Blended Learning in Computing Courses

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Challenges to Higher Education

- Scaling up with improving quality
- Fast changing industrial scenario
- Huge shortage of good teachers
- Archaic systems to conduct formal educational programs

How do we meet the Challenges

- Rediscover the goals of higher education
- Redesign of UG Programs
- Design of instruction for higher order learning
- Use technology in all aspects of teaching and learning

Higher Education

Goal

- Critical and creative reflection and discourse

Present practices

- Untenable and incongruent with the needs and demands of present day knowledge society

Needs of today's Knowledge Society

- Effective communication
- Self-directed and life-long learning
- Ethical reasoning
- Individual, communities and cultures
- Service to community
- Influence of mind, body and spirit on health
- Critical thought and knowledge acquisition
- Competence in one's discipline

Learning

- Has cognitive and sociological dimensions
- Neither can be subordinated to the other or neglected
- Learning takes place best when students are actively engaged in the process of inquiry.
- When action is divorced from thought, teaching becomes information transmission
- Higher education experiences are best conceived as communities of inquiry.

Educational Inquiry

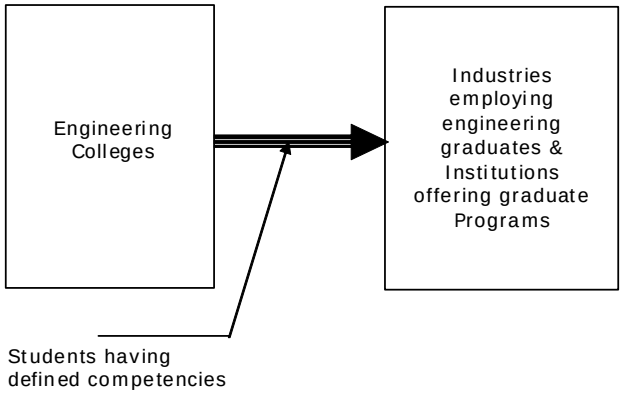
- It is a process to investigate problems and issues – not to memorize solutions.
- It focuses on intended goals and learning outcomes.
- It is a systematic process to define relevant questions, search for relevant information, formulate solutions and apply those solutions.
- Inquiry is both a reflective and collaborative experience.
- Inquiry must be purposeful, but flexible, to explore unintended paths of interest.

COI Framework

- Pedagogically identifies the core elements and provides direction for the design of authentic and engaging higher-order learning experience.
- Reflection and collaboration must be present for high cognitive presence.
- Students must be prepared and willing to recast their role.

Design of UG Engineering Programs

- Should start with the recognition of the most important relationship



UG program in engineering

Should start with stating

- Program Educational Goals
- Program Outcomes (Washington Accord, ABET, NBA etc.)
  Attributes of a graduating engineer

Program Educational Objectives (PEOs)

- The educational objectives of a program are the statements that describe the expected achievements of graduates within first few years of their graduation from the program.
- They are guided by global and local needs, vision of the Institution, long term goals etc.
- Department faculty members must continuously work with local employers, industry and RD advisors, and the alumni.

Breadth Vs. Depth

- Meaningful learning requires that the student experiences higher level learning activities involving application to new situation, analyzing, evaluating and creating while paying attention to the development of generic competencies
- Too many courses would only lead to superficial learning

Computing Curricula (2005)

Guidelines developed by:

- ACM
- AIS
- AITP
- IEEE-CS

Computing

Computing is defined to mean

- 'Any goal-oriented activity *requiring, benefiting from,* or *creating computers'*
- Sometimes the term Information Technology is used to represent the entire "Computing"

Computing

Computing includes

- Designing and building hardware and software systems for a wide range of purposes
- Processing, structuring, and managing various kinds of information
- Doing scientific studies using computers
- Creating and using communications and entertainment media
- Finding and gathering information relevant to any particular purpose

  and so on

Bachelor degree programs in computing

- Computer Engineering
- Computer Science
- Information Systems
- Information Technology
- Software Engineering

Software Engineer

- It is a job label
- There is no standard definition for this term when used in a job description.
- Its meaning varies widely among employers
- It can be a title equivalent to computer programmer or a title for someone who manages a large, complex, and/or safety-critical software project

All BE Programs in Computing

- Have several common elements
- Should include learning experiences that meet the attributes as defined by Washington Accord or similar Accreditation agency
- Should be situated in at least two selected domains

PEOs of BE in Information Technology

- Explain and apply appropriate information technologies and employ appropriate methodologies to help an individual or organization achieve its goals and objectives
- Manage the information technology resources of an individual or organization
- Anticipate the changing direction of information technology and evaluate and communicate the likely utility of new technologies to an individual or organization
- Develop IT systems that would perform tasks related to E-governance and/or Health Care Management
- Work in a team using common tools and environments to achieve project objectives

PEOs of BE in Software Engineering

- Specify, design, develop, test and maintain usable software systems that behave reliably and efficiently and satisfy all the requirements that customers have defined for them
- Work in a team using common tools and environments to achieve project objectives
- Develop software systems that would perform tasks related to Research, Education and Training and/or E-governance
- http://www.tceisd.org

Designing a Course

- Design a course as per a selected Instructional System Design model
- Identify competencies the students should acquire at the end of the course
- Write down the instructional objectives as a set of problems the students should be able to solve.
- Structure the course through hierarchical arrangements of concepts the students need to master.
- Select an instructional strategy to conduct the course

Competencies (Information System Design)

1. Identify information needs of an organization and distinguish between operational, tactical and strategic information.
2. Divide an organization based on their functions and determine information needs of each of the functional areas.
3. Classify information systems as transaction processing systems, management information systems, decision support systems, business intelligence systems and the appropriate levels of management where they are needed.
4. Classify methods of processing data as batch processing, on-line processing and real-time processing and apply them in appropriate contexts.

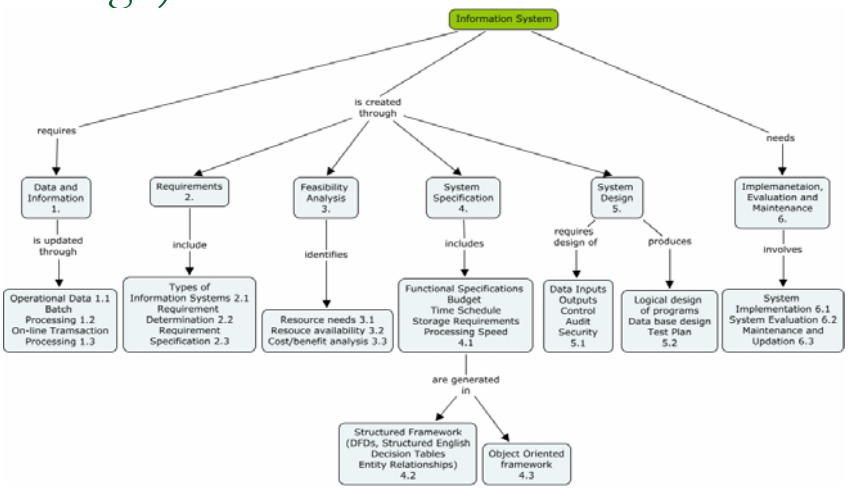
Competencies (Information System Design)(2)

5. Create system requirements specifications document based on interaction with users of the information system to be designed.
6. Perform feasibility analysis for a proposed system, formulate the system goals and their technical, operational and economic feasibility
7. Formulate data flow diagrams corresponding to document and data flow in organizations and apply them for evolving process specifications.
8. Express data processing rules using structured English and decision tables. Identify and remove incomplete, ambiguous and contradictory rules in the specification.

Competencies (Information System Design)(3)

9. Design the databases required in information systems and normalize them.
10. Design methods of codifying inputs, validating them and generating reports understandable to appropriate levels of management.
11. Design controls, audit trails and security systems and testing methods for both existing and new information systems of organizations.
12. Identify objects from system requirement specifications and model system based on that.

Concept Map (Information System Design)



Instructional Strategy

- Selection of a set of instructional methods
- Instructional methods could include lectures, assignments, asynchronous group discussions, group projects, field surveys, writing reports, seminars etc.
- Blended learning offers an opportunity to achieve the goals of higher education while permitting scaling up

Blended Learning

- Integrates the strengths of face-to-face and online learning to address worthwhile educational goals
- Offers a great possibility of recapturing the ideals of higher education
- It is not an addition of another expensive educational layer
- It is a thoughtful fusion of face-to-face and online learning
- Aims at the course design to optimize student engagement.
- Restructuring and replacing traditional class contact hours

Framework for Blended Learning

- Learning is constructing meaning from experiences
- Meaning is not constructed in isolation
- Making meaning is a collaborative constructivist process
- Such a constructivist process has inquiry at its core
- Social interaction and collaboration shapes and tests meaning, thus enriching understanding and knowledge sharing
- Emphasis is on inquiry processes that ensure core concepts are constructed and assimilated in a deep and meaningful manner

Principles of Blended Learning Design

- Plan to establish a climate that will encourage open communication and create trust.
- Plan for critical reflection, discourse, and tasks that will support systematic inquiry
- Sustain community by shifting to purposeful, collaborative communication.
- Encourage and support the progression of inquiry.
- Manage collaborative relationships to support students in assuming increasing responsibility for their learning
- Ensure that inquiry moves to resolution and that metacognitive awareness is developed.
- Ensure assessment is congruent with intended learning outcomes

Thank You