational modeling, and STEM disciplines via the engaging medium of video games, a preferred method of play for many youth.

"DSI:DC was developed to leverage what we know about good game design and interest-driven learning. Several educational researchers claim that good game design equals good learning, in that challenges are attuned to players' skills, contextualized feedback is provided to improve performance, and rewards are given for persistence in the face of complexity and ambiguity," said Michael A. Evans, an associate professor in the Department of Learning and Technologies at Virginia Tech. "Interest-driven learning tells us that when youth are able to make connections between personally meaningful preferences and academic tasks, they are more likely to succeed."

Evans said DSI:DC is distinguished from comparable, game-based learning projects because players interact with an actual computational model of infectious diseases as opposed to a fictional story line.

"The potential to introduce middle and high school youth to topics such as infectious diseases and computational modeling in this type of learning environment could advance research and practice in STEM education and computational thinking," Evans said.

Developed as part of the Models of Infectious Disease Agent Study

program and funded by the Office of Science Education of the National Institutes of Health, DSI:DC brought together a team of researchers from the Virginia Bioinformatics Institute; the Department of Learning Sciences and Technologies; the Institute for Creativity, Arts, and Technology; and game development company Persistent. The goal was to create a fun, interactive learning environment that will help students understand how epidemiologists deal with potential disease outbreaks.

"The game engine is based on an interactive state-of-the-art infectious disease modeling environment called 'indemics.' It is designed to execute on large parallel clusters like the Shadowfax (supercomputing hybrid server) at the Virginia Bioinformatics Institute," said Madhav Marathe, deputy director of the Network Dynamics and Simulation Science Laboratory at the institute. "Indemics provides game players with a rich set of game moves and interventions. Indemics is capable of supporting the evolution of DSI:DC to a massively multiplayer online game in the near future."

DSI:DC was funded as part of the Models of Infectious Disease Agent Study, a collaboration of research and informatics groups to develop computational models of the interactions between infectious agents and their hosts, disease spread, prediction systems, and response strategies. The models will be useful to policymakers, public health workers, and other researchers who want to better understand and respond to emerging infectious diseases. If a disease outbreak occurs, the network may be called upon to develop specific models to aid public officials in their decision-making processes.

In addition to being helpful in educating middle school students, DSI:DC has applications that extend into public health policy.

"DSI:DC is an interactive game built on advanced high performance computing based simulations of epidemic processes," said Chris Barrett,

scientific director at the institute. "Although the initial target application is for middle and high school students, DSI:DC can be adapted for training policy analysts in the use of sophisticated epidemic planning tools. Over the near term, we will be looking to commercialize this technology for other similar applications."

DSI:DC was funded as part of the National Institutes of Health's National Institute of General Medical Sciences MIDAS Grant 3U01FM070694-09S1. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Provided by Virginia Tech