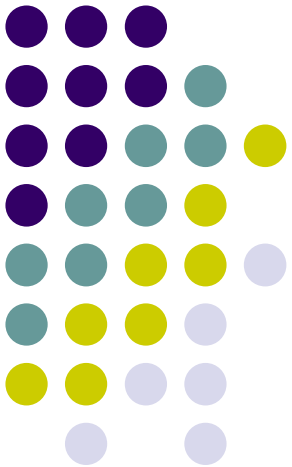
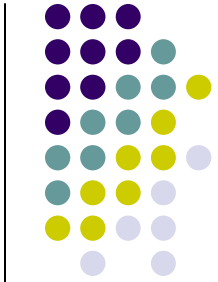
E-Learning and Related Technologies

Mark Micallef

mmica01@um.edu.mt



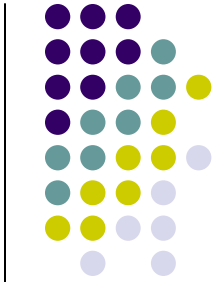
Why E-Learning in a SE Course?



- Solves many problems with learning
  - Time contraints
  - Distance constraints
- E-Learning is becoming very popular
- Continuosly Evolving
- Software Engineering at the forefront of new developments

What is e-learning?

The Traditional University



- Lecturer delivers a number of lectures
- Some tutorials may be given
- Students work on an assignment
- Students take a test
- Assignments and Tests are Corrected
- Grade given

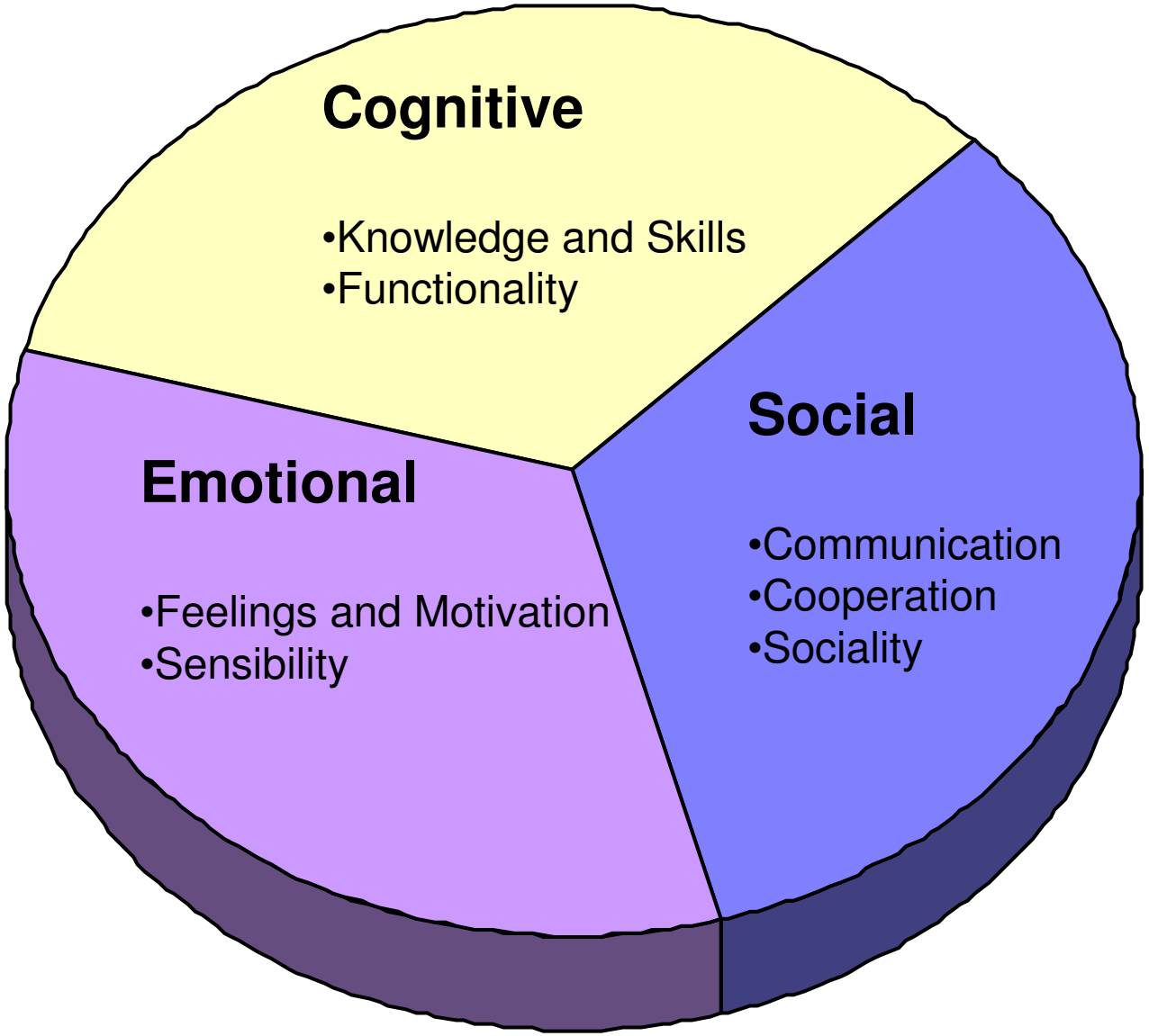
Replicating the same in e-learning

- Lecturer records a video of a lecture delivery
- Students download video and follow lecture
- Questions can be made via e-mail
- Students submit assignment via e-mail
- Students go to a local examination centre to take a test
- Corrections made →grades issued

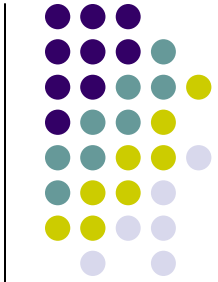
Will that work?

- Is the e-learning option as effective as the face-to-face method?
- There are some problems:
  - Lecturers never meet students
  - Students do not form a community
  - We are not fully utilising the potential of the virtual learning environment

The Three Dimensions of Learning



Another Go at E-Learning

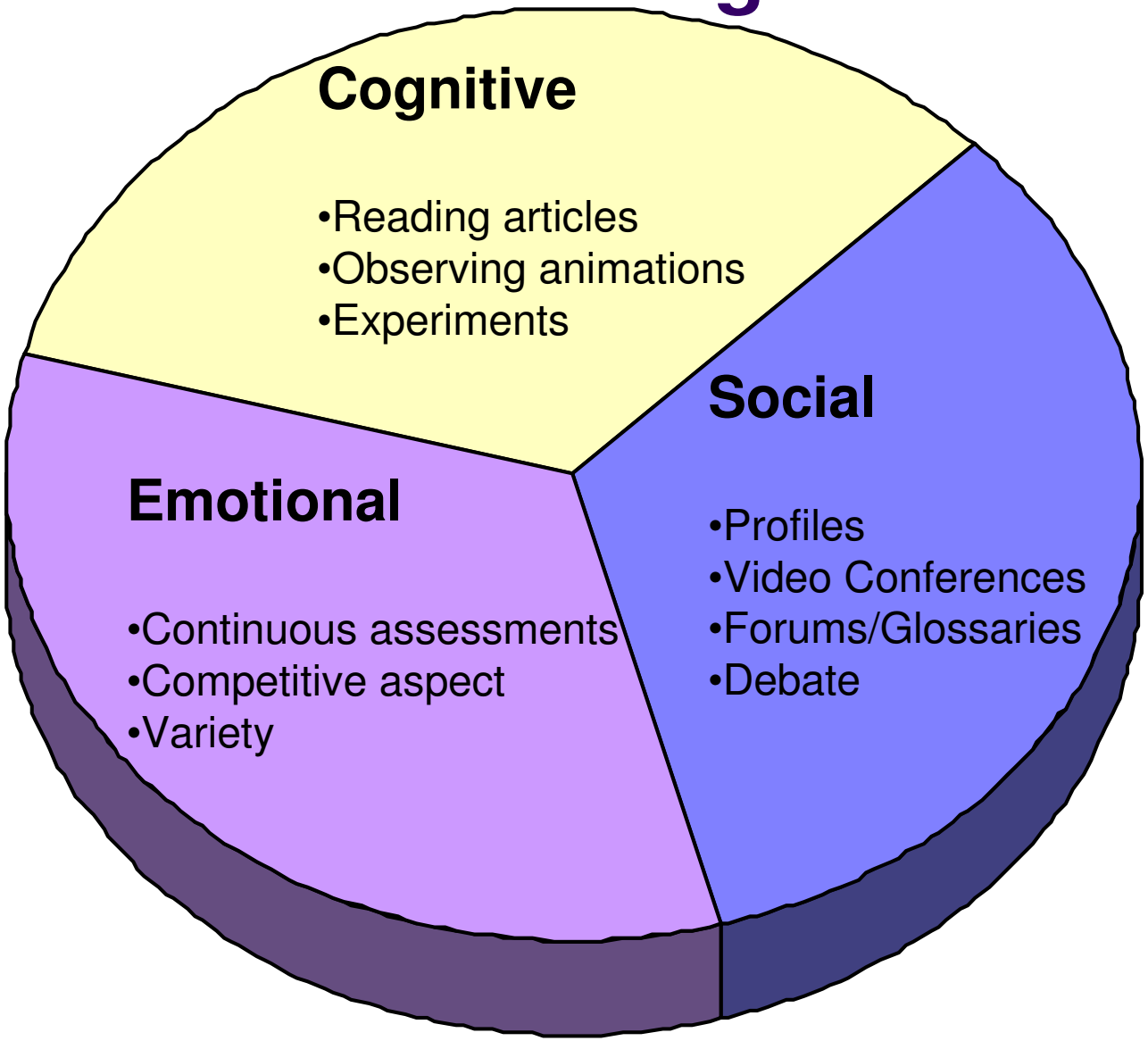


- Students build a profile of themselves
- Introductory Video Conference
- Course Forum
- Course Glossary
- Personal Journal
- Lesson 1 – Provide 3 articles for students to read

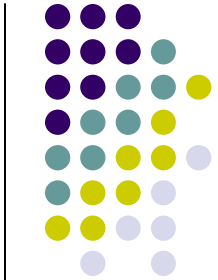
Another Go at E-Learning (2)

- Lesson 2 – Online lesson involving reading and some instructional animations
- Lesson 3 – Hands-on lesson. Students interact with learning objects to learn material
- Multiple Choice Test (Automatically corrected)
- Live Online Debate between teams of students

Dimensions of Learning Affected

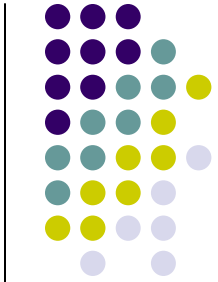


E-Learning Definitions



- **E-Learning** is the process of engaging learning via the use of electronic technology.
- **Virtual Learning Environments (VLEs)** are specialised e-learning software packages which facilitate the delivery of e-learning content.

Learning Objects

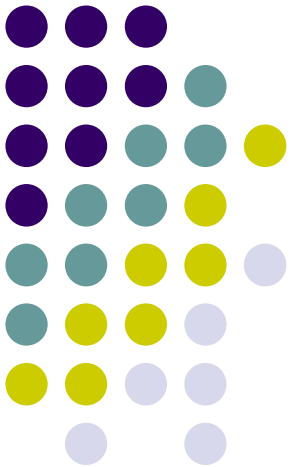


- **Learning Object (LO)** – An entity or set of resources which can be used to facilitate intended learning outcomes.
- Often incorporate assessment
- Learning Object vs. Information Object
- Active vs. Passive
- Skills, Concepts Processes vs. Textbooks, Websites, and Courses
- Concept of **Reusable Learning Objects** (RLOs)

Examples of Learning Objects

- www.merlot.org
- http://www.wisc-online.com/
- http://coolgenius.com/
- http://alivetek.com/learningobject
- http://www.cyberschoolbu/
- http://instcomp.spjc.edu/itwebsite/resources/_resources.htm

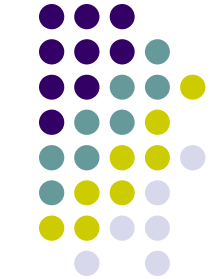
Designing an Online Course



Design Design Design (1/3)

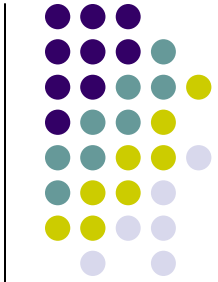
- Concept of design in Engineering and Software Engineering holds for E-Learning Systems
- Do not try to attempt to take a set of existing lecture slides and map them to a VLE

Design Design Design (2/3)



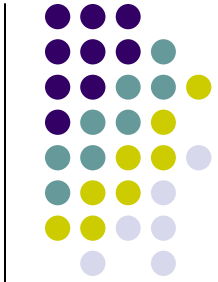
- Look at courseware and ask:
  - Can this material be mapped to a VLE as is?
  - How can I replicate my interaction with students in a physical classroom for this course?
  - Do VLEs present opportunities for better interactivity for this course? How?

Design Design Design (3/3)



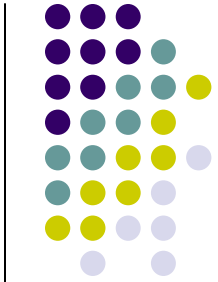
- Steps in a design process
  - Task Analysis
  - Audience Analysis
  - Learning Objectives
  - Instructional Strategy
  - Course Structure
  - Mix of Methods and Media
  - E-tutoring requirements
  - Delivery Hardware and Software
  - Requirements for Learner Management and Record Keeping

Story Boarding



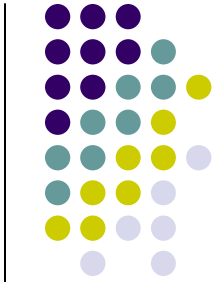
- In many ways, online courses are like a film production with added interactivity
- Storyboards help set out the ‘plot’ of the course
- Use storyboards to highlight course content:
  - Content Highlights
  - Interactivity Highlights
  - Media Highlights

Issues: *Political Correctness*



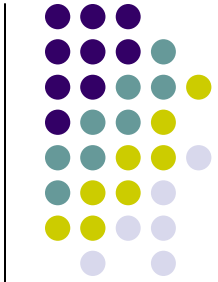
- E-Learning increases variety of students
- Different backgrounds, cultures, races, religions
- Avoid Mega-sins
  - Sexism
  - Ageism
  - Racism

Issues: *Online Technologies*



- Careful when selecting technologies
- Ensure portability with browsers, operating systems and devices
- Ensure long-term support and applicability

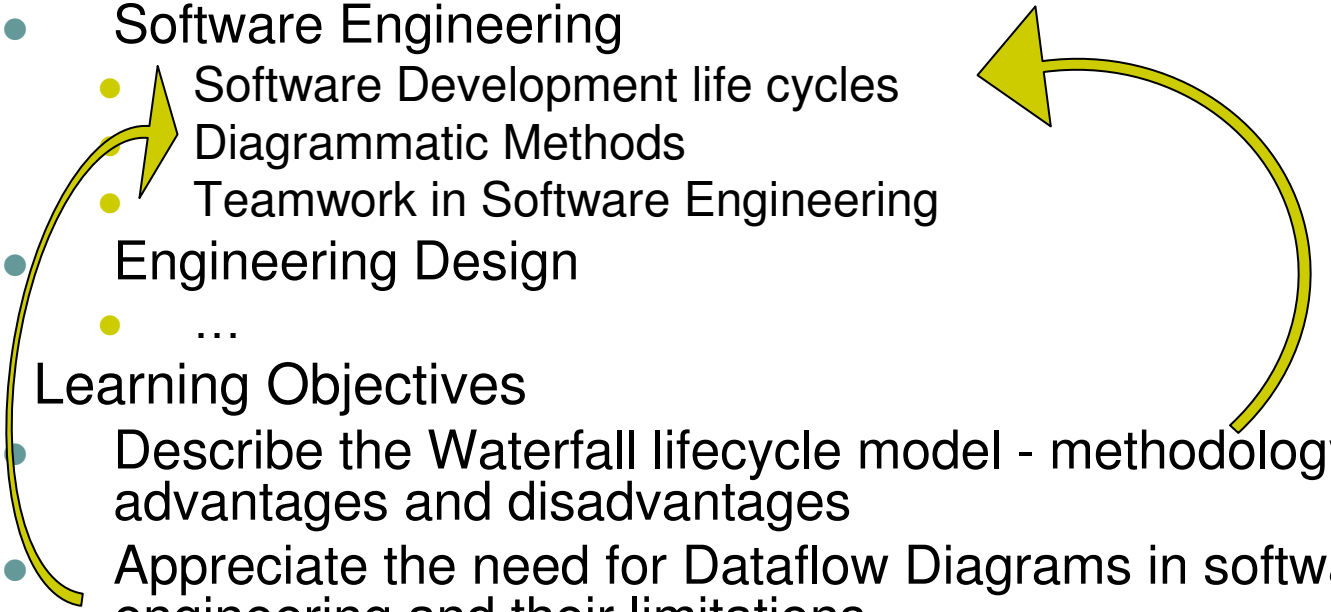
Issues: *Reviews*



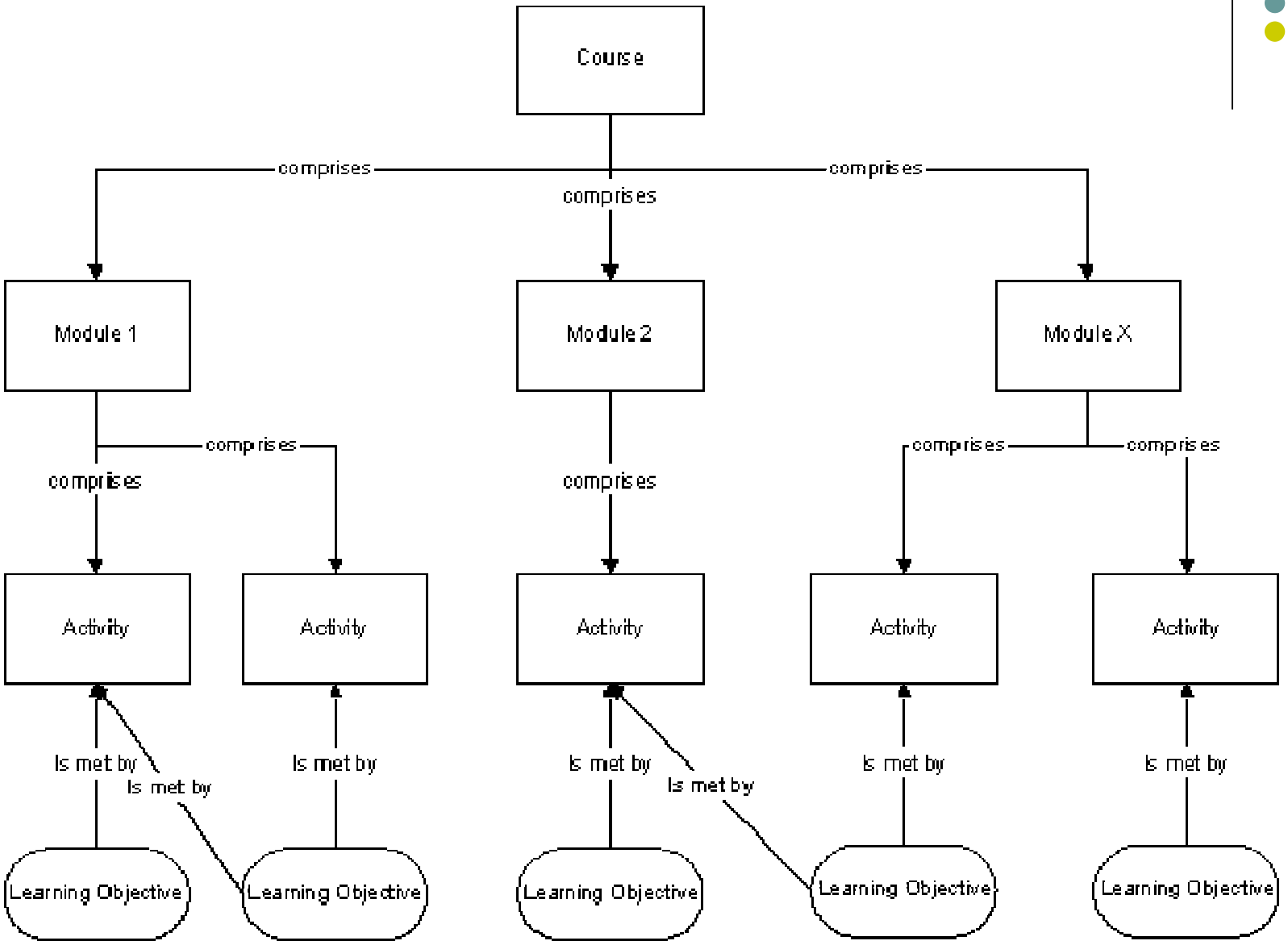
- Be sure to Pencil In Reviews
  - Content Reviews
  - Project Reviews
  - Technical Reviews
  - Navigability Reviews

Anatomy of an Online Course

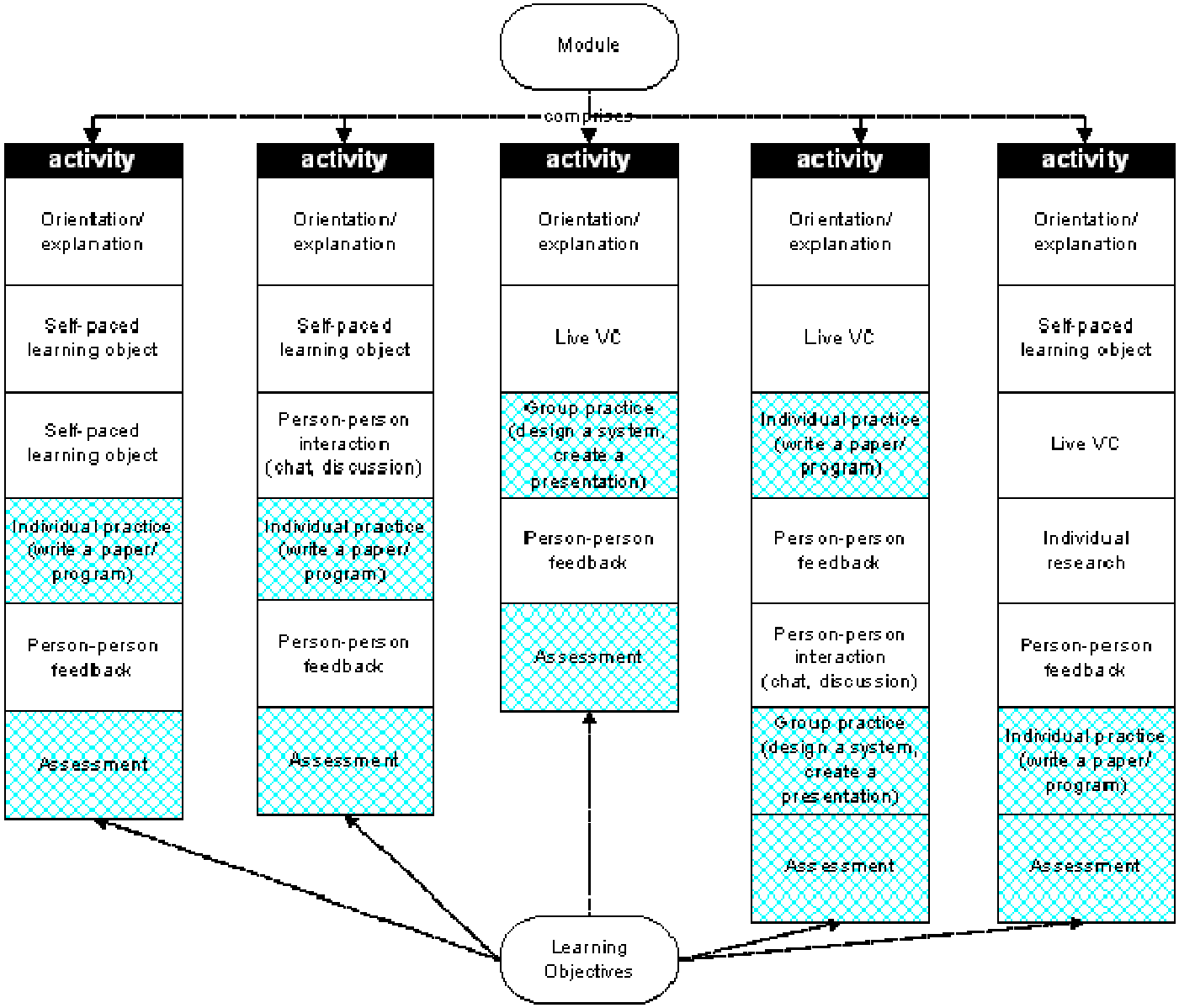
- Syllabus (E.g. ACM 2001 Computer Science Syllabus)
- Knowledge Areas
  - Software Engineering
    - Software Development life cycles
    - Diagrammatic Methods
    - Teamwork in Software Engineering
  - Engineering Design
    - …
- Learning Objectives
  - Describe the Waterfall lifecycle model - methodology, advantages and disadvantages
  - Appreciate the need for Dataflow Diagrams in software engineering and their limitations
  - …



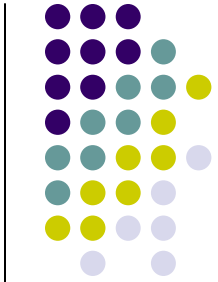
Anatomy of an Online Course



Anatomy of an Online Course



Course Proformas (1/6)



MVU Course Proforma

v. 0.0

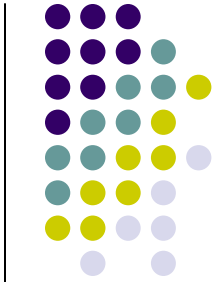
I. General

Course Code	CS110
Title	UNIX/LINUX Operating System Principles
Description	The aim of this course is to provide the student with all necessary fundamental knowledge, concepts and techniques to effectively use and manage personal and application data, as well as execute applications, on UNIX/LINUX platforms.

II. Prerequisites

Description	**ACM**
NA	

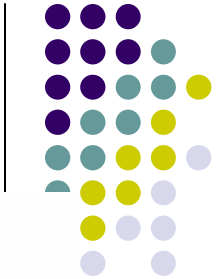
Course Proformas (2/6)



III. Syllabus

#	Knowledge Area	ACM
1	Overview of Operating System	OS1
2	Operating System Usage	UOM1
3	Text file Editing	UOM2
4	Process Management	UOM3
5	Device Management	OS6
6	File Systems	OS8

Course Proformas (3/6)

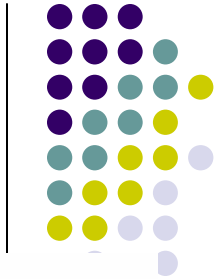


IV. Learning Objectives

For each Knowledge Area

KA#	Learning Objective	ACM
1	Explain the objectives and functions of modern operating systems	OS1.1
1	Describe how operating systems have evolved over time from primitive batch systems to sophisticated multiuser systems	OS1.2
1	Describe the conceptual and physical structure of the UNIX/LINUX operating environment	OS1.uom1
1	Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve	OS1.4
1	Analyse the tradeoffs inherent in operating system design	OS1.3
1	Install and use GUIs for UNIX/LINUX environments	OS1.uom2
2	Learn how to navigate the UNIX/LINUX file system and how to control a work session	UOM1.1
2	Describe and use some basic UNIX/LINUX utilities	UOM1.2
2	Describe, compare and use online help variants	UOM1.3
2	Extract user and system information from UNIX/LINUX platforms	UOM1.4
2	Learn to manage user data and use related UNIX/LINUX utilities	UOM1.5
2	Describe and exemplify input/output control	UOM1.6
2	List and learn the use of UNIX/LINUX security mechanisms	UOM1.7

Course Proformas (4/6)



V. Modules

Module #	1
Module Name	Introduction to Operating Systems (OSs) and their evolution
Module sequence	1

Module #	2
Module Name	UNIX/LINUX GUI concepts and practical exploitation
Module sequence	2

Module #	3
Module Name	The UNIX/LINUX file system, session management and utilities for their navigation/management
Module sequence	3

Module #	4
Module Name	UNIX/LINUX online help and more utilities

Course Proformas (5/6)

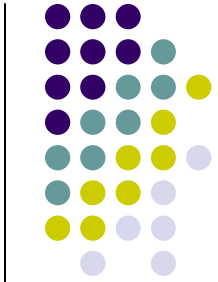
VI. Activities

Course Introduction

Activity Title	Introductory Video Conference
Who will perform the activity	Whole class and tutor
Type of activity	Video Conference
Brief description	All students and the tutor will introduce themselves to each other via Video Conferencing. The tutor will orient the students with the structure of the course and what she expects out of them. The students will be expected to fill in all information about themselves in moodle prior to the video conference.
Nominal time required to complete	1 hour
Status	Mandatory
Sequence in Module	1
How assessed	Not Assessed
When assessed	Not Assessed
Learning Objectives addressed	None

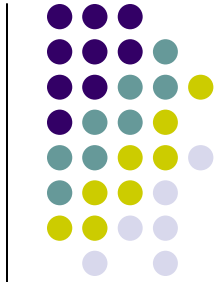
Activity Title	Glossary and FAQ
Who will perform the activity	Whole class and tutor
Type of activity	Glossary and FAQ
Brief description	Students will be asked to maintain a glossary and FAQ amongst themselves. Each student must

Course Proformas (6/6)



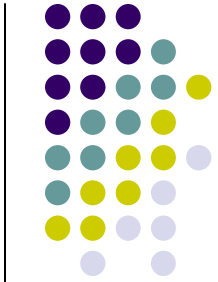
VII. Activity/Learning Objective Cross Tabulation

Learning Objective	Activity/Activities Addressed By
OS1.1	1.1, 3.2
OS1.2	1.1
OS1.uom1	1.2, 1.4
OS1.uom2	2.1, 2.2
OS1.3	1.1
OS1.4	1.1
UOM1.1	3.1
UOM1.2	1.3
UOM1.3	1.3, 4.1, 4.2
UOM1.4	3.3



Assessment Strategies

Reasons for Assessment

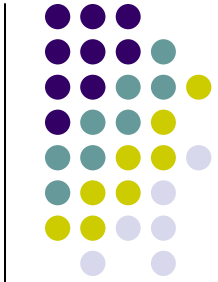


- To grade or rank students
- To license to proceed
- To provide information to other interested parties

- To provide feedback to students to improve their learning
- To diagnose students' strengths and weaknesses
- To motivate students

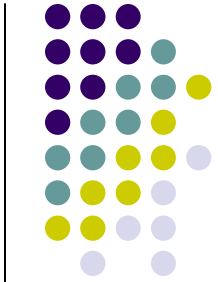
- To provide feedback to lecturers to improve their teaching
- To provide feedback to course designers to improve their course

Assessment Strategies



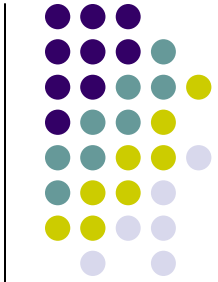
- Direct link between learning objectives and the generation of assessment criteria
- Summative
  - Assessment for grading
    - Should be a comprehensive measure of overall knowledge, skill, or performance
- Formative
  - Assessment for Learning
    - Feedback to the learner and the tutor
- Seriously consider continuous assessment as opposed to just a final exam

Types of Assessments



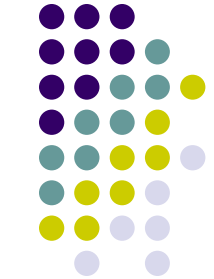
- Group Assessment
  - Develops interpersonal skills
- Self-Assessment
  - Obliges students to evaluate themselves
  - More self-awareness
  - Better understanding of learning outcomes
- Peer Assessment
  - Students evaluate each other's work
  - Develops heightened awareness of what is expected

Assessment Techniques (1/2)



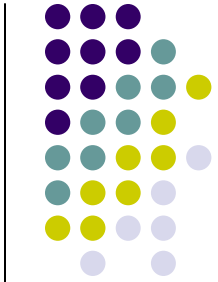
- Questions – Unseen Examination
  - Traditional Approach
  - Tests the individual knowledge base
- Scenarios – Testing Skills instead of Knowledge
  - Students apply their knowledge to solve problems
- Coursework Essays
  - Also traditional
  - Can be time consuming
  - Explore a topic at greater depth
  - Will shift balance of time spent on individual areas

Assessment Techniques (2/2)



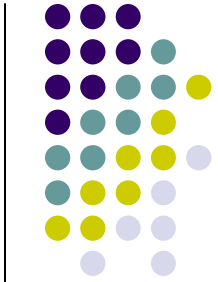
- Projects
  - May develop a wide range of expertise
  - E.g. research, IT, project management, etc
- Presentations, debates, roleplay
  - Knowledge
  - Communication Skills
- Multiple choice
  - Very useful for self assessment

Student Competences



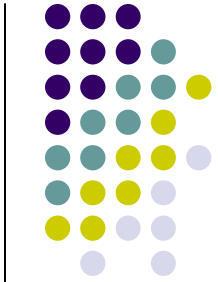
- Knowledge – recall of information
- Comprehension – interpretation of information
- Application – Solving problems with knowledge
- Analysis – Identification of patterns, analysis, connections, etc
- Synthesis – Generlisation, invent, design, plan, etc
- Evaluation – Make a judgment, assess value of ideas, theories, etc

Cheating (1/2)



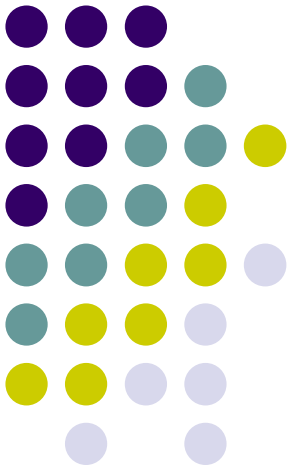
- Many sites helping students to cheat
  - http://www.academictermpapers.com/
  - http://www.termpapers-on-file.com/
  - http://www.nocheaters.com/
  - http://www.cheathouse.com
  - http://www.realpapers.com/
  - http://www.pinkmonkey.com/

Cheating (2/2)

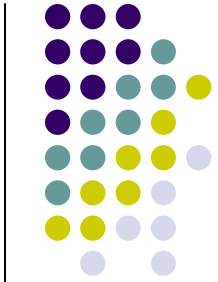


- Plagiarism is very serious
- In one study, 87% of students admitted they copied material from the web without citing it.
- Technology can help but is not enough
- Make assessments as unprone to teaching as possible

Virtual Learning Environments (VLEs)



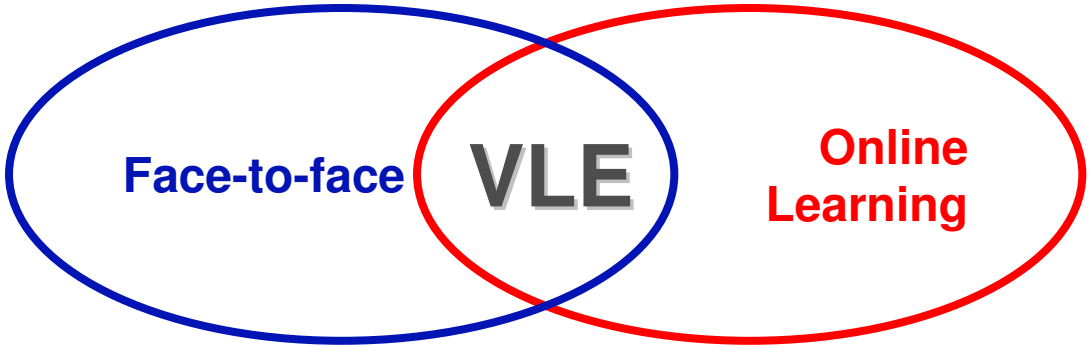
What are VLEs? (1/2)



- Software applications which provide a “Virtual Classroom”
- A “shell” in which content is placed and managed
- Important Features
  - Delivery of Learning Content
  - Communication Facilities
- Utilise web technology

What are VLEs? (2/2)

- Allow Hybrid Courses

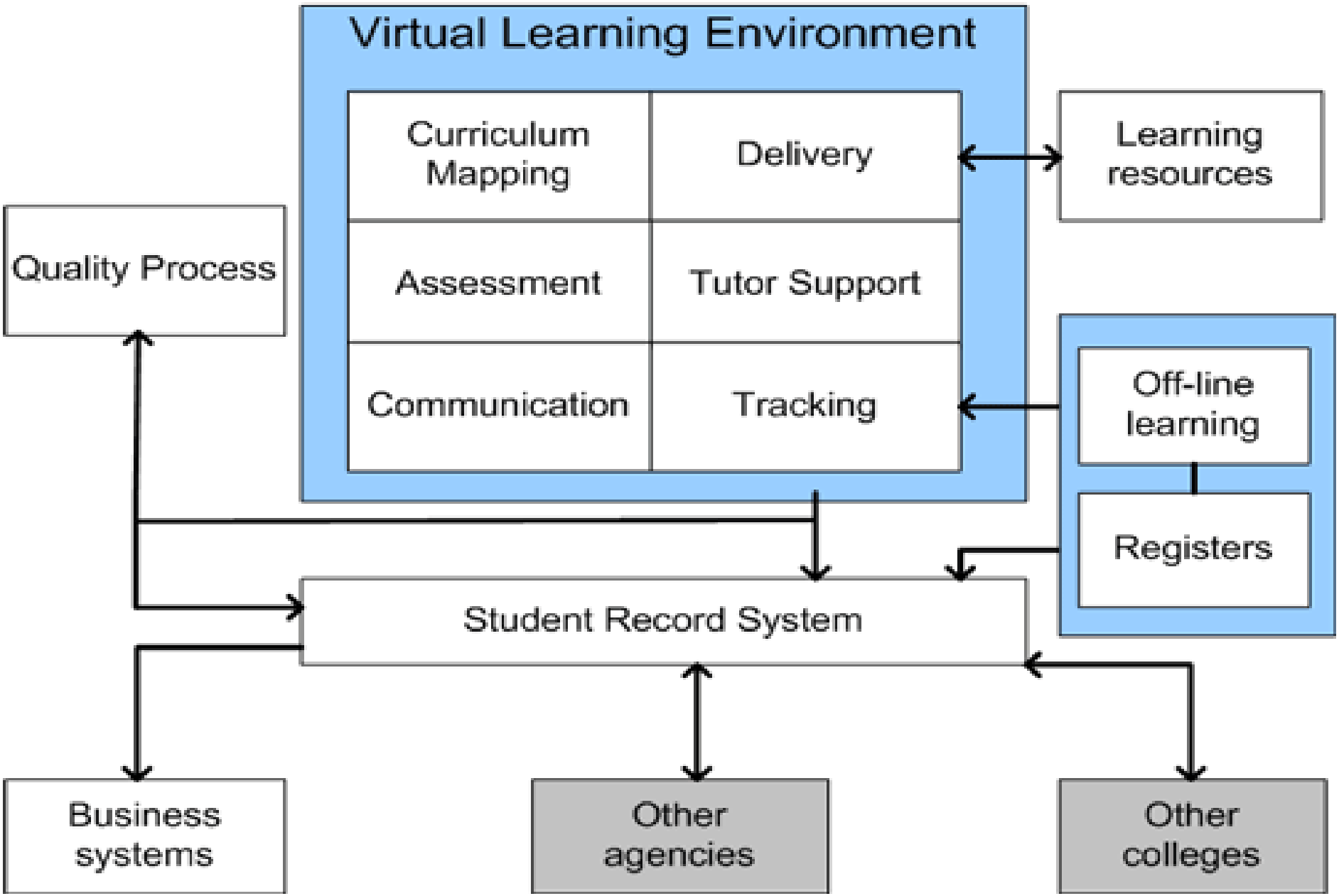


- Feedback
  - To learners
  - To tutors
- Sometimes referred to as
  - Course Management Systems (CMS)
  - Learning Management Systems (LMS)

VLEs vs Managed Learning Environments (MLE)

- A MLE incorporates all components that contribute directly or indirectly to the learning and management of that learning.
  - Information Systems
  - Processes
- Not necessarily exclusive to e-learning
- VLEs are one of the components in a MLE

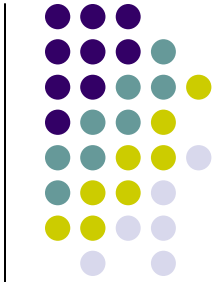
Managed Learning Environment



Available Virtual Learning Environments

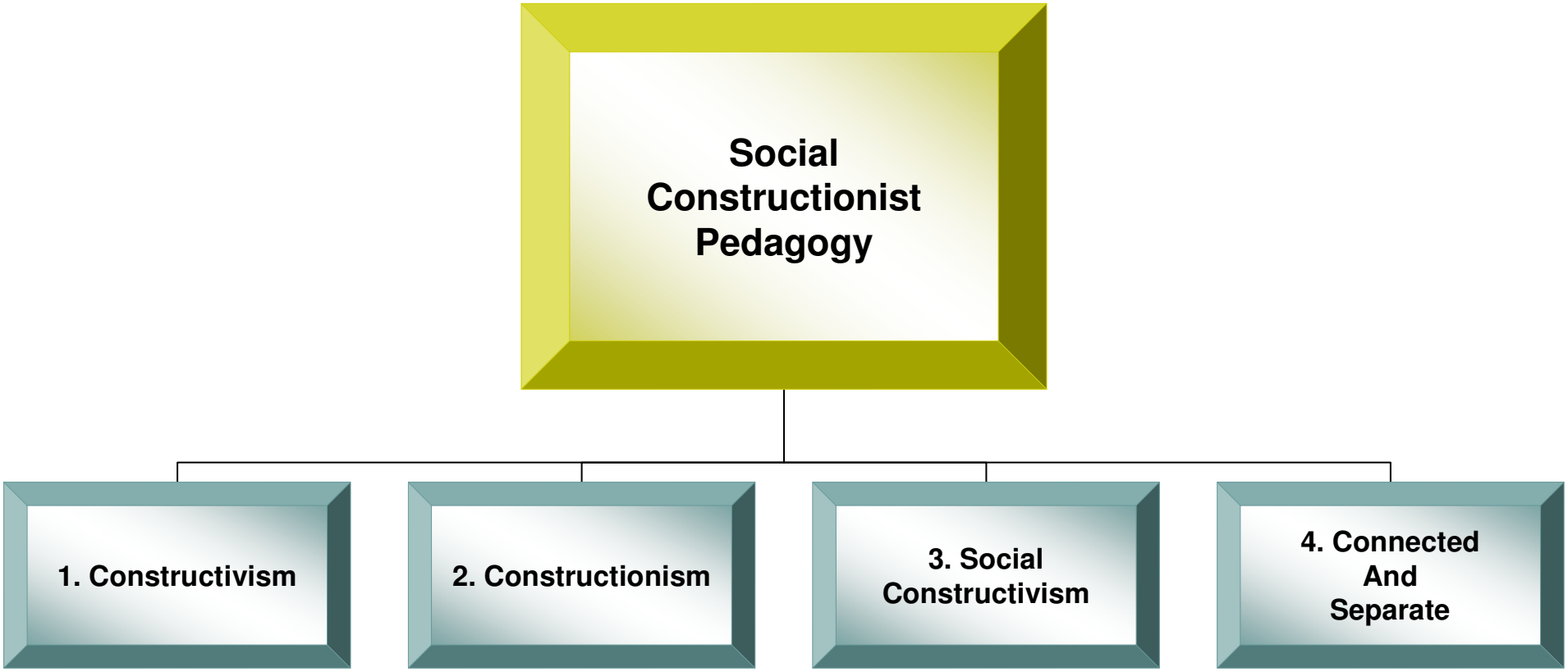
- Commercial
  - WebCT
  - Blackboard
  - Gradepoint
- Open Source
  - Moodle
  - Bazaar

A closer look at moodle



- Open-source
  - Free
- Simple intuitive user interface
- Focus is on sharing ideas and engaging in the construction of knowledge
- Built around a *"Social Constructionism"* educational philosophy

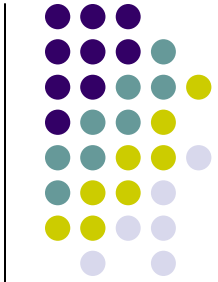
Moodle's Design Philosophy



Feature Comparison

	moodle	WebCT	Blackboard
Student Peer Review	✓	✗	✗
Self Assessment of Submission	✓	✗	✗
Student Journals	✓	✗	✗
Embedded Glossary	✓	✗	✗

Moodle Basics



- Easy to use interface
- Extensive help system
- Course Formats
  - *Weekly Format* – for courses with a fixed schedule
  - *Topics Format* – for concept oriented courses
  - *Social Format* – for less formal courses, or non-course uses like departmental sites

Components of a Moodle Course

- Moodle has a modular architecture

- *Resources*: tools for adding static content
  - **Text pages**
  - **Web Sites**

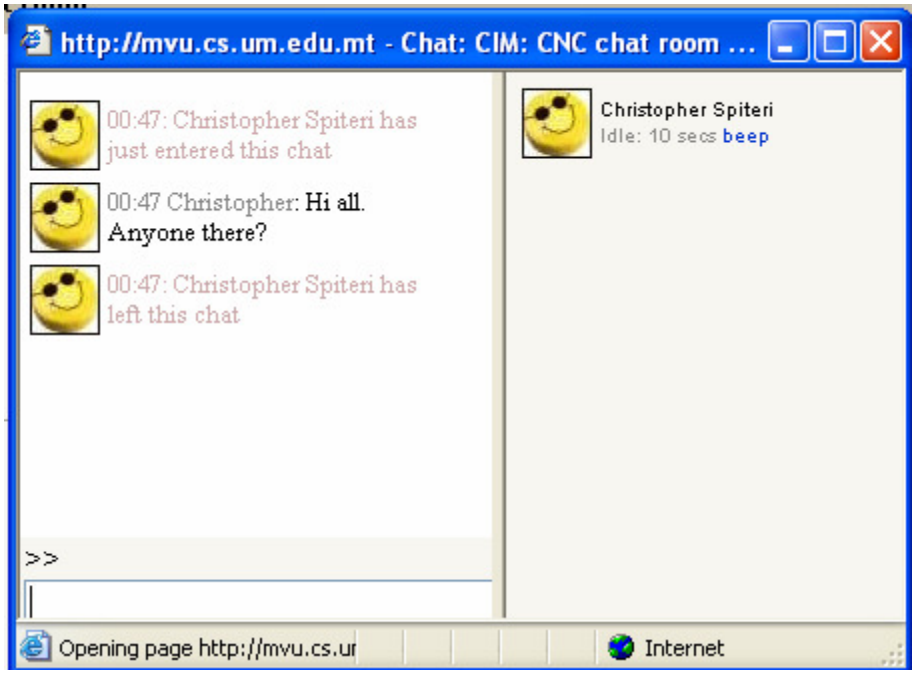
- *Activities*: tools for adding dynamic content
  - **Lessons**
  - **Assignments**
  - **Forums**
  - **Quizzes**
  - **Glossaries**

Calendar

- A calendar event allows a user to post significant events, relative to their account permissions

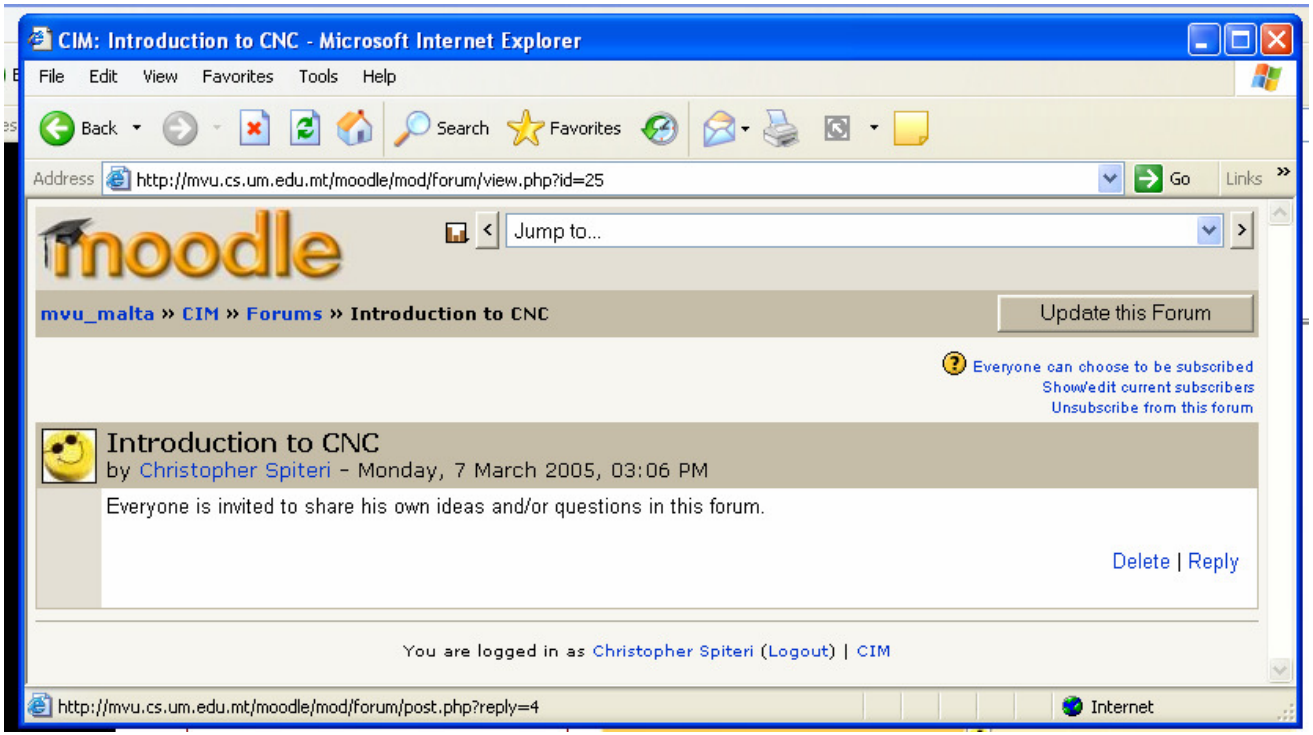
Chat

- The chat module allows participants to have a real-time synchronous discussion via the web



Forum

- A Forum is basically a posting area where participants can create or contribute to a theme with their own comments

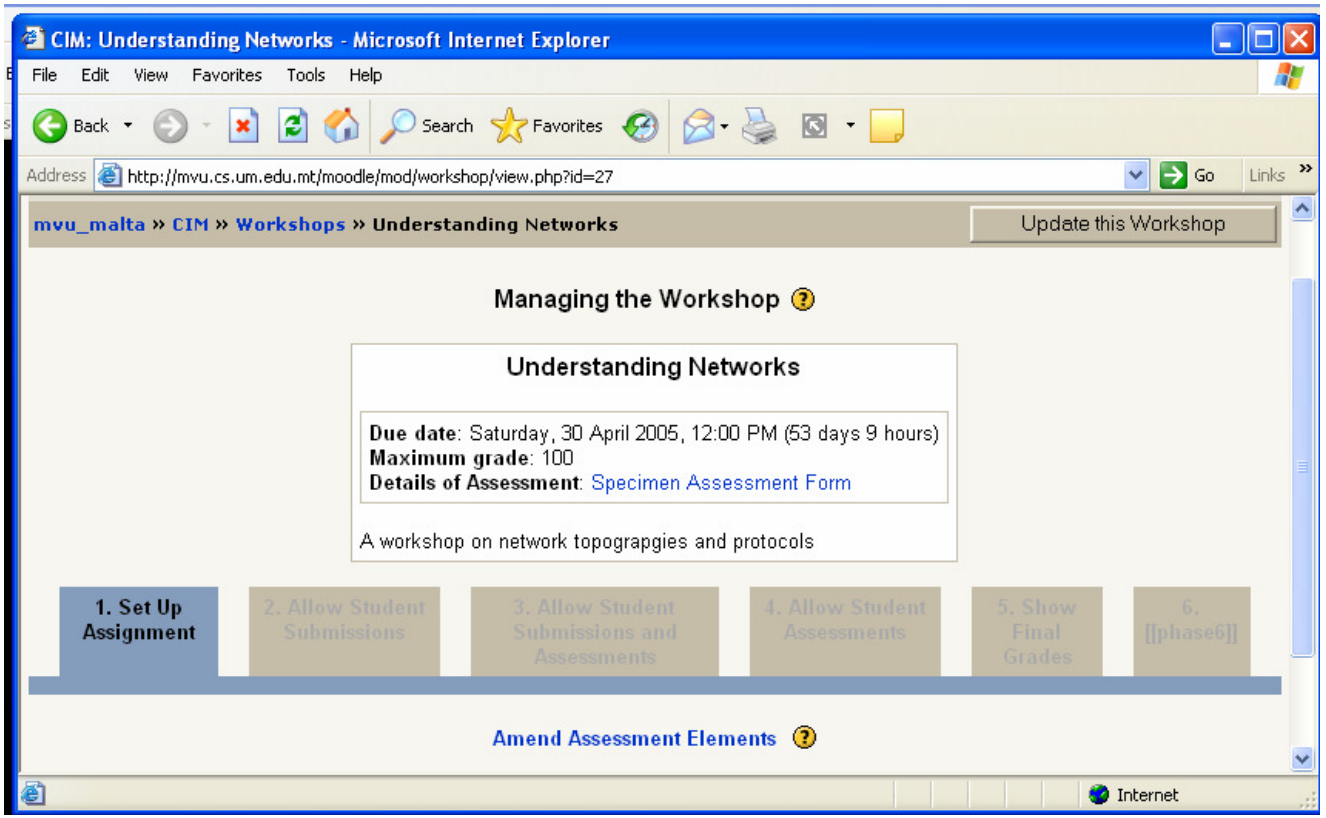


Lesson

- A lesson module delivers content in an interesting and flexible way
- Consists of a number of pages
- Each page normally ends with a question and a number of possible answers
- Student progresses onto next page depending on choice of answer

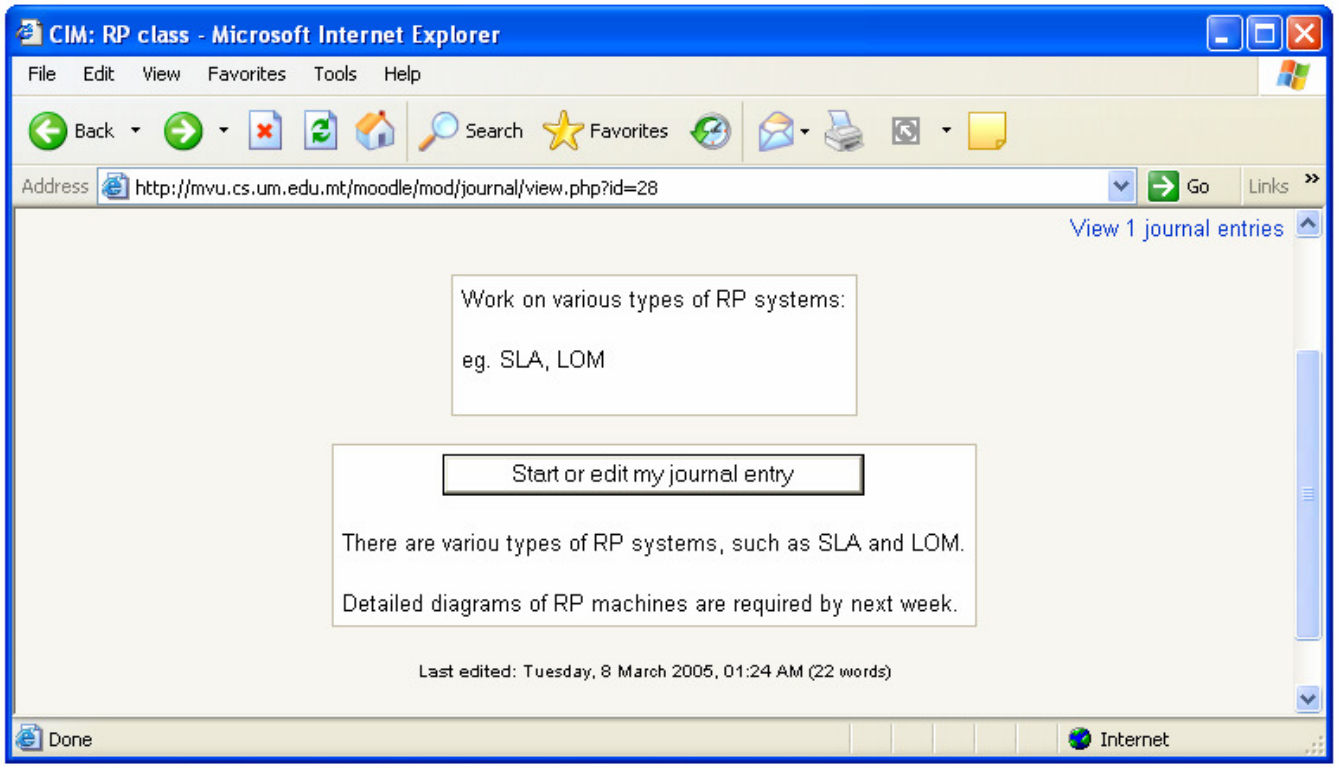
Workshop

- A Workshop is a peer assessment activity that allows participants to assess each other's projects
- Allows the lecturer to both manage and grade material



Journal

- A Journal feature allows every student to have a personal journal that only they and their lecturer will be able to access



Quiz

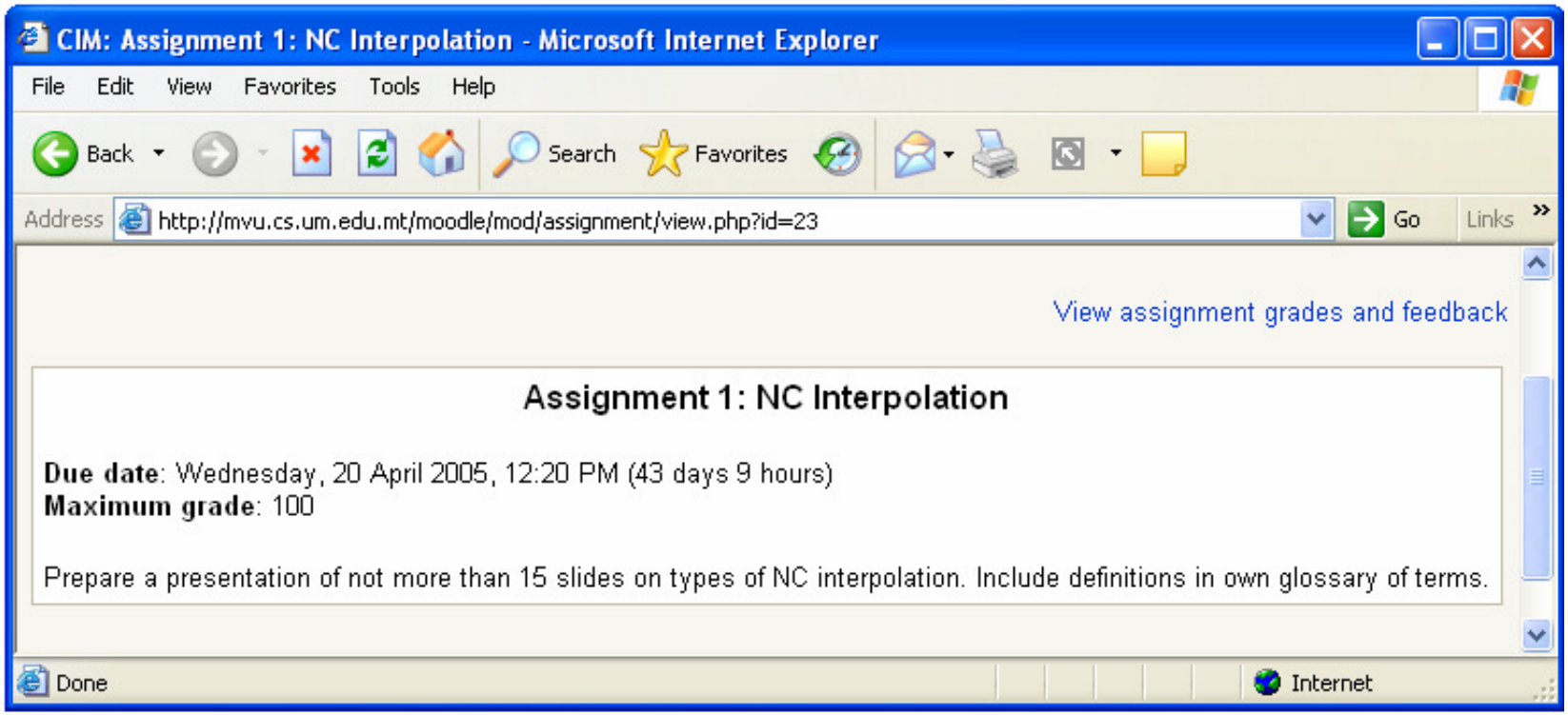
- A quiz module consists of multiple choice, true-false, short answer questions
- Questions are kept in a categorized database, and can be reused within and between courses
- Can allow multiple attempts
- Teacher can provide feedback
- Includes grading facility

Glossary

- The Glossary feature in Moodle acts as a definition resource
- Can be presented in a number of formats
- Glossary entries can be linked to key phrases throughout system

Assignments

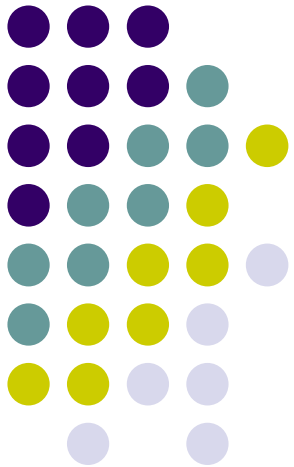
- Assignments can be delivered to students through Moodle, their responses posted back with online feedback



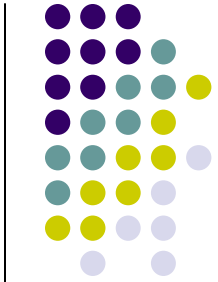
Logs

- Logs show the activity in a class for different days or times
- Check the time students spend on activities

E-Learning Standards

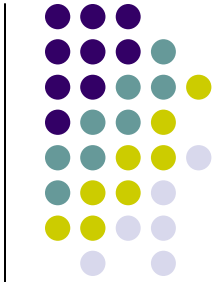


Standards Organisations



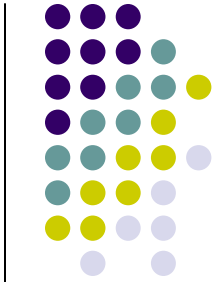
- AICC (www.aicc.org)
  - International Group of professionals
  - Creates CBT Guidelines for the Aviation Industry
  - Created Computer-Managed Instruction (CMI) Guidelines
- IEEE (www.ltsc.ieee.org)
  - **L**earning **T**echnical **S**tandards **C**ommittee
  - Invented the Learning Object Metadata (LOM) Specification

Standards Organisations



- IMS Global Consortium (www.imsproject.org)
  - Focused on development of specifications related to ***metadata*** in content packaging
  - Describes content and way how VLEs and LMSs can communicate with Learning Objects, Libraries, etc
- ADL (www.adlnet.org)
  - U.S. Government Sponsored
  - Specifications for enhancement and adoption of e-learning
  - Developed the SCORM Standard

ADL SCORM

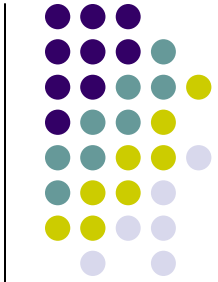


- Sharable Content Object Reference Model (SCORM)
- “collaborative effort between government, industry and academia”

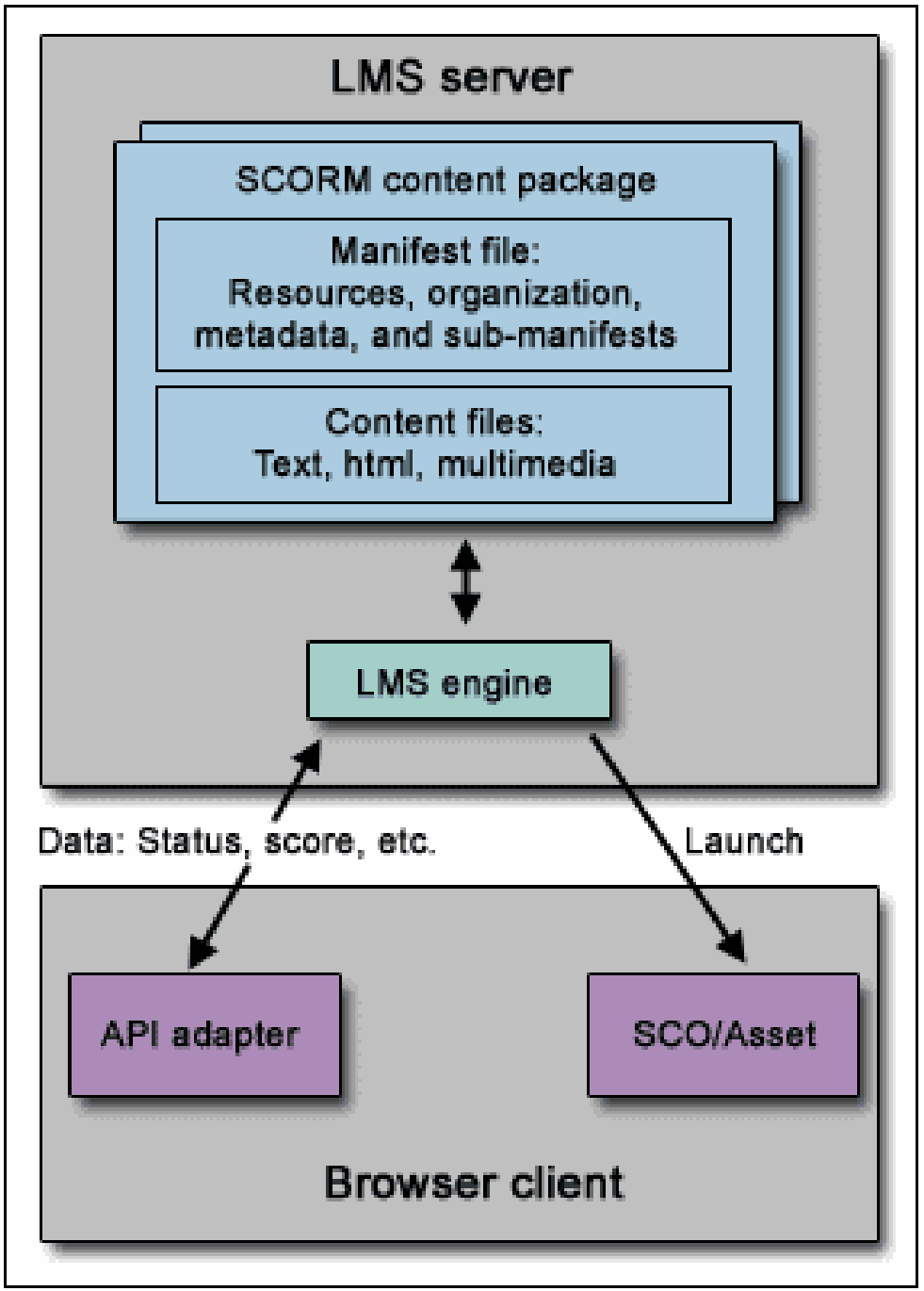
SCORM Package Components

- Assets
  - Files that can be launched on a web browser
  - HTML, JPGs, GIFs, Text, applets, flash
- Shareable Content Objects (SCO)
  - A collection of assets
  - One asset implements methods for interfacing with the LMS
- Content Aggregation
  - A structure of content
  - Similar to a table of contents
  - Notice separation of content from sequence

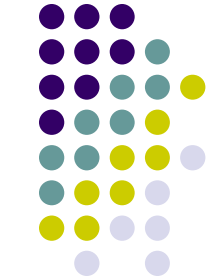
SCORM



- Shareable Content Object (SCO)
  - A SCO is a package of resources with its own internal organisation/sequence that conforms to a reference model
  - A SCO is designed to be contained within a compatible (SCORM compliant) Learning Management System (LMS) eg Moodle
  - As a minimum, implements:
    - LMSInitialise();
    - LMSFinish();

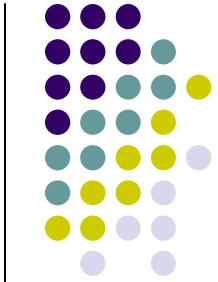

LMS server
SCORM content package
Manifest file:
Resources, organization,
metadata, and sub-manifests
Content files:
Text, html, multimedia
LMS engine
Data: Status, score, etc.
Launch
API adapter
SCO/Asset
Browser client

IMS Content Packaging



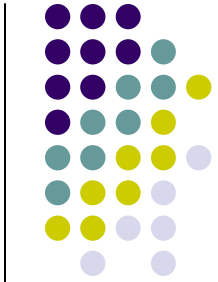
- *superseded by the IEEE Std 1484.12.1 - 2002, IEEE Standard for Learning Object Metadata (LOM)*
- part of SCORM

Content Packaging



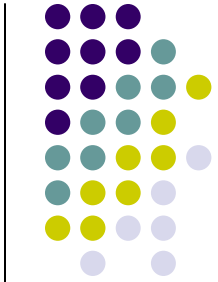
- bundles all the resources together in one file for the LMS
- Manifest file
  - *what is in the package*
  - *metadata*
- XSDs
- zip of all components

Free Tools



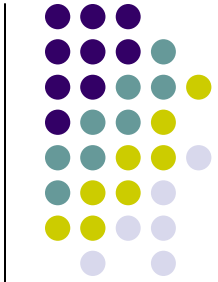
- RELOAD
  - www.reload.ac.uk
  - packager
  - metadata editor

Accessibility



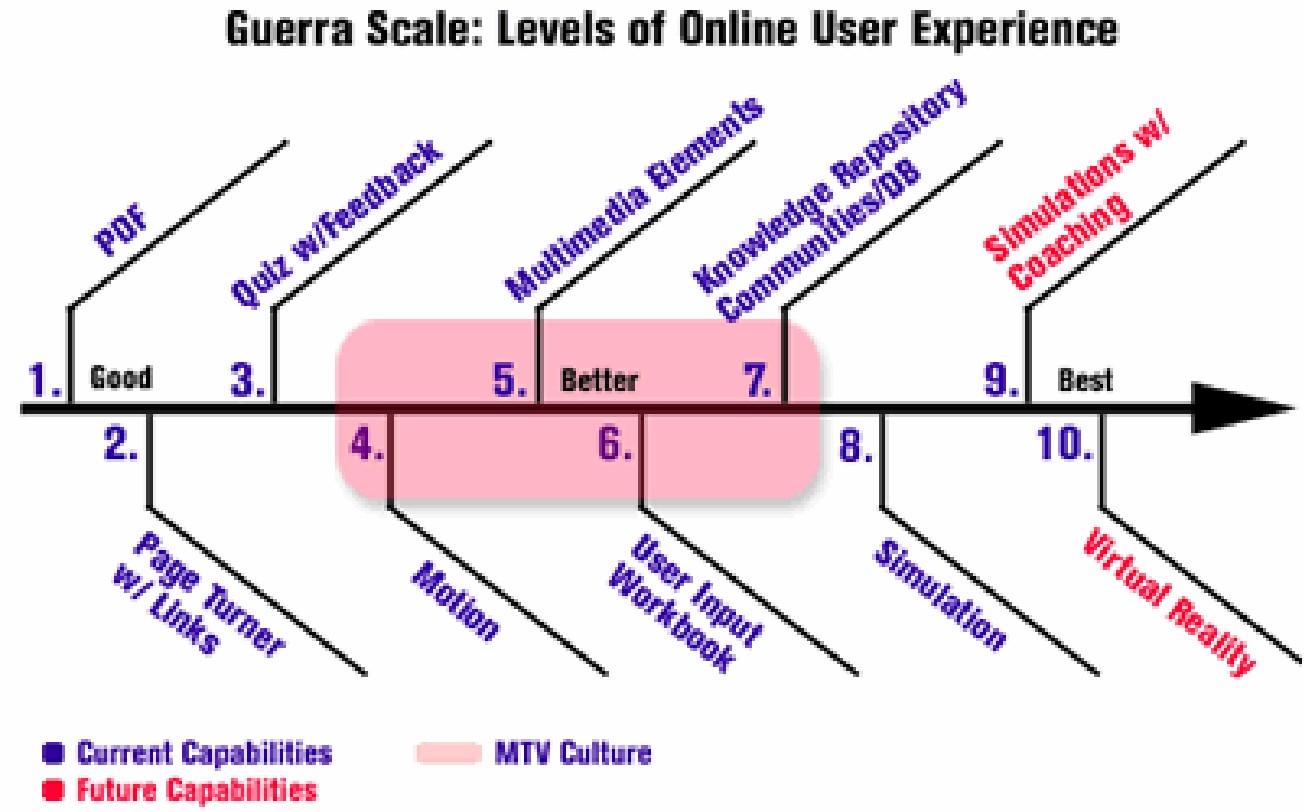
- Section 508.
  - www.section508.gov/
- W3C Web Content Accessibility Guidelines,
  - ‘Double A’
  - www.w3.org/TR/WAI-WEBCONTENT/full-checklist.html
- IMS Guidelines for Developing Accessible Learning Applications

six principles for accessibility in online learning

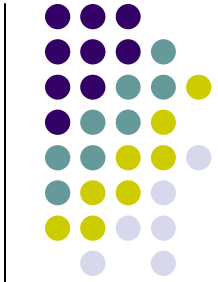


1. **Allow for customisation based on user preference.**
2. **Provide equivalent access to auditory and visual content based on user preference.**
3. **Provide compatibility with assistive technologies and complete keyboard access.**
4. **Provide context and orientation information.**
5. **Follow relevant specifications, standards and/or guidelines.**
6. **Consider the use of XML.**

Guerra Scale

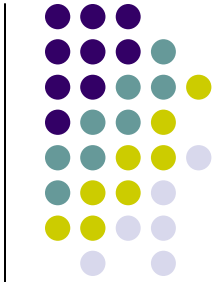


Guerra Scale 1-3



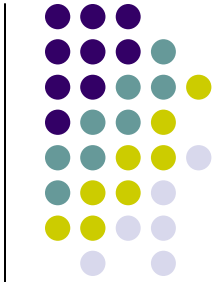
- GS1 downloadable doc.
- GS2 page turning
  - alternative routes, links, static graphics, pop-up windows, and assessment
- GS3 individualised feedback
  - responses to questions

Guerra Scale 4-5



- GS4 movement
  - animations
- GS5 multimedia
  - sound & motion
  - video
- GS2-GS5 can build most of the SPLOs required

Guerra Scale 6-8



- GS6 User workbook
- GS7 knowledge repository, database, knowledge library
- GS8 Simulation and Role Play
- GS9 live coaching
- GS10 Virtual Reality