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Event Materials Publication



Bringing Intellect and Innovation into the K-12 Science Classroom

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Introduction

How can K-12 teachers use technology to encourage their students to regularly ponder and solve intellectual questions in a very meaningful and practical way? Furthermore, how can teachers do this while simultaneously satisfying regional, state and national education curricula and accountability standards?

These two questions are at the heart of Professor Joe Krajcik's work. A professor of Science Education at the University of Michigan, Krajcik notes on his website, "My goal is to create classrooms environments where students are actively doing the intellectual work. My working prediction is that such educational environments will help learners develop deep understanding of content as well as strategies for generating new understandings" (<http://www-personal.umich.edu/~krajcik/index.htm>).

During a recent visit to the Teachers College, Krajcik discussed a number of his technology innovations and initiatives to members of EdLab. The following is a brief overview of content of the event, as well as web links to notable science education web sites.

I. Innovations for the Palm

*Uh oh! Sam's got cooties!
But, from whom?!*

Welcome to the world of *Cooties*—a simulation program developed for the Palm by Krajcik and his colleagues at the University of Michigan to help K-12 students understand how diseases spread.

Sit back and imagine... you are sitting in a classroom of thirty middle school students, each with a Palm in hand. The students are mingling and beaming their Palms at one another. Although unaware of their condition, some students have cooties, some are highly immune and others are susceptible and likely to "catch" the disease any minute. You wonder, "Who will catch it next?" Looking down at your own Palm you panic and think, "Could it be me?!"

Intended to supplement the curriculum on communicable diseases titled, *How Can Good Friends Make Me Sick?*, *Cooties* enables teachers to predetermine the nature of the "disease" that they will allow to spread throughout their classroom via Palm. In addition, after students mingle and play the game, they can track who initiated the disease and how it spread; which in turn helps them understand how good friends actually can make them sick.

Cooties is just one of many science applications that Krajcik and his colleagues have developed for the Palm and personal computer. For a complete list of the applications

they have created, visit <http://www.hice.org/software/handheld/index.html>. Not only are the applications meant to be fun and engage children in the learning process, but they are designed to more fully realize the potential of technology in the science classroom.

II. Does Palm technology enhance learning?

For the past seven years Krajcik has been monitoring Detroit classrooms that use his Palm applications in order to shed light on the question, “If kids have access to technology tools on demand, does this regular interaction with technology enhance learning?”

So far the answer has been, “not much.” In pre and post-tests administered over two-year periods by Krajcik and his team of researchers, both classrooms that used his supplementary Palm applications and those that did not performed about the same. Regardless, Krajcik wonders if a different set of testing probes would have revealed distinct results. For example, perhaps students that used the Palms significantly increased their technology competency skills, factors not measured by the pre and post-tests. This hypothesis is supported by the fact that Krajcik noticed major shifts in Palm usage within the classrooms he observed throughout the course of his research. Initially users were very procedural, but by year two, users typically approached the Palm as a thinking tool. This promising observation implies that over time Palm users might boast learning gains over non-Palm students. The question remains, what type of learning gains?

Another notable observation by Krajcik is that the Palm classrooms in his study were facilitated by strict teachers that prohibited students from using their Palms creatively. Krajcik suspects that if the kids in his study had been granted more freedom to play with their Palms that their learning and understanding of the lessons at hand would have likely increased.

Future research in various contexts and locations will be helpful in addressing Krajcik aforementioned hypotheses and in determining whether Palm technology truly does enhance learning.

III. Video Initiatives: Helping Teachers Enhance Learning in the Classroom

Video is a tool near and dear to Krajcik’s heart. Krajcik regularly takes footage of science classrooms for research and professional development purposes. In turn, he uses the videos to show teachers how to introduce inquiry-based learning methods into their classrooms. Unfortunately, there are a couple of challenges with using video for pedagogical and training purposes. First, taking real classroom footage requires unanimous parental consent. Second, converting long video clippings into widely accessible digital formats continues to be a challenge. Regardless, Krajcik is very optimistic about the power of real classroom footage as a tool to teach and train teachers.

Krajcik envisions that one day he will create a rich online repository able to contain full-length videos and other resources useful to teachers of the K-12 science classroom. In the

mean time, teachers wishing to view short video clips and obtain materials for the science classroom should visit Knowledge Networks on the Web (<http://know.umich.edu/index.asp>). As stated on the KNOW web site, Knowledge Networks on the Web is a collaboration between The Center for Highly Interactive Computing in Education (hi-ce) and teachers in Detroit, Ann Arbor, and other places where LeTUS and related inquiry-oriented science curricula are used. Readers interested in learning more about Krajcik's Palm applications and curricula such as *How Can Good Friends Make Me Sick?* are sure to find KNOW an excellent resource for cutting edge science classroom materials.

IV. The Future of Technology and Education

Krajcik's visit to EdLab was certainly informative and inspiring in terms of the future of technology applications in the classroom. Regardless, education technologists have a number of hurdles to overcome as the demand for technology in the classroom increases. These include:

- *Accessibility*—teachers and students should have access to technology on-demand. A single computer lab for an entire school is not enough.
- *Costs*—outfitting classrooms with full sets of laptops, Palms and software applications is currently prohibitively expensive.
- *Digital Storage Space*—Teachers and researchers alike would benefit greatly from rich digital repositories filled with lesson plans, software downloads, professional development videos, chat features, etc. These repositories would help practitioners and researchers share ideas and disseminate best practices within and across fields.

As Prof. Krajcik's work illustrates, this is an exciting time for those interested in the future of technology in the classroom. The only question that remains is what will be created next?!