Chemistry Unwired

Hewlett Packard Technology For Teaching Grant Initiative
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Lexington, Kentucky
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Chemistry Unwired

Chemistry Unwired was developed to restructure our chemistry laboratory courses from deductive to inductive learning.

The Hewlett Packard Technology for Teaching Grant allowed us to incorporate wireless tablet PC technology into our lab curriculum.

Tablet PC technology has been used to collect water samples for calcium water hardness analysis.

Outcomes have been positive.

Expectations are for more laboratory exercises to be converted to inductive learning with further enhancement of learning communities.
Chemistry Laboratory Experiments

Traditional Laboratory Experiments

- Experiments were chosen to enhance concepts that were covered in lecture
- Students would read experiment, answer pre-lab questions, listen to pre-lab lecture and perform laboratory exercise
- Students were graded on precision and accuracy of their results
- A laboratory practical was also administered to determine proficiency of laboratory techniques
Recurring Problems

- Students did not read laboratory experiment or did not comprehend reading
- Students waited until the last minute to complete the pre-lab questions
- Students did not relate experiment to concepts covered in lecture or refreshed in pre-lab discussion
- Students’ precision and accuracy of results were variable
- Students had difficulty relating experiment to concept
- Students saw a vague connection between science and technology
Inductive Learning

- Students are given a project – to determine water hardness in locations throughout the county
- What is water hardness? What are the ions that create water hardness? Why is it prevalent in our region? How would you determine water hardness? Which group has the hardest water?
- Students record location of sample using Microsoft Streets and Trips with GPS and determine water hardness using a digital titrator
Questionnaire

- Do you own a computer? ______________
- If yes: Is it a laptop, tablet or desktop? If No, skip to #
- What are your three most used programs?
  - How many hours do you spend on your computer?
  - Break down the amount of time spent on each program
- #Have you ever used a tablet personal computer?
- What would be the greatest advantages for tablet computer use?
- What are the advantages of a tablet pc over a laptop? Over a desktop?
- Is there a need for tablet personal computers in science?
- Give examples of how one might use a tablet pc in science courses?
- What would be the advantages of tablet PCs in the science courses?
- Do you believe students need table PCs in the classroom or lab?
- How much would you pay for a tablet pc?
- If a tablet pc’s cost was part of your tuition would you be willing to pay a wholesale price for a tablet pc?
Sample Collection & Analysis
Evaluation

- The GPS Lab has created a learning community
- Students have improved their ability to self-assess data. Students were interested in others results. Example: The Duck Ponds
- A powerful picture of students’ contributions are realized when plotted on an area map for all to see which makes the project meaningful to the students.
- Answers to questions on exams relating to use of the computer versus those who did not were not significantly different on acid/base titration lab.
- Students want more laboratory exercises that use inquiry-based practices
Evaluation

- Inquiry-based exercises take more time to develop
- Inductive learning exercises leave less control as to what the outcomes will be
- Inductive exercises require more time to effectively implement the new technology (infrastructure, time and effort of implementing new methods and exercises)
- Concern for students collecting samples outside of the lab or instructor supervision require additional planning
- Faculty must be willing to develop inquiry-based methods versus behaviorist methods of instruction – a new paradigm
Evaluation

- Laboratory faculty have integrated tablet PC use into three labs currently and have been pleased with the interaction of the students with the technology.
- More laboratory exercises are being converted to use tablet PCs and more faculty are interested in using the technology in their laboratories.
- Process is slower than expected in integrating the technology fully in the laboratory and classroom.
Evaluation

- Collecting meaningful data that differentiates between those who have used the technology and those who have not and the overall benefit has been hard to quantify. However, the development of cohesive groups of students who seem genuinely interested has been a great positive.

- Expanding the use of mobile technology by other disciplines at BCTC and collect data on usage is also a new priority.
Data From Questionnaire

Age Distribution of Participants

- 15-19
- 20-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49

How much would you pay for a tablet PC?

- $0
- $1-499
- $500-999
- $1000-1499
- $1500-1999
- $2000-2499
- $2500-2999
- $3000-3499

Computer Ownership

- Own Computer
- Do Not Own Computer

Reported Tablet PC Usage

- Have Used a Tablet PC
- Have Not Used a Tablet PC
Summary

The HP Technology for Teaching Grant has facilitated our conversion of laboratories from deductive to inductive learning at a pace and time that would be inconceivable without their help. The introduction of the wireless tablet PC technology has created a learning community between students. Students are energized to have the opportunity to use the technology, especially the ability to use the technology on their own outside the laboratory. Laboratory exercises are more real and the data and analysis that students produce is more consistent in quality. The faculty have been and are seeking more opportunities for inclusion of the table PC technology not only in their labs but in their classrooms. The merit and worth of this technology is apparent to all.
The K-12 HP Technology for Teaching grant initiative is designed to support innovative and effective uses using a collaborative, team-based approach to implementing technology integration projects. School teams consisting of 5 teachers will receive the equipment, professional development and support they need to effectively integrate technology into their instruction.

In the selection process, preference will be given to schools that serve a large number of low-income students, relative to district or state free and reduced price lunch percentages, and to projects that included integration of mathematics and/or science curriculum. Additional consideration will be given to schools in selected districts.
K-12 HP Technology for Teaching Grant Initiative

K-12 Award Package

The 2007 K-12 HP Technology for Teaching grant award will include several elements. The award package is valued at least $30,000 at market price. Specific product models will be determined at the time the grant is awarded. Each of the five teachers on the school's project team will receive*:

- an HP Tablet PC with Microsoft Windows XP Tablet PC Edition
- a multimedia projector
- an HP digital camera
- an HP PSC printer, scanner, copier
- a $500 stipend
- customized professional development opportunities to support the use of technology in their teaching and support from a mentor with experience integrating technology in the K-12 environment.