Using ICT to Facilitate the Student Active Learning

Through Web-Based Course

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Objectives

Audiences will:

• **Realize the availability of new technology (ICT) to support learning and teaching**
• **Understand the Student Active Learning concept**
• **Understand the e-learning concept and its pedagogical aspects**
• **Understand how to use ICT to support the Student Active Learning through web-based course (e-learning) within the framework of long life learning.**
• **Understand the role of assessment to evaluate the teaching and learning process.**
What is ICT?

• Information technology refers to the processes, applications and equipment by which we access, organize, analyze, evaluate and present information.

• ICT isn’t just about computers, it’s calculators, PDAs, digital cameras, scanners, video cameras, MP3 players, the internet, digital data logging…
Information and Communication Technology

• ICT includes all forms of telecommunication systems such as telephones, the Internet, and the Web.

• ICT includes calculators, computers, digital cameras, digital music devices.

• ICT includes the field of Computer and Information Science.
New Available Technology for Teaching & Learning

- PC (including Notebook)
- Mobile devices (Mobile Phone, PDA)
- Networking Technology (including Wireless Technology)
- Internet Application (E-mail, HTML, XML, MathML, PHP, JavaScript, Java Applet, Flash, Discussion Forum, Instant Messangers, CMS, LMS, Weblog, etc.)
- Multimedia Technology (Digital Camera, Digital Video Camera, Digital Audio Converter/Player, etc.)
Laptops for Learning

- Mobile computing with wireless LAN
- Promote computer use and literacy of students
- Integrate privately owned and operated computing equipment into campus infrastructure
- Create infrastructure for new methods in teaching and learning
  → A large number of new student workplaces
Student experiences of laptops

- 67% say owning a laptop has facilitated their studies
- 46% use their laptops for group work regularly or frequently
- Problems are primarily solved with the help of friends (44%) or on one’s own (34%)
- 42% wish an increased use of laptops in the teaching

(Anders Hagström: Project Manager, ETH World Swiss Federal Institute of technology, ETH Zurich)
Growth - Hypothetical Model of ICT in Education

- Computer Based Learning
- Single-user tools
- Online Learning
- Multi-user Virtual Learning Environment
- Learning on Demand
- Online Compound Learning Systems
- Learning Mall
- Distributed Electronic Virtual Knowledge Systems

Growth of ICT uses in Education

Technological Change

Educational Progress

Time

1980 2000 2020 2040

Substitution Creative destruction Transformation

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Why ICT?

- Technology → a major factor in the transition to a knowledge economy & information society
- ICT is increasingly used in education and in the business and leisure industries.
- Application of ICT to manage information and solve problems → important set of skills
- Needs to provide students a wide variety of opportunities to explore how the technology can support them in their learning
Curriculum Changes in the Knowledge Economy and Information Society

- Life long learning skills
- **Metacognition skills** (the ability to set student’s own goals, planning their own learning and evaluating their success)
- Transfer of knowledge/skills → more active involvement of students
The Power of ICT in Learning

- **Connectivity** - access to global information & world full of learning resources
- **Flexibility** - any time, any place, independent learner, self-paced learning
- **Interactivity** - assessment, feedback, across time and place
- **Collaboration** - support collaborative learning (develop learning community, shared experiences)
- **Extended opportunities** - e-content can reinforce and extend classroom-based learning; networked communication provides virtual communities for students/teachers to practice advanced tools
- **Motivation** - multimedia resources can make learning fun (ICT can simulate authentic problem situations)

Increased efficiency of tracking and monitoring learners’ progress
ICT & Curriculum

- ICT as a Subject Content
  - Within Specialized Subjects (e.g. Computer Science, Information Technology Management)
  - Integrated with Other Subjects (e.g. Computer applications for mathematics, engineering, economics, etc.)

- ICT as a Tool
  - For Academic Information Management
  - As Learning Tool
  - As Teaching Tool
Learning Paradigm Change

Teacher is
... a sage on the stage

Teacher is
... a guide on my side
Goals of Education (David Perkins)

Cognitive Scale

Low Order | Medium Order | High Order
---|---|---
Acquisition and retention of knowledge and skills | Understanding of one's acquired knowledge and skills | Active use of one's acquired knowledge and skills. (Transfer of learning. Ability to apply one's learning to new settings. Ability to analyze and solve novel problems.)
Learning Pyramid

- Students are increasingly active, and challenged. Experience is increasingly practical and multi-sensory.
- Students receive information with a recall rate of 5%.
- Students apply their learning with a recall rate of 10%.
- Students recall information with a recall rate of 20%.
- Students demonstrate with a recall rate of 30%.
- Students discuss groups with a recall rate of 50%.
- Students practice by doing with a recall rate of 75%.
- Students teach others/Immediate use of learning with a recall rate of 90%.

National Training Laboratories in Bethel, Maine
The Dale’s Cone of Learning

AFTER TWO WEEKS WE TEND TO REMEMBER ...

10% of what we read

20% of what we hear

30% of what we see

50% of what we see and hear

70% of what we say

90% of what we say and do

READING

HEARING WORDS

LOOKING AT PICTURES

WATCHING A MOVIE/VIDEOTAPE

LOOKING AT AN EXHIBIT

WATCHING A DEMONSTRATION

SEEING IT DONE ON LOCATION

PARTicipating in a discussion

Giving a talk

DoinG A DRAMATIC PRESENTATION

Simulating the real experience

DoinG THE REAL THING

PASsive

Active

The Seven Principles for Good Practice in Undergraduate Education

1. Encourages Student-Faculty Contact
2. Develops Reciprocity & Cooperation Among Students
3. Uses Active Learning Techniques
4. Gives Prompt Feedback
5. Emphasizes Time on Task
6. Communicates High Expectations
7. Respects Diverse Talents and Ways of Learning

(Chickering & Gamson 1987)

How can ICT support it?
What is Active Learning?

• Involving students directly and actively in the learning process itself

• Involving students practicing important skills and in applying new knowledge.

• Students are given the opportunity to take a more interactive relationship with the subject matter of a course, encouraging them to generate rather than simply to receive knowledge.
What is Active Learning?

• Emphasizing more on developing students' higher order thinking skills
• Greater emphasis is placed on students' exploration of attitudes and values
• Teachers facilitate rather than dictate the students’ learning.
Active Learning

Engaging students in doing something besides listening to a lecture and taking notes to help them learn and apply course material. Students may be involved in talking and listening to one another, or writing, reading and reflecting individually.

Active Learning occurs when teaching provides students with opportunities to learn independently and from one another another
Constructivism: Learning is a 'meaning-making' process

New learning

Existing concepts, knowledge and experience

Links that create understanding.
This new concept is similar to...
is related to...
is because....

building on previous knowledge and skills
Active Learning = Activity-based Learning

• Reading, Writing, Sketching, Drawing
• Solving problems, Troubleshooting
• Answering questions
• Formulating questions of their own
• Discussing
• Explaining, Interpreting, Critiquing
• Debating, Brainstorming
• Group working
• Case studies
• ...

How can ICT support it?

Students are making their own choices and taking up responsibility of their learning process.
Collaborative Learning:

• *a subset of active learning activities that engage students in interacting with one another while learning and applying the course material.*

• *Usually it involves breaking the class into small groups (of 2 or 3 students) and teacher posing a question, often of a conceptual nature, and allowing each group to discuss a possible answer for a period of a minute or two. He/she then seeks answers at random.*
Benefits of Active and Collaborative Learning

In addition to the obvious advantages of information retention,

- **Interaction**: student-faculty, student-student
- **Academic achievement** (i.e., grades, more material learned, mastery learning)
- **Communication skills**
- **Higher-level thinking skills**
- **Teamwork**
- **Attitude** towards the subject and motivation to learn, enjoy the class more
Why it works?

- Individual students may get stuck on a problem and give up, whereas groups of students tend to keep going,
- Students become exposed to alternative problem-solving strategies,
- Students are much less fearful of generating and answering questions among themselves than individually and directly to the instructor in class,
- As McKeachie says, students learn best what they teach!
The best answer to the question, "What is the most effective method of teaching?" is that it depends on the goal, the student, the content, and the teacher. But the next best answer is, "students teaching other students."

Wilbert J. McKeachie
Implementation of Active Learning

- PBL (Problem-Based Learning)
- PBL (Project-Based Learning)
- Peer Instruction
- Web-based Simulations
Problem Solving Includes:

• Posing, clarifying, and answering questions
• Posing, clarifying, and solving problems
• Posing, clarifying, and accomplishing tasks
• Posing, clarifying, and making decisions
• Using higher-order, critical, and wise thinking to do all of the above
Project-Based Learning (PBL)

• Students work individually or in teams over a period of time.

• Students produce a product, performance, or presentation.

• PBL is learner centered:
  - Teacher is “guide on the side.”
  - Teacher is not “sage on the stage.”
ICT-Based PBL Empowers Students and Teachers

• Teacher is immersed in an exciting learning environment designed to actively engage students.

• Teacher, as a “guide on the side,” is both a teacher and learner, learning from and sharing with students.

• Students engage in projects that they help to define, are intrinsically motivated, and do activities where they can see the results.
E-Learning: Using Web in Learning

- **Resourceful**: Links to other web sites that are relevant to the course topic(s)
- **Instructional**: A combination of contents and learning activities
- **Integral**: Using Web for classroom teaching and learning functions.
  - Posting syllabus online
  - Posting lecture notes online
  - Including additional resources
  - Using Web-based conferencing for discussion or other activities
- **Fully online**: Using the Web to delivery a course
Why use the Web?

• Expand classroom boundaries
  - More information
  - Higher accessibility
  - Enhanced interactivity and interaction

• New teaching paradigm
  - Student-centred approach
  - Constructivist approach
  - Active, authentic cooperative learning

• Individualization of Instruction: Students have widely varying interests, abilities, talents, and rates of learning

• Bonus: Your teaching portfolio
What is E-Learning?

- Learning that use ICT (Web)
- The focus is on *learning activity*

“e-Learning exploits interactive technologies and communication systems to improve the learning experience. It has the potential to transform the way we teach and learn across the board. It can raise standards, and widen participation in lifelong learning. **It cannot replace teachers and lecturers**, but alongside existing methods it can enhance the quality and reach of their teaching.”

*(Towards a Unified e-Learning Strategy, DfES 2003)*
E-Learning Framework

Student learning through:

- acquiring skills
- constructing knowledge and understanding
- participation and interaction

(Center for Learning and Teaching, 2003 http://www.wlv.ac.uk/celt/oltips/3what.html)
A model of learning activity design

A model of effective practice with e-learning

(JISC’s Effective Practice with e-Learning Guide, 2004, p.49)
Students need learning that is efficient and enjoyable, in a supportive environment:

- media are well matched to learning objectives
- active learning is supported through feedback
- an appropriate balance is achieved across the range
- methods are matched to study logistics and resources

<table>
<thead>
<tr>
<th>Media forms</th>
<th>Methods/technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrative</td>
<td>Lecture, video, book, CD, Web</td>
</tr>
<tr>
<td>Interactive</td>
<td>Tutorial, Library, CD, Web</td>
</tr>
<tr>
<td>Communicative</td>
<td>Seminar, group, online conference</td>
</tr>
<tr>
<td>Adaptive</td>
<td>Laboratory, field trip, simulation</td>
</tr>
<tr>
<td>Productive</td>
<td>Essay, product, animation, Weblogs, Wiki</td>
</tr>
</tbody>
</table>

Adapted from Diana Laurillard, Open University, UK
Based on research conducted by Edgar Dale in the 1960s:
The least effective method, the top of the cone, involves learning from information presented through verbal symbols, i.e., listening to spoken words.
The most effective method, the bottom of the cone, involves direct, purposeful learning experiences, such as hands-on or field experiences.
What is the 'appropriate balance'?

How best to distribute study time by guided, collaborative, individual modes, and across the five media forms?

Consider efficiency of study time!

<table>
<thead>
<tr>
<th>Learning Activity</th>
<th>Media Forms</th>
<th>Lecturer</th>
<th>Student</th>
<th>Self</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td>ICT</td>
<td>Normal</td>
<td>ICT</td>
</tr>
<tr>
<td>Attend, Passive</td>
<td>Narrative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attend, Active</td>
<td>Interactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss</td>
<td>Communicative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td>Adaptive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Articulate</td>
<td>Productive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How can we build E-Learning system?

• Plan instructional activities
• Design a web site
• Use Learning Management System (LMS) – choose Commercial or Free?
  - Pay: WebCT, BlackBoard, etc.
  - Free: Moodle, Manhattan, Claroline, Dokeos, LON-CAPA, etc.
• Use some authoring tools: MS Word, LaTeX, PDF Maker, MS FrontPage, MS Power Point, Dreamweaver, etc.
• Use some assessment/survey software: Hot Potatoes, PHPSurvey, etc.
Designing a web site

- Analyze the audience
- Analyze the content
- Define objectives
- Storyboard it
- Use a tool (or tools) to develop the site (e.g. HTML editor, web-based conferencing)
- Testing and evaluation
- Revise the objective, content
Flowchart of Developing Web-based Course

Apply for Web-based Class

Log in to the Class

Configuring the Class Tools

Managing Class Calendars

Uploading LOMs

Managing Students

Managing Communications

Managing Assignments/Assessment

Assigning LOMs

Arranging LOMs

Monitoring & Evaluation

Instructional Analysis

Developing & Preparing Learning Object Materials (LOMs)

Program Mapping
Selecting of E-Learning Tool

- Quality of product
- Extent and complexity of multimedia design ie use of media
- Interactivity
- Overall ease of use - navigation, aesthetics
- Collaborative capabilities
- Content delivery - tone of program
- Implementation costs
- Administration and management structure
- Security and monitoring facilities
- Open-standards based
- Scalable
- Application sharing
What do you need?

• Time and effort to plan a course
• Online teaching skills: coaching
• Instructional technology support
Resources available on campus

• Units
  - Academic Technologies for Learning (ATL)
  - Faculty-based Centers (e.g. Engineering TLC)
  - Technical Resource Group

• Technical Support

• Consultation on project planning, instructional design and evaluation
Resources available on campus

• Tools for building an educational web site
  - WebCT, WebBoard, FirstClass, etc. (pay)
  - Moodle, Manhattan, Claroline, Dokeos, etc. (free)
  - Web authoring programs (e.g. DreamWeaver, FrontPage, Netscape Composer, LaTeX)

• Why do you need these tools?
  - Use web conferencing
  - Create online interactive materials
Action Plan

• Case Scenario
• State the rationales
• List the instructional objectives
• Identify the ways to use the Web
Don't forget...

- The Web is just one of the instructional technologies
- Follow the good teaching principles as guidelines for using the Web in your teaching
- Be clear about your objectives, be creative when planning your course
- Acquire necessary skills
- Resources for further information
Strategic Planning Overview

Where are we now?

(Audit, Analysis, Research)

The Strategic Gap

Too big to jump?

Where do we want to be?

(Vision, Strategic Targets)

The Plan is the Bridge Over the Gap

The Plan is made up of Projects in Stages over 3 to 5 years. The Projects are assessed against Strategic Targets, prioritized and budgeted. The Plan is regularly evaluated and refined.
Planning for learning technologies

Active learning in a supportive environment
Methods suited to logistical needs

Reliable cheap networking
Helpdesk support

Balance of media forms
Provision for feedback

Collaboration
Migration of best practice

Customisable learning activities
Workload planning

Research on learning
Reward for excellence

Quality standards for ICT
Use feedback to build knowledge
Planning for learning technologies

Meeting students’ needs

Technical infrastructure

Course design

External partnerships

Resource planning

Staff development

Quality assurance

18 Agustus 2006

Sarasehan Dosen Jurusan Teknik Informatika FTI UII Yogyakarta
How to measure new learning results?

- New assessment methods
- Measure ability of knowledge reproduction → measure ability to apply knowledge in realistic settings.
- Closed format → Open formats (portfolio, performance assessment, etc.)
- Summative assessment → Formative assessment
Authentic Instruction and Authentic Assessment

- **Instruction** is authentic when it closely conforms to what we want students to learn to do.

- **Assessment** is authentic when it closely conforms to having students do what we are preparing them to do.
Authentic Instruction and Authentic Assessment for:

- Agricultural Age: *Hands-on, informal, learn by doing*
- Industrial Age: *Factory-like educational systems*
- Information Age
  - *Learning in and being assessed in an open computer, high connectivity environment*
  - *Learning to learn, to take responsibility for one’s own learning, and to become a lifelong learner*
Assessment (Authentic Assessment)

- Formative Assessment providing feedback to help improve quality of a project.
- Summative assessment after project is completed.
- Long term “residual impact” assessment and use in one’s portfolio.
- Use of rubrics
- Intermediate goals: milestones.
- Self assessment.
- Peer assessment.
Formative assessment methods and Bloom’s taxonomy.

<table>
<thead>
<tr>
<th>Bloom’s Taxonomy</th>
<th>Learning Skill</th>
<th>Concept-test</th>
<th>Venn Diagram</th>
<th>Image Analysis</th>
<th>Concept Map</th>
<th>Open-ended Question</th>
<th>Evaluation Rubric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>memorization and recall</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Comprehension</td>
<td>understanding</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Application</td>
<td>using knowledge</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Analysis</td>
<td>taking apart information</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Synthesis</td>
<td>reorganizing information</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Evaluation</td>
<td>making judgements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>⬤</td>
</tr>
</tbody>
</table>

## Critical thinking question stems

<table>
<thead>
<tr>
<th>Bloom’s Taxonomy</th>
<th>Question Stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>What is...?</td>
</tr>
<tr>
<td></td>
<td>What would happen if...?</td>
</tr>
<tr>
<td></td>
<td>What does...illustrate about...?</td>
</tr>
<tr>
<td></td>
<td>What is analogous to...?</td>
</tr>
<tr>
<td>Comprehension</td>
<td>How could...be used to...?</td>
</tr>
<tr>
<td></td>
<td>What is another example of...?</td>
</tr>
<tr>
<td>Analysis</td>
<td>How does...affect...?</td>
</tr>
<tr>
<td></td>
<td>What are the differences (similarities) between...?</td>
</tr>
<tr>
<td></td>
<td>What causes...?</td>
</tr>
<tr>
<td>Synthesis</td>
<td>What is a possible solution for the problem of...?</td>
</tr>
<tr>
<td></td>
<td>How does...relate to what we learned before about...?</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Why is...important?</td>
</tr>
<tr>
<td></td>
<td>What is the best...and why?</td>
</tr>
<tr>
<td></td>
<td>Do you agree/disagree that...?</td>
</tr>
</tbody>
</table>
Good teaching is ...

...good teaching.

However...

“Good technology in the hands of poor teachers can do more harm than good!”

Good teaching may overcome a poor choice in the use of technology, but technology will never save bad teaching; usually it makes it worse.

A.W. Bates (1995), Technology, Open Learning and Distance Education
Thank You!
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