Using Laptops Effectively in Higher Education
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Abstract

The presentation will focus on a wide range of “best-practice” activities used to incorporate laptops into higher education. A majority of the activities are based on well-researched, cognitive theory: collaborative learning, constructivism, facilitation and coaching, promoting higher level reasoning, developing metacognitive skills, incorporating a variety of learning styles, connecting concepts to real world knowledge, and actively applying knowledge. Specific activities include online debates, analysis of case studies, WebQuests, online research, online, in-class surveys, java-applets, streamed videos, peer feedback, online discussion on key topics, portfolios, and effective web page design. A detailed “before and after” assessment of students’ attitudes, computer skill level, and practical use of laptops revealed significant and positive improvement in all three areas.

Overview

While laptop use is increasing in higher education, guidelines and research about how to use them in effective and meaningful ways is noticeably absent. Many faculty stop at using PowerPoint presentations, web pages, and email. The considerable investment in time and resources to support laptop use, though, warrant a more thorough exploration and evaluation of strategies required to enhance learning.

The University of Ontario Institute of Technology (UOIT) is Canada’s only laptop university. This presentation highlights the strategies used by professors at UOIT to promote effective learning using laptop computers. A majority of the activities used were based on well-grounded, learning theory including cooperative learning (e.g., Dewey, 1966; Johnson & Johnson, 1994, 1998; Kagan, 1997; Sharon, 1999; Slavin, 1995), constructivism (e.g., Bereiter & Scardamalia, 1989 Bruner, 1983, 1986; Vygotsky, 1978), facilitation and coaching (e.g., Brown & Palinscar, 1989; Chi & Bassock, 1989; Collins, Brown, & Newman, 1989), incorporating a variety of learning styles (e.g.,, Gardner, 1983) problem based learning (e.g., Albanese & Mitchell, 1993; Bransford, 1990; Bredderman, 1983; Collins, Brown, & Newman, 1989), higher-level thinking skills (e.g., Resnick, 1989), connecting concepts to real world knowledge (e.g., Lampert, 1986; Larkin, 1989; Reder & Klatzky, 1994; Stenberg, 1989), and actively applying knowledge (Carroll, 1990; Caroll & Mack, 1984).

Student Activities in the Class

Debates Using the Online Discussion Board (collaboration, higher level thinking, writing skills)

Students are divided into learning teams at the beginning of the course. A debate topic is presented and students have to research and post their arguments (as a team) on the discussion board. Multiple debates can be set up with groups assigned to accomplish specific tasks (e.g., opening arguments, rebuttals, summaries, judges to determine winners). Debates generate considerable energy in the class and are ideal introductory or culminating activities to a more formal presentation.

Case Studies (real world connections, writing skills, collaboration, learning style)

In learning teams, students are presented with a case study and have to work together to develop and post a solution. The key to making this activity work is to assign a group leader who makes sure everyone is heard and to make sure the case study is meaningful. Teams can then evaluate each others answers and post suggestions online. Alternatively, one or two solutions can be projected on the screen to stimulate full class discussion and evaluation. This activity generates good discussion and excellent solutions and works well, as a culminating activity that brings a number of concepts together.

WebQuest in Class (real word knowledge, research skills, application of skills, collaboration)

Students can follow a well-organized WebQuest (e.g., investigation using the web as a resource) that must include a specific set of tasks and a good set of starting resources. This activity can be done in pairs or alone. This activity appears highly effective for focussing students on a specific set of concepts or skills.
Researching (evaluation and research skills, real word knowledge)

Students must first select a topic of interest, possibly within a given set of topics offered by the teacher, and then they must research the topic using the web OR ideally, an electronic library of formal journal articles and books. Part of the assignment must encourage students to evaluate the validity of the information found. This is an excellent way to open up students to the academic literature base of their particular discipline. Students are often startled, if not overwhelmed at the range of information available. This is a good activity leading into a project or experiment.

Online Questionnaires/Inventories (real world knowledge)

Depending on the discipline, there may be interactive online questionnaires, tests, or exercises that students can complete leading them into a specific topic. For example, we used a Multiple Intelligence Online Questionnaire as an introduction to Learning Styles and education. Students are interested in learning about and evaluating themselves and this exercise will help them focus on the material presented after.

Java Applets (constructivism, learning style)

The use of this activity depends on the specific discipline, but there are numerous java applets that can be used for practice, exploration, and demonstration. Using online exercises with immediate feedback can help solidify a number of key concepts, particularly in mathematics and science.

Streamed Videos (real world knowledge, evaluation, learning style)

Streamed videos can be used inside or outside of class, but students should bring headphones. There are many videos that help bring a real-world context to a variety of disciplines. We have concentrated on the Annenberg collections where there are hundreds of exceptionally well done videos in Education, Science, and Mathematics. Students have found many of these videos particularly enlightening. The advantage of streaming is that students can readily review specific parts of the video depending on their needs and tastes. They can also explore concepts at home.

Posting Key Questions at End of Class (higher level reasoning)

Using either Silicon Chalk or any discussion board, student learning teams can meet five minutes before the end of class to discuss and post any questions they might have. The instructor then gets a good sense of what concepts were understood and what concepts need more explanation. Posting as a group reduces fear of being signalled out for a “naïve” question and it reduces the number of postings (which can be considerable).

Previewing Assignments and Giving Immediate Feedback (collaboration, learning styles)

When assignments and projects are being explained, students can post questions and misunderstandings, either as a group or individually. Some students do not feel comfortable raising their hand in a large lecture and asking a question and often the response is lost to a number of students who cannot hear. Ideally, the combination of open questioning in class with online questions works best. While the assignment-assessment activity can be done after class, it has more impact if it is done in class as students tend to put assignments out of there minds until several days before it is due. Establishing a clear concept of the assignment from the beginning is critical for success and allows the teacher to make immediate modifications.

Web Knowledge (real world knowledge, applications of concepts, collaboration)

There is a wealth of real-world information that can be instantly accessed on the web. It can be challenging to find such information for a specific lecture, but evaluation of real world data and information (e.g., a newspaper report, a recent journal article, a television clip, a web site, a set of statistics, an annual report) can be quite motivating. It is advised that instructors have a specific set of questions for students to answer about a specific information source. Working individually at first, then in pairs, then opening it up to the class (think-pair-share) is an effective technique for stimulating thought and discussion.
Student Activities Outside of the Class

**Online Discussion for Building Knowledge (higher level thinking, written skills, learning style)**

Online discussions can be very effective or disastrous, depending on the kind of questions you ask, the size of your class, and the rules you establish for posting messages. If you ask focused questions, limit the number of people who can participate in a specific discussion, insist on clear, short subject lines, and concise 3-5 sentence postings, you can have very meaningful and lively discussions that include students who might not feel comfortable talking face-to-face. In general, online discussions can allow students to reflect a little more than they might in a group discussion. Finally, students should always be encouraged to build knowledge based on previous postings and not to simply repeat what another student said.

**Posting and Evaluation of Solutions in Discussion Board (evaluation, higher-level skills, metacognition)**

Typed answers (where appropriate) or scanned in diagrams, solutions, and concepts maps can be an effective way to share ideas and information. Students can then examine and/or evaluate each others work and build their knowledge. It is important for students to understand that there are different solutions to problems, a realization made much easier through peer evaluation.

**Communication with Peers and Professors**

Both in class and outside of class, students are able to communicate with each other (through synchronous – chat experiences and through asynchronous – posting and/or email experiences). Communication allows students to immediately post questions and problems so that their peers or the professor can respond. In addition, work groups can have private discussion topics set up so that they can share group project material and make comments to each other freely and with ease.

**Streamed Videos (real world knowledge, evaluation, learning style)**

Streamed videos are very effective for assignments and homework and, depending on the video, can bring real world grounding to a specific topic. For more details, see Streamed Videos in the “in class” activities listed above.

**Demonstration of Specific Tasks (application of skills, concept review)**

Camtasia studio is a very promising product that allows an instructor to record and demonstrate how to do a particular task, either on the computer or using a tablet (or some other writing device). The instructor can talk while doing the task. All the information can be recorded and played back to the students. We are just experimenting with this software, but it has the potential to be a tremendous review tool and time saver, especially if the instructor builds up a library of demonstration clips.

**Creating E-Portfolios (constructivism, higher level thinking)**

Creating electronic portfolios, journals, or research logs can be an effective tool for students to showcase their work, as well as bring together a number of topics in a culminating task. You can also have students create web pages on a wide range of course related issues – this can help augment the main course web page for future courses. Creating web pages can be a challenge, so care must be taken to offer the appropriate amount of support. Keep in mind Word or FrontPage can be used to create web pages easily and quickly, albeit the code can be a little dense.

**Video Projects (learning style, application of concepts)**

Creating mini-video clips or digital pictures can be a powerful tool for engaging students in a variety of topics. It can also be an effective evaluation tool for presentations. Many students benefit considerably from watching themselves present information. The range of application is virtually endless – we have used them for microteaching, mini-lessons on specific core topics, creating virtual research conferences, and teaching core business concepts.

**Resource Collections (application of skills, knowledge building)**

Students collect, analyze, and annotate various web pages and then post online. This allows for the collection of immediate and valuable resources for the class and the students. Through the creation of a digital resource web site, students then take the listed web pages and collect, organize and synthesize them into meaningful
topic areas. This digital resource collection will be valuable to the students in their careers and in fulfilling assignments throughout the term.

**Group Work (application of skills, knowledge building)**

Students work collaboratively to prepare and present digital projects (e.g. PowerPoint presentations, online course modules, computer robot activities). The fact that everyone has a laptop allows for constant communication and sharing of resources, as well as the opportunity to do parts of a project and piece it together on the laptop. This has been proven effective with HyperStudio music projects, web page projects, online courseware modules, PowerPoint presentations, video projects etc.

**Faculty Activities in the Class**

**PowerPoint Presentations (learning style, interactive learning, collaborative learning)**

Many instructors use PowerPoint presentations, but a number do not use this tool well. Simple rules such as having an overview slide, limited text on each slide, point-by-point transitions, high-contrast, consistent colour schemes, specific activities and questions within the presentation, and limiting the length help make this tool more effective. Many students get distracted or bored and start surfing the web when presentations are too long, too dense with content, or do not involve the students. The presentation can be more effective if it is posted on a web page so that students can refer to it. If Silicon Chalk is used, the entire presentation can be recorded with sound for playing back later.

**Laptop Screens Down when Lecturing (collaborative learning)**

This is a simple rule that lectures should insist on if they want to present or lecture. Many students surf the web, read email, or do homework on their laptops during a class. Insist that the laptop screens are pushed down during the “lecturing” part of your class – otherwise you are wasting your time. It could be argued that students could be taking notes and this is a legitimate response, but this does not seem to be the case in our experience. Explain to the students why you are asking them to put their screens down, but keep your presentations short and to the point.

**Polling Students (collaborative learning)**

If you want to involve the students in your presentation, ask them regularly to post whether they understand as specific topic or can answer a specific question. Silicon chalk allows students to post their answers and then calculates the totals almost instantaneously. This valuable tool gives the instructor instant feedback about content and pace. We are just beginning to use this tool, but see that it could have good potential for keeping students focussed on a presentation.

**Quick Content Questionnaires (collaborative learning, application of concepts)**

With Silicon Chalk, you can also post questionnaires and give students instant feedback on their answers. This is a good way to review concepts presented in a previous class at the start of a lecture. Of course, the tool can be used at any time in the class as a means to assess learning.

**Working on Problems with a Tablet (learning styles, collaborative learning)**

The tablet allows instructors and students to present analog information on the projector – solutions to problems, concepts maps, and diagrams. These diagrams can be saved and posted on a web page or on a discussion board for evaluation. Students can concentrate more on the presenter’s explanations, rather than having to write down notes and listen at the same time.

**Faculty Activities Outside of the Class**

**Web Page – Lesson Plans, Resources and Assignments (interactive learning, learning style)**

It is invaluable to be able to post your lesson content, resources, course outline, assignments and any other course related material on a well organized web page. You have to be very careful, though, to make navigation and access easy. Some authoring tools are very cumbersome and students will avoid the web page if they cannot find the information they need. Having the course materials on the web page is invaluable, as students who miss class or forget certain details can quickly refer to any posted lesson. It is also an effective organizer for students at the start of a class. Furthermore, it can give students perspective on the whole course – where they are coming from and where they are going. One final word of caution: Instructors need to understand the key rules of creating a proper web page, regardless of the tool they use. Classic problems like presenting far too much text on the screen, too
many pictures and distractions, extremely large files, hard to read fonts and poor navigation schemes quickly reduce the effectiveness of a web page as an effective learning tool.

Reviewing Key Web Resources (interactive learning, constructivism)
As the course develops over time, an instructor can gather a solid collection of tried-and-true, annotated resources. Care must be taken to (a) revisit all links periodically as web page addresses change frequently, (b) include sites with good content, as opposed to sites that point to a seemingly endless list of resources, and (c) keep the list to a maximum of say 10 - 15 resources. Simply put, students will use the resource if they are helpful. You need to be diligent about this area.

Monitoring and Participating in the Discussion Board (facilitation and constructivism)
It is essential for the instructor to (a) ensure the rules of a discussion board are being followed, (b) understand how students are thinking, and (c) add thoughtful, probing questions, especially when discussions start to stray away from the key topics. Instructors have to be careful not to put there opinions or evaluations in too often, as the students may back away from participating. You also need to monitor which questions prompted good discussions. Most importantly, you have to ensure that certain rules are followed: clear subject lines and concise messages are the most important.

Assessment of Laptop Strategies

Attitudes
The students (n=52) in the teacher education program showed significant gains in self-efficacy (p<.005) and intentions to use computers in the future (p<.005), but not affective or cognitive attitudes.

Computer Skill
Students (n=52) improved significantly (p< .001) with respect to operating system, communication, www skills, word processing, spreadsheet, database, graphics, multimedia, create web page, and programming skills.

Practical Use
On average, students reported that they actively used their computers at the university and in their practicum field placements for planning lessons, using application tools for class, and group work.

Importance/Relevance to Other Institutions
While a number of high education programs are promoting the use of laptops, there is a clear lack of guidance on how to use laptops in a pedagogically useful and effective manner. In some cases, having laptops in the classroom can be a distraction and even deterrent to learning. This presentation provides a number of tested, evaluated and theoretically grounded strategies for using laptops in a meaningful way.

References


