

Learning: No longer a textbook case

May 2 2011, By Alicia Roberts



Wake Forest biology professor Dan Johnson reviews learning nodes on an iPad with student Rebecca Perry.

Switching from rigid, linear textbooks to technology such as iPads alone won't boost student performance – so a team of Wake Forest researchers has turned the classroom upside down, allowing students to tailor each course to their own learning style.

This project, supported by extensive research and emerging technology, puts the power of [learning](#) into the hands of students and snatches traditional textbooks right out of their backpacks.

“Students don't read textbooks – study after study has shown that,” said Dan Johnson, a senior lecturer in biology. “And even if a student completes a reading assignment, the text doesn't promote deep understanding and long-term retention. It facilitates memorization. So why are we still using them?”

This new way of teaching works for a variety of different learning styles. It also better engages students who have learning difficulties such as dyslexia or other processing disorders, who have long struggled with the traditional lecture-and-reading assignment model. Under this new structure, students can access dozens of pieces of information, from text to videos to quizzes to interviews with experts. That supplemental information ensures better understanding and engagement.

The research team, which includes Johnson, Associate Professor of Physics Jed Macosko and Assistant Professor of Education Kristin Redington Bennett, has received a \$249,348 grant from Next Generation Learning Challenges, a program run by Educause and financed largely by the Bill & Melinda Gates Foundation. Working in close collaboration with their strategic technology partner, Odigia, the team will spend the next several months building out the system it has designed and the next two years testing it further in the classroom.

This is a digital tool – but don't call it an e-textbook. The team has created an ever-evolving learning space customizable for a variety of students. Information is organized into interconnected nodes that contain all of the baseline information a textbook would include, plus supplemental material and self-assessments to enhance the learning experience.

“Take the example of how mitosis works,” Johnson said. “It’s a fundamental piece of knowledge for anyone taking Intro to Biology, but the average student walks out of college still not understanding it because all they’re expected to do is read about it then take a test.”

Under this new system, students have access to 40-50 “learning nodes” that let them explore mitosis from different directions. Each node includes additional materials that deepen learning.

- Basic text is reinforced with multimedia: a video showing how the cells split; an interview with a molecular biologist who talks about how mitosis goes astray in cancer; images of the cells.
- Embedded quizzes assess comprehension of the topic and a student's ability to use that knowledge. The system monitors students' scores as well as overall interaction with the content, so the teacher can monitor progress and suggest help when needed.
- Students can ask for help by posting questions to peers or to the teacher. Again, the teacher could review answers given by peers to ensure accuracy.
- Students and teachers can write new nodes. In 2010, 19 students in one of Macosko's first-year seminar courses used the system – and wrote 130 new nodes in one semester.

Macosko said that autonomy kept his students excited about the subject and engaged in learning – a key to success, according to the watershed education study, “How People Learn.” The research says that, to teach students how to understand concepts, courses must accommodate myriad learning styles, should be interactive and should build on previous knowledge, not on arbitrary chapter structures in books.

“Think of a textbook – it's too long, has lots of text, and gives few opportunities to check your thinking,” Macosko said. “When you read a textbook, you don't often ask the question, ‘Why should I know this?’ It's our very nature to learn by questioning.”

Initial testing will involve students taking college biology for non-majors. In the fall, [students](#) will use the tool at Wake Forest, Salem College, Winston-Salem State University and Guilford Technical and Community College.

Provided by Wake Forest University

Citation: Learning: No longer a textbook case (2011, May 2) retrieved 20 April 2024 from <https://phys.org/news/2011-05-longer-textbook-case.html>

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