ABSTRACT

Project STEP\(^1\) (Science and Technology Enhancement Program) at the University of Cincinnati is a program funded by the National Science Foundation GK-12 Program. A primary activity of Project STEP is to train engineering, math, science, and education graduate students (STEP Fellows) to bring their technical expertise into high school classrooms. They collaborate with secondary education teachers to generate new lessons, activities, and resources to enhance the STEM skills of high school students. In addition, the STEP Fellows conduct training for teachers to help them integrate technology into their educational activities to further enhance learning in the classroom. This paper describes our experiences in developing a technology workshop for teachers, taught by graduate students. The workshop focused on innovative and advanced uses of technology rather than basic computer skills. The workshop was well-attended and well-received; we include a summary of the evaluation feedback submitted by teachers.

Keywords: technology training, teachers, STEM education

1. DETERMINING THE TOPICS

In order to determine the topics of each session, STEP teachers were asked to complete a survey. The survey asked several types of questions associated with seventeen different technologies including: asking teachers about their proficiency in various software, hardware or Internet resources, interest in learning the technology, the availability of the technology in their school, and whether the teacher was aware of the technology listed. The survey also provided teachers with an opportunity to add in any other technology not listed. The results were then analyzed by the STEP team in order to determine the sessions teachers were most interested in participating in. Teachers were also offered an opportunity to earn graduate credit through the University of Cincinnati for a reduced price. If teachers chose to earn credit they were required to incorporate one of the learned technologies into a lesson, evaluate the lesson, and write-up a reflection.

2. INVITING THE PARTICIPANTS

A brochure was created electronically and in print. An e-mail list was created by the grant coordinator in order to send the technology workshop information directly to teachers throughout the greater Cincinnati area. The print version of the brochure was distributed to various schools through the greater Cincinnati area in order to reach those teachers who may not open e-mail from an unknown address. Figure 1 is an excerpt from the brochure that describes some of the specific workshops. The content of each one is described and illustrated in Section 2. Figure 2 describes the goal of the workshop and the modes of instruction. Teachers participated in hands-on learning conducted by the Fellows in a computer classroom at the University of Cincinnati. The vision for the workshop was that teachers would be able to create technology-based lessons for immediate use in their classrooms.

Teachers were invited to register using a web-based registration form. A total of 25 STEM teachers from both urban and suburban school districts attended.

3. CONDUCTING THE TECHNOLOGY WORKSHOP

In this section we briefly describe the four topics covered at the workshop: concept mapping, digital storytelling, graphics and word, and Internet resources and WebQuests. More detailed explanations of each session presented in the workshop are available on the Project STEP website at www.eng.uc.edu/STEP/TechWorkshop/TechWkshp2005/. Each session was designed to benefit classroom teaching and to meet technology standards. The sessions presented ideas and skills for teachers to utilize in classroom teaching, for administration duties, and with students to assist teachers in implementing student technology standards.

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**Figure 1. Excerpts from the Technology Workshop Brochure**

**Project STEP**

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**Teaching with Technology**

A free workshop for science and mathematics teachers

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**A hands-on workshop.**

At “Teaching with Technology,” we will provide you with the knowledge and confidence you need to bring new and innovative technology into your classroom and daily lessons. You will receive hands-on training as well as supported time to experience the possibilities that these technologies can offer you and your students.

Workshop sessions will include:

- **Digital Story Telling**
  - If a picture is worth a thousand words - just think how effectively your students could communicate when they can include audio, motion, written words, and sound!

- **Internet Resources & Web Guests**
  - Explore some of the great resources on the Internet which is available to teachers for free.
  - Create a list of resources to take back with you for future use: This session will also introduce you to Web Quests.

- **Concept Mapping**
  - A concept map is a special form of a web diagram for explaining knowledge as well as organizing and showing information. It enhances thinking and learning, which helps students to synthesize information...
  - And much more...

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**Figure 2. Excerpt from the Brochure Describing the Workshop**

**Come for the breakfast, stay for the learning.**

The “Teaching With Technology” workshop has been designed to provide hands-on technological training to middle and high school teachers interested in improving their technology skills and incorporating these skills into their classroom. We based our workshop offerings on your feedback concerning the needs in your own classrooms.

Our vision is for the educators involved in this series not only to learn about and practice with a variety of software and hardware, but also to be able to create technology-based lessons for use in their own classrooms in the coming school year. STEP Fellows, who are currently in classrooms throughout the city, will be presenting these technology lessons and will be able to help you develop lessons that relate directly to your standards based on these technologies.

**Hands-on Learning**

This workshop series will consist of several seminar periods where you will be able to experiment with these tools and reflect on how you can incorporate them into your classroom. In each seminar, you will be guided through applications of a particular type of technology and encouraged to examine ways in which your students can utilize each program.
**Concept Mapping**
The Concept Mapping session was conducted by Michelle Daniel and Bethany Vice Bowling. The session first described general organizers that can be used in the classroom. An advanced organizer is not a summary; it bridges the gap between what a learner already knows and what is about to be learned. An advanced organizer is typically at a higher level of abstraction than the material to be introduced afterward. One such technique is a concept map. The session specifically addressed concept maps, the technology available for making the maps, and how they can be used in math and science classrooms. The tutorial includes 46 slides with many examples; one example using a software tool called Inspiration is shown in Figure 3. Inspiration is a visual learning tool (free 30-day download available at [www.inspiration.com](http://www.inspiration.com)) that facilitates creation of idea maps, concept maps and webs. Teachers can use concepts and tools such as Inspiration for their own brainstorming, or they can have students use the technology to improve critical thinking, comprehension, and writing skills.

**Digital Story Telling**
The Digital Story Telling session was conducted by Matt Estes and Mike Rust. Digital Story Telling can be an effective teaching method used to reach students using a variety of multimedia sources assembled into a coherent lesson. It can also be used by students to organize and present their ideas. The media can include: digital imagery, text, voice, sound, music, video, and animation. When students are given an assignment to create a digital story, they are the organizers of information; they are responsible for storyboarding and concept mapping. They are the finders and evaluators of information; they can search the Internet or use digital libraries and select/edit what they find. Students are the designers of a communication strategy; they make choices about the media to use and how to organize and format the material. Additional information can be found at the website [wwwdigitales.us](http://wwwdigitales.us). The use of digital story telling as a teaching method develops a wide variety of technology skills in students and meets numerous technology standards.

This session demonstrated how to put together a multimedia story using Microsoft Windows Movie Maker. This software is available on any platform running Windows XP (no additional purchase is necessary.) Hardware that can be used to provide sources for digital story telling includes: a microphone, a scanner, a digital video recorder, and a digital camera.

**Excel**
The Excel session was conducted by Jim Allen and Sarah Pumphrey. Teachers can use Excel for classroom organization: checklists, seating assignments, and team organization, as well as for classroom management: grading, attendance, and scheduling. Students can use Excel for visualization in presentations and reports as well as for analysis: performing calculations, importing data, table searching, and graphing. The session included hands-on use of auto fill, built-in functions, short-cut keys, protection, symbols and cell-formatting, formula manipulation, importing data, sheet referencing, and chart creation.

**Graphics and Word**
The Graphics and Word session was conducted by Bartley Richardson and Amy Dimmerling. It focused on advanced applications in Microsoft Word, such as including and formatting images in documents. The session described and illustrated four tools that are included in Word: the spelling, grammar, thesaurus, and reading statistics tools. These tools can help make a document look professional while minimizing the amount of time spent looking-up words and English rules. In addition, the session discussed and illustrated creating and formatting tables, using the drawing tool and the equation editor, and inserting hyperlinks into documents.
There are many online resources for WebQuests. A summary of selected resources is given in Table 1.

Upon conclusion of the workshop, participants were provided with a CD of workshop resources and could request an account to the workshop’s Blackboard, which included session presentations, web links, and handouts.

### 4. EVALUATION OF THE WORKSHOP

Participants were asked to evaluate each session and asked to provide an evaluation on the overall structure of the technology workshop. A summary of the questions and average scores for individual workshop are given in Table 2 and overall technology conference summary scores in Table 3. A score of 1 indicates “Strongly Agree,” 2 indicates “Agree,” 3 indicates “Disagree,” 4 indicates “Strongly Disagree,” and NA = “Not Applicable.” A blank indicates “I don’t know.” Twenty-five teachers attended the workshop and not all teachers responded to all surveys. The number of respondents to surveys ranged from 19 to 25.

Overall survey scores for individual workshops were excellent with average scores on all 15 items between 1.0 and 2.0 indicating high agreement that the workshop was well done and that the Fellows did a good job. Each session had open ended questions that teachers responded to and a summary from each session’s responses follows.

#### Digital Story Telling:

Teachers expressed that this session was outstanding. They indicated that they learned a new tool that would be exciting to use with students. The teachers responded that they would have liked more time to explore Digital Story Telling and Windows Movie Maker. They also mentioned that they would have liked one computer per participant and the opportunity to bring in their own files to create a movie for their own class.

#### Concept Mapping:

Teachers expressed that they liked using Inspiration software and felt it could be applied in the classroom in meaningful ways. They also indicated that they would like to have less historical information included and more time devoted to classroom ideas and practice using skills.

#### Graphics and Word:

Teachers indicated that they learned new skills in Microsoft Word that they had been unaware of such as readability, auto summarize, graphic manipulation, drawing and manipulation of tables, styles and format modifications, and application of short-cut keys. They included in their input that there should be a beginner and an advanced graphics and Word sessions.

#### Excel:

Teachers responded that they learned to format cells, to use auto fill function, charting, and to apply functions within spreadsheets. They indicated that there is a need to have a beginners and an advanced Excel class and more ideas on how to integrate the program into a classroom would be beneficial. The teachers also indicated that the presenters of this session needed to decide prior to the session who would answer what question types and distribute the duties. Lack of distributing the duties between the presenters caused distraction throughout session.
Internet Resources and WebQuests: Teachers responded that the free Internet resources were great, but they would have liked more time to explore all the sites. They mentioned that providing a CD with all the websites was valuable. Teachers responded that they felt learning about and trying WebQuests was good, but that they would have liked time to actually create their own WebQuest. This session could have been divided into two sessions to allow more time to be devoted to each topic.

Overall survey scores were excellent with average scores on all 15 items between 1.0 and 2.0 indicating high agreement that the workshop was well done and that the Fellows did a good job. Teachers added comments that this workshop was more helpful and interesting than the prior year’s workshop. As one teacher put it, “even on an off day, it was worth the effort. The presentations were very closely related.” There was no one most valuable session; each teacher responded with a different variety of skills learned and favorite session lists. Most teachers did indicate that they would like longer session times in order to explore skills learned even if this meant fewer sessions. In addition, open ended questions asked teachers what they found most useful about the workshop. Examples include:

“I really learned a lot of things to share in the classroom. I’ve already shared some of the WebQuest and free resource information with the math department! Overall the workshop was excellent with very applicable and valuable information. I was impressed!”

“I thought the 2005 Step Technology Workshop was fantastic. I learned many new things that I will be trying in my Computer Applications classes during the year. In fact, I have already downloaded the Inspirations Software program for a 30 day free trial, and purchased one of the computer video recorders that were demonstrated in the Digital Storybook session. I thoroughly enjoyed the day, and hope to participate in future STEP activities that are held throughout the year.”

“I had such a good time at the workshop. I plan to start using at least two of the technologies immediately. The rest will need some vacation time for me to study them.”

“There was no one thing that I would say I couldn’t find very helpful with teaching. It was a GREAT workshop (Especially the Digital Story Telling)”

### Table 2. Survey and Average Scores for Individual Workshop Sessions

<table>
<thead>
<tr>
<th>Question</th>
<th>Digital Story Telling (n=25)</th>
<th>Concept Mapping (n=20)</th>
<th>Graphics and Word (n=19)</th>
<th>Excel (n=22)</th>
<th>Internet Resources and WebQuests (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The purpose of this workshop was clear.</td>
<td>1.24</td>
<td>1.50</td>
<td>1.26</td>
<td>1.45</td>
<td>1.56</td>
</tr>
<tr>
<td>The workshop fulfilled this purpose.</td>
<td>1.08</td>
<td>1.50</td>
<td>1.21</td>
<td>1.32</td>
<td>1.32</td>
</tr>
<tr>
<td>The work shop was well organized.</td>
<td>1.28</td>
<td>1.50</td>
<td>1.26</td>
<td>1.62</td>
<td>1.46</td>
</tr>
<tr>
<td>The information sent in advance of the workshop was effective.</td>
<td>1.48</td>
<td>1.40</td>
<td>1.32</td>
<td>1.48</td>
<td>1.60</td>
</tr>
<tr>
<td>The facilities were sufficient for the workshop.</td>
<td>1.16</td>
<td>1.35</td>
<td>1.16</td>
<td>1.38</td>
<td>1.32</td>
</tr>
<tr>
<td>This workshop has given me valuable information for using technology in my classroom.</td>
<td>1.20</td>
<td>1.55</td>
<td>1.16</td>
<td>1.43</td>
<td>1.36</td>
</tr>
<tr>
<td>The work sessions were a valuable use of my time.</td>
<td>1.64</td>
<td>1.50</td>
<td>1.26</td>
<td>1.70</td>
<td>1.52</td>
</tr>
<tr>
<td>The material was presented in a way that makes it easy to apply to my own class room situation.</td>
<td>1.38</td>
<td>1.50</td>
<td>1.42</td>
<td>1.63</td>
<td>1.56</td>
</tr>
<tr>
<td>The work shop is aligned with the technology standards or will help address one or more of those standards in my class room.</td>
<td>1.33</td>
<td>1.45</td>
<td>1.26</td>
<td>1.55</td>
<td>1.32</td>
</tr>
<tr>
<td>I will be able to use what I learned in the work shop in my class room.</td>
<td>1.27</td>
<td>1.61</td>
<td>1.28</td>
<td>1.43</td>
<td>1.32</td>
</tr>
<tr>
<td>The material would be relevant to most science class rooms.</td>
<td>1.28</td>
<td>1.50</td>
<td>1.21</td>
<td>1.45</td>
<td>1.40</td>
</tr>
<tr>
<td>I would recommend this work shop to other educator.</td>
<td>1.12</td>
<td>1.55</td>
<td>1.26</td>
<td>1.50</td>
<td>1.52</td>
</tr>
<tr>
<td>The presenters were informative and well prepared.</td>
<td>1.24</td>
<td>1.50</td>
<td>1.37</td>
<td>1.77</td>
<td>1.52</td>
</tr>
<tr>
<td>This was a good time to offer the work shop.</td>
<td>1.08</td>
<td>1.25</td>
<td>1.22</td>
<td>1.45</td>
<td>1.28</td>
</tr>
</tbody>
</table>

The week following the workshop, seven of the teachers sent the Grant Coordinator emails giving added insight on the technology workshop. All of the responses were positive, some asked for emails of presenters to ask additional questions, some asked to be given a Blackboard account so they could access online workshop material, and some asked to be placed on the STEP newsletter mailing list. Examples of comments shared through email include:

“I thought the 2005 Step Technology Workshop was fantastic. I learned many new things that I will be trying in my Computer Applications classes during the year. In fact, I have already downloaded the Inspirations Software program for a 30 day free trial, and purchased one of the computer video recorders that were demonstrated in the Digital Storybook session.”

“Thanks for offering such a nice class; I wish teacher inservice days were as productive.....”
“I had such a good time at the workshop. I plan to start using at least two of the technologies immediately. The rest will need some vacation time for me to study them.”

“I really learned a lot of things to share in the classroom. I’ve already shared some of the web quest and free resource information with the math department! Overall the workshop was excellent with very applicable and valuable information. I was impressed!”

“I have already checked into one of the websites to create a timeline for the students. (It is a standard we must teach this year in grade three.) What a great way to teach it...create one’s own timeline and work from there.”

Table 3. Survey and Average Scores for Overall Workshop (n=19)

<table>
<thead>
<tr>
<th>Question</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>The purpose of this workshop was clear.</td>
<td>1.21</td>
</tr>
<tr>
<td>The workshop fulfilled this purpose.</td>
<td>1.32</td>
</tr>
<tr>
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<td>1.16</td>
</tr>
<tr>
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</tr>
<tr>
<td>The facilities were sufficient for the workshop.</td>
<td>1.16</td>
</tr>
<tr>
<td>This workshop has given me valuable information for using technology in my classroom.</td>
<td>1.26</td>
</tr>
<tr>
<td>The work sessions were a valuable use of my time.</td>
<td>1.26</td>
</tr>
<tr>
<td>The material was presented in a way that makes it easy to apply to my own classroom situation.</td>
<td>1.26</td>
</tr>
<tr>
<td>The workshop is aligned with the technology standards or will help address one or more of those standards in my classroom.</td>
<td>1.42</td>
</tr>
<tr>
<td>I will be able to use what I learned in the workshop in my classroom.</td>
<td>1.32</td>
</tr>
<tr>
<td>The material would be relevant to most science classrooms.</td>
<td>1.19</td>
</tr>
<tr>
<td>I would recommend this workshop to other educators.</td>
<td>1.21</td>
</tr>
<tr>
<td>The presenters were informative and well prepared.</td>
<td>1.16</td>
</tr>
<tr>
<td>This was a good time to offer the workshop.</td>
<td>1.44</td>
</tr>
</tbody>
</table>

5. NEXT STEPS

The Project STEP team is in the process of planning our fourth annual Technology Workshop right now. We will take the suggestions for improvement from the prior year into account as we plan for the next workshop. The suggestions for improvement included:

- check content being covered to be sure that session is not trying to cover too much without giving enough time to practice skills,
- check computers prior to sessions to verify they are working and have programs needed,
- create a webpage with email links to presenters so participants can ask questions after workshop is over,
- divide Internet Resources and WebQuest session into two sessions,
- include less historical information and cover more classroom ideas, and
- distribute duties within sessions prior to session taking place to reduce distractions.

We will keep the things that the teachers found most useful about the workshop and replicate these in our upcoming workshop such as:

- continue to list free web resources with time to explore them,
- continue to give good examples, and
- continue to present ideas and skills that are immediately usable in class and beneficial to student learning.

We are currently polling teachers about their preferred topics using Doodle (www.doodle.ch). The choices for this year include:

- Internet Resources and WebQuests,
- Intro to Podcast/Videocast,
- Digital Story Telling,
- Take/Edit Digital Pictures,
- Concept Mapping,
- Novice PowerPoint,
- Advanced PowerPoint, and
- Excel: Graphing and Advanced Features.

In addition to the delivery modes used in 2005, we will also record and prepare all of the instruction for podcast/videocast so that the workshop may be more widely disseminated for others who are not able to attend it physically.