HP Innovations in Education Project Results & Analysis

The preliminary results are categorized into (i) Attitude survey, (ii) Service Learning project surveys, (iii) Interactive activities survey responses, (iv) Survey responses to flash-based animations, (v) Student survey response to efficacy of pre-recorded video lectures, and (vi) Student responses to different mode of content delivery. Students were asked to respond to survey questions on a 5-point Likert scale (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1). Sample results of these surveys are presented as follows.

A. Attitude Survey

Figure 1 shows the attitude of students towards use of Tablet-PCs and supporting note-taking tool in ENGT 103: Introduction to Engineering Technology course. The student attitude towards use of Tablet-PCs and Windows Journal was gathered through a questionnaire consisting of twenty-two questions.

As shown in Figure 1, 50% of respondents agreed that use of Tablet-PCs and windows journal improved their note-taking skills, 80% of respondents experienced improved classroom learning, 70% of respondents agreed that use of tablet and note-taking tool improved their understanding of course material, 90% of respondents had positive experience in using instructional technology used in classroom, and 100% of respondents agreed that Tablet-PCs and Windows Journal helped them to be more organized in their course work.

B. Service Learning Project Surveys

Figure 2a and Figure 2b depicts responses to service-learning project survey in ENGT 103: Introduction to Engineering Technology course. Students in ENGT 103, which is an introductory course in Engineering Technology program, were assigned an energy audit project. As part of this project they were asked to pick a house in the local community and conduct a complete energy audit of that house. Twenty-six students participated in this project. They were required to interact with the occupants/owner of the house and manufacturer/supplier of electrical appliances used in a typical home. At the end of the project students submitted a report with an excel sheet showing distribution...
of energy consumption in the house. The graph in Figure 2a shows student responses to a survey to assess their service-learning project experience.

As seen in Figure 2a only 5% of respondents strongly disagreed that they would like to see more service-learning projects. Students experience in the service-learning project was also evaluated through brief interactive session with the instructor. Overall response from students who participated in this project was very satisfactory. Only complain from students was related to the duration in which they have to complete the project. A majority of students suggested at least three-week period instead of 2 weeks that were given to them for completing the project.

Figure 2b shows responses of community residents to the service-learning project carried out by students in this course.

As seen in Figure 2b, 100% of respondents agreed that service-learning project was clearly articulated by students, 100% of respondents agreed that students exhibited professionalism, 100% of respondents agreed that students were proficient in their interaction, 100% of respondents agreed that students were knowledgeable about the project, 90% of respondents agreed they would like to see more service-learning projects.
C. Interactive Activities Survey Responses

Figure 3a-3i show students responses to efficacy of using web-based interactive activities in some of the courses in technology program.

Figure 3a depicts student responses to a set of web-based interactive activities in TCPU 450: Network Communications II course. As seen in Figure 3a, 100% of respondents found activities to be well-planned, 90% of respondents experienced improved understanding of the topic, 100% of respondents expressed that activities made them think critically, 90% of respondents agreed that activities reinforced what they learnt in class, 100% of respondents agreed that interactive activities can help improve their grades and they would like to see more such activities.

Results from similar activities in the same course and other courses are presented below.
Fig. 3c: Student Surveys: ACL Interactive Activities
TCPU 460 Network Administration & Security w/Lab

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>% of Respondents</th>
</tr>
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<tbody>
<tr>
<td>Well-Planned</td>
<td></td>
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<tr>
<td>Improved</td>
<td></td>
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<tr>
<td>Understanding</td>
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<td>Think Critically</td>
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<tr>
<td>Reinforced Lecture</td>
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<tr>
<td>Grades Improve</td>
<td></td>
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<tr>
<td>More Activities</td>
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</tbody>
</table>

Fig. 3d: Student Survey Responses: Basic Network Security Interactive Activities
ENGT 340 Digital Communications

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>% of Respondents</th>
</tr>
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<tbody>
<tr>
<td>Well-Planned</td>
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<tr>
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</tr>
<tr>
<td>More Activities</td>
<td></td>
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</tbody>
</table>
Fig. 3e: Student Survey Responses: Wireless Technologies Interactive Activities
ENGT 340 Digital Communications

Fig. 3f: Student Survey to ISP Interactive Activities
ENGT 340 Digital Communications
D. Survey Responses to Flash-Based Animations

Figure 4a–4f show student responses to flash-based animations used in some of the computer networking courses. Flash-based animations/simulations were used to depict difficult concepts visually covered in these courses.
Figure 4a shows responses to a set of flash-based animations used to simplify some key topics in Network Addressing from ENGT 340 Digital Communications course. As shown in Figure 4a, 90% of the respondents agreed that flash-based animations improved their understanding of the topic, reinforced lecture content, can improve their course performance, and they would like to see more animations in the course.
Fig. 4d: Students Responses to ISP Flash-Based Animations
ENGT 340: Digital Communications

- Strongly Agree
- Agree
- Not Sure
- Disagree
- Strongly Disagree

Level of Agreement

% of Respondents

- Improved Understanding
- Reinforced Lecture
- Improved Performance
- More Animations

Fig. 4e: Student Survey Responses: Distance Vector Routing Protocol Flash-Based Animations
TCPU 360: Network Communication I w/Lab

- Strongly Agree
- Agree
- Not Sure
- Disagree
- Strongly Disagree

Level of Agreement

% of Respondents

- Improved Understanding
- Reinforced Lecture
- Improved Performance
E. Student Responses to Pre-Recorded Lecture Videos

Figure 5a-5b show students survey responses to pre-recording video lectures on selected topics in TCPU 360 and ENGT 340 courses.

Students in TCPU 360: Networking Communications I w/Lab course and ENGT 340: Digital Communications were asked to watch pre-recorded video lectures on selected topics. They were given a pre-test in the beginning and then a post-test after watching the video lectures. In addition, to the pre/post test they were also given a survey to assess the effectiveness of video lectures in their learning. Figure 5a depicts student responses (cumulative) to pre-recorded video lecture survey for three topics. As seen in the result graph, 100% of respondents agreed that video lectures
were easy to understand, over 80% of respondents agreed that it improved their understanding of the topic, over 80% of respondents agreed that video lectures can replace PowerPoint lecture slides/notes, over 80% of respondents agreed that video lectures can improve their course performance, and over 80% of respondents would like to see more video lectures in this course.

F. Student Responses to the Mode of Content Delivery

At the end of the semester students were asked to grade their experience with different ways the course content was delivered. The delivery methods used were: Reading text/handouts, PowerPoint lecture slides, Flash-based simulations/animations, Interactive activities/puzzles, and video lectures. Figure 6a-6f presents results from student responses to mode of content delivery survey questions for TCPU 360 course and ENGT 340 course.
As shown in Figure 6a, students rated (Average = 3.66) Interactive activities/puzzles to have the highest level of impact on their learning in TCPU 360 course, whereas, Reading textbook or class handouts had the least impact (Average = 1.833) on their performance in this course.

Figure 6b presents student responses to various learning skills that were improved through use of technology in TCPU 360 course. Five skills were identified as Interactive, Collaborative, Active Learning, Participatory Learning, and Critical Thinking.
As shown in Figure 6b, 100% of the respondents identified that Participatory Learning skill was improved through use of technology. 50% of respondents experienced interactive and collaborative skill improvement through use of technology, over 80% of respondents expressed that their Critical Thinking improved through use of technology. Only 33.33% of respondents identified that their Active Learning skill was improved through use of technology.

Figure 6c depicts student responses to preferred mode of course content delivery. Students in TCPU 360 course were asked to select their top two preferred methods of content delivery.

As seen in Figure 6c, Interactive activities/puzzles and Flash-based simulations/animations used in this course were the top two preferred methods.
Fig. 6d: Student Responses to the Level of Impact of Each Method of Delivery

ENGT 340 Digital Communications

<table>
<thead>
<tr>
<th>Method of Content Delivery</th>
<th>Mean Level of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Presentations</td>
<td>3</td>
</tr>
<tr>
<td>Interactive Activities/Puzzles</td>
<td>2.87</td>
</tr>
<tr>
<td>Flash-Based Simulations/Animations</td>
<td>4</td>
</tr>
<tr>
<td>PowerPoint Lectures/Slides</td>
<td>4.12</td>
</tr>
<tr>
<td>Reading Textbook/Handouts</td>
<td>1</td>
</tr>
</tbody>
</table>

Fig. 6e: Student Responses to Skills Improved Through Use of Technology

ENGT 340 Digital Communications

<table>
<thead>
<tr>
<th>Reported Skills</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction</td>
<td>62.50%</td>
</tr>
<tr>
<td>Collaborative</td>
<td>37.50%</td>
</tr>
<tr>
<td>Active Learning</td>
<td>100.00%</td>
</tr>
<tr>
<td>Participatorial</td>
<td>62.50%</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>62.50%</td>
</tr>
</tbody>
</table>
In academic year 2010-2011 (2nd year of the project) following evidence will be collected to gage impact of using HP Blade workstation-based remote computing infrastructure on both instruction and learning.

- Monitor utilization of resources on Blade workstations.
- Comparing the number of courses offered web-enhanced and distance learning courses offered before and after the availability of high performance blade workstations.
- Frequency of faculty and students accessing resources on blade workstations.
- Monitoring the quality of web-enhanced/distance learning courses.

**Topic and Course wise Pre-Test/Post-Test**

In order to quantitatively assess the impact of integrating technology-based learning in various courses, students were given pre and post test on every key topic covered. In addition to topic wise pre/post tests, students were also given course wise pre/post test in few courses. The results from these pre/post tests are shown in Figure 7a-7e. In Figure 7a, topic wise pre/post test (Average Score) comparisons from ENGT 340 course is shown. Results clearly show a significant improvement in student performance on each topic. (Note: No course wise pre/post test was given for ENGT 340 course as this course was an elective)
Students in ENGT 340 were also involved in creating a course Blog. Each student was required to make at least two blog entries per week. Student could either start a new discussion on blog or respond/comment on existing discussion. Students were graded based on the quality and course relevance of their blog entry.

Figure 7b shows topic wise pre/post test comparisons from TCPU 460 (Network Admin & Security) course. Again the comparisons show a significant improvement in student performance in the topics shown in Figure 7b.
Figure 7c shows course wise pre/post test comparisons for TCPU 460 course. The results show a significant improvement (Average post test score of 68.9% as compared to 22.6% in the pre test) in student performance in this course.

Similar results from another course are shown in Figure 7c and Figure 7d.
Fig 7f: TCPU 360: Course Pre/Post Test Results

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