

Online tutorials help elementary school teachers make sense of science

June 18 2009

Interactive Web-based science tutorials can be effective tools for helping elementary school teachers construct powerful explanatory models of difficult scientific concepts, and research shows the interactive tutorials are just as effective online as they are in face-to-face settings, says a University of Illinois expert in science education.

David Brown, a professor of curriculum and instruction in the College of Education, said that elementary school teachers need high-quality, research-based resources to help them build a meaningful scientific knowledge base.

"Refining one's scientific knowledge base through online interactive resources can help teachers develop a deeper conceptual understanding of scientific phenomena, making them better prepared to engage students in science-based activities," Brown said.

In any curriculum, there is teacher background literature or other forms of digested information that teachers can study to refresh their memories or get the broad stroke outlines of what they're going to teach.

The trouble with those teaching aids, according to Brown, is that the information they contain is "usually fairly terse" and isn't interactive or research-based.

If teachers lack confidence in their scientific knowledge base, they're probably going to avoid situations where they might be caught flat-

footed by a student's question, because they don't want to be asked a question they don't know how to answer, Brown said.

So they'll fall back on more traditional lesson plans that emphasize the rote memorization of scientific terms over inquiry-based forms of learning, such as hands-on activities and discussions of those activities.

But an emphasis on routinized learning doesn't help students grasp the foundational science behind what they're learning, Brown said.

"If online tutorials focus on explaining the underlying scientific concepts behind the phenomena rather than on the rote memorization of facts, that can help teachers form a more meaningful conceptual understanding of what they're going to teach," he said. "A teacher who has a firm [scientific knowledge](#) base can then help students understand the fundamental scientific ideas and concepts behind what they're learning better."

To test his hypothesis, Brown developed "Making Sense of Science," an online multimedia tutorial that tested subjects' pre- and post-test knowledge of the scientific concept of buoyancy.

In the first 10 interviews, the average post-test score increased by 16 percent; in the second group of 10, by 28 percent; and for a group of 68 online users, by 33 percent. Similarly, Brown discovered that the average post-test confidence scores nearly doubled after the respondents interacted with the tutorials, and the written explanations of their ideas went from "somewhat incoherent" to "coherent explanations that made use of relevant ideas," he said.

"We found that our resources were effective, and they were as effective online as they were face-to-face," Brown said.

The tutorials were also crafted to address the perceived deficiencies that Brown thought other teacher background information and online resources suffered from.

"The resources are designed to help teachers develop their ideas," Brown said. "They're not designed for teachers to use directly with the students, but rather as background information for the teachers to develop their ideas so they'll be in a better position to engage students in activities."

Those positive results make Brown guardedly optimistic that online resources for teachers can be developed that will be helpful in advancing reform in elementary [science education](#).

"The focus in both national and state standards is involving students in inquiry-oriented activities," he said. "This is just trying to provide a resource for teachers for what they're already being asked to do at the national and state levels."

Brown believes having better prepared elementary school science teachers will ultimately lead to more students interested in science.

"There's a world of difference between a drill-and-kill lesson versus an inquiry-oriented one in terms of student engagement and retention," he said. "There's a wealth of potential there that we're not tapping into."

Source: University of Illinois at Urbana-Champaign ([news](#) : [web](#))

Citation: Online tutorials help elementary school teachers make sense of science (2009, June 18) retrieved 3 May 2024 from <https://phys.org/news/2009-06-online-tutorials-elementary-school-teachers.html>

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