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# OBE – emphasizing the implementation stage (the curriculum delivery)

Prof Dr Shahrin Mohammad

13-14th Feb 2011

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## Workshop Learning Outcomes

At the end of the workshop you are able to;

- **review the programme objectives, programme outcomes and course outcomes and make corrective actions**
- **describe the various student learning styles and choose the appropriate Teaching and Learning methods and approaches to develop the desired learning outcomes**
- **describe the overall process that relates to continuous quality improvement**

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## Begins with the end in mind

**What are the expected outcomes/results?**

1.
2.
3.
4.
5.
6.

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MALAYSIAN QUALIFICATIONS AGENCY
Ministry of Higher Education Malaysia

and the

Engineering Accreditation Coucil,
Board of Engineers

Washington Accord

2009 : MALAYSIA AS A MEMBER OF THE WASHINGTON ACCORD

2

## The Need for an Outcomes Approach
**for Continual Programme Improvement**

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## Findings of Programmes Evaluation/Audit

- The content and level are maintained (Curriculum)
- Implementation of Outcome-based Education (OBE)
- Programme Continual Quality Improvement (CQI)
- Systematic (QMS)

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## QA CODE OF PRACTICE: 9 ASPECTS/CRITERIA - STANDARDS

| | | |
|---|---|---|
| Vision, Mission, & institutional goals, learning outcomes | Curriculum design & delivery | Student selection & support |
| Student Assessment System | Academic staff | Educational resources |
| Program Monitoring & Review | Leadership, Governance and Administration | Total Continuous Quality Improvement |

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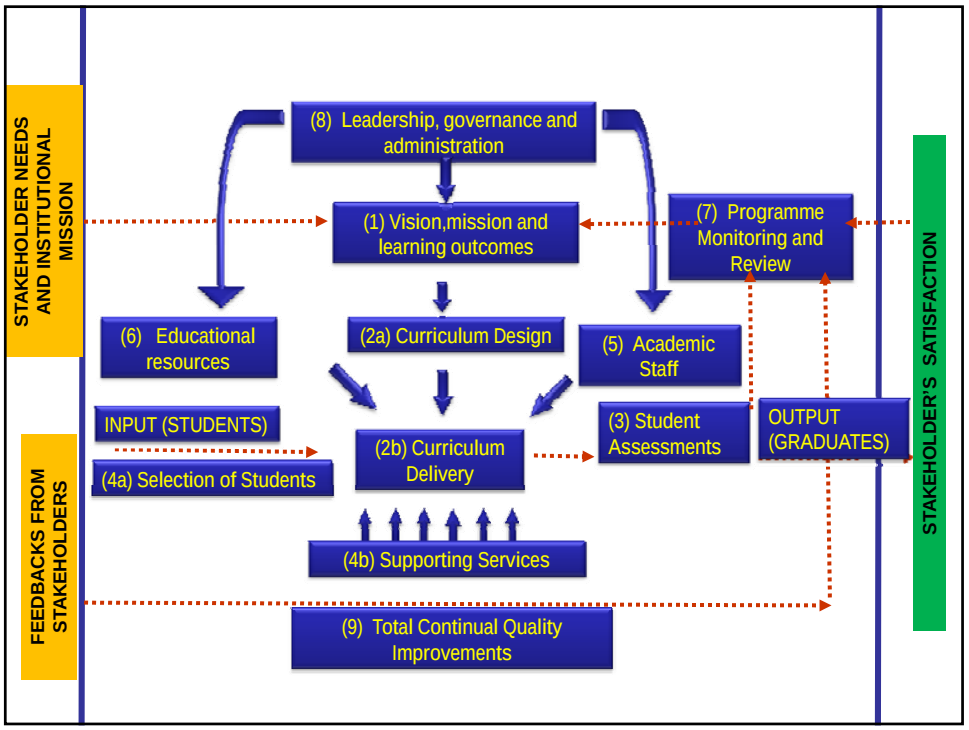
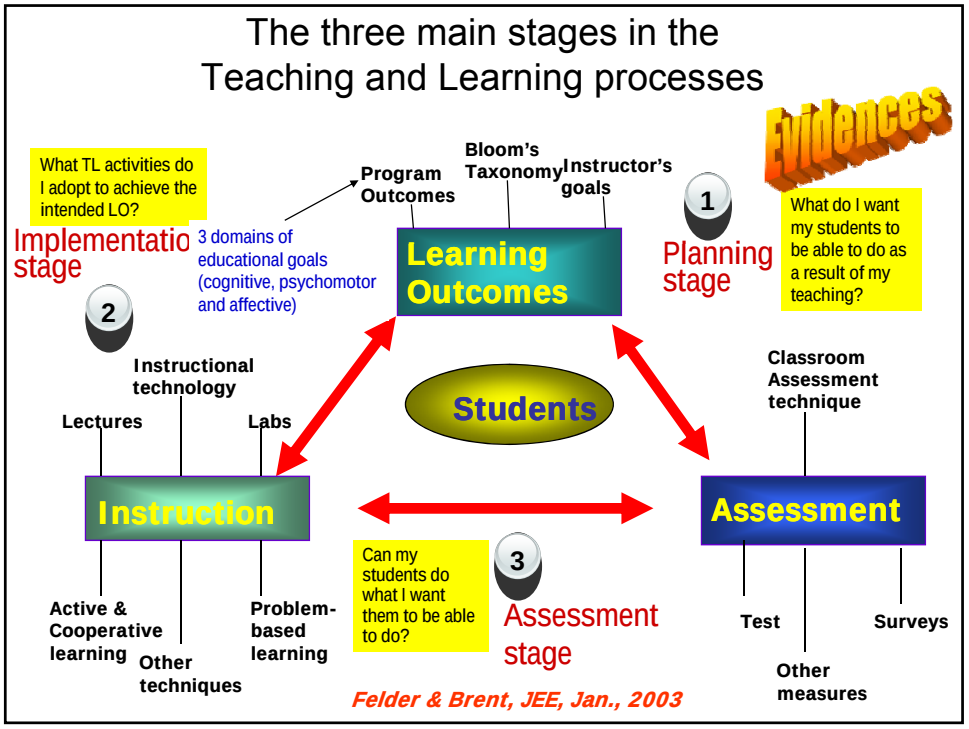
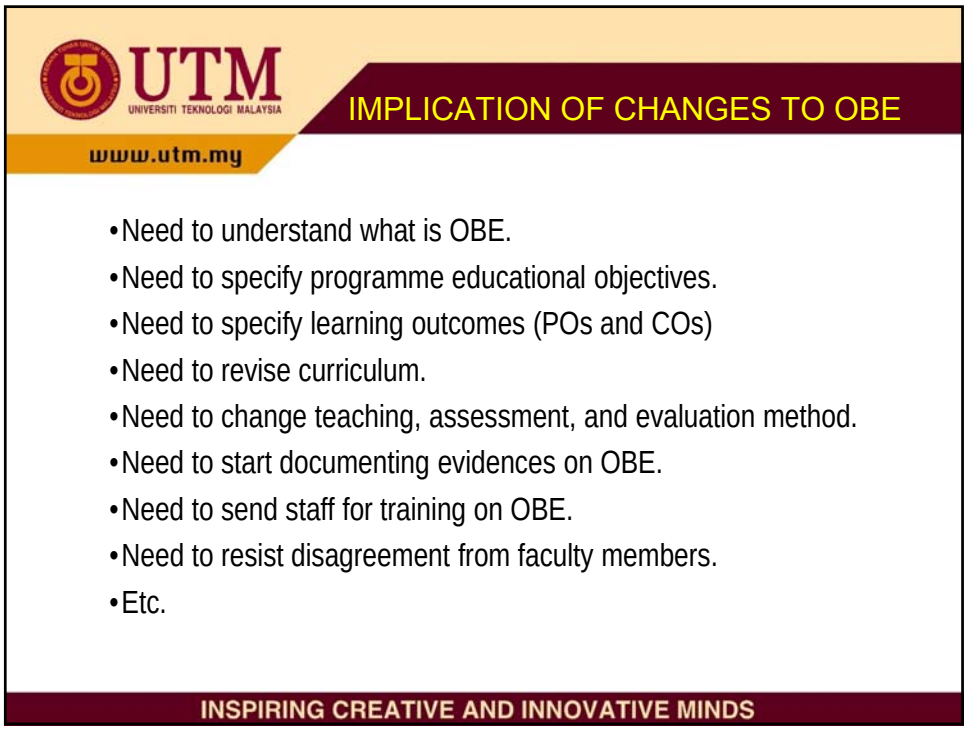



The three main stages in the
Teaching and Learning processes
Evidences
What TL activities do I adopt to achieve the intended LO?
Implementation stage
2
3 domains of educational goals (cognitive, psychomotor and affective)
Program Outcomes
Bloom's Taxonomy
Instructor's goals
Learning Outcomes
1
Planning stage
What do I want my students to be able to do as a result of my teaching?
Instructional technology
Lectures
Labs
Students
Classroom Assessment technique
Instruction
Assessment
Active & Cooperative learning
Other techniques
Problem-based learning
Can my students do what I want them to be able to do?
3
Assessment stage
Test
Surveys
Other measures
Felder & Brent, JEE, Jan., 2003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IMPLICATION OF CHANGES TO OBE
•Need to understand what is OBE.
•Need to specify programme educational objectives.
•Need to specify learning outcomes (POs and COs)
•Need to revise curriculum.
•Need to change teaching, assessment, and evaluation method.
•Need to start documenting evidences on OBE.
•Need to send staff for training on OBE.
•Need to resist disagreement from faculty members.
•Etc.
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## An OBE curricula ...

- must have programme objectives, programme outcomes, course outcomes and performance indicators.
- must be objective and outcome driven, …. stated objective and outcomes must be assessed and evaluated.
- centered around the needs of the students and the stakeholders
- address Knowledge, Skills and Attitudes to be attained by students.
- the course outcomes must satisfy the stated program outcomes.
- include different delivery methods to complement the traditional Lecturing method.
- assessment based on suitable performance indicators.
- need to address the programme objectives within 3-5 years after their graduation. (for engineering programme)

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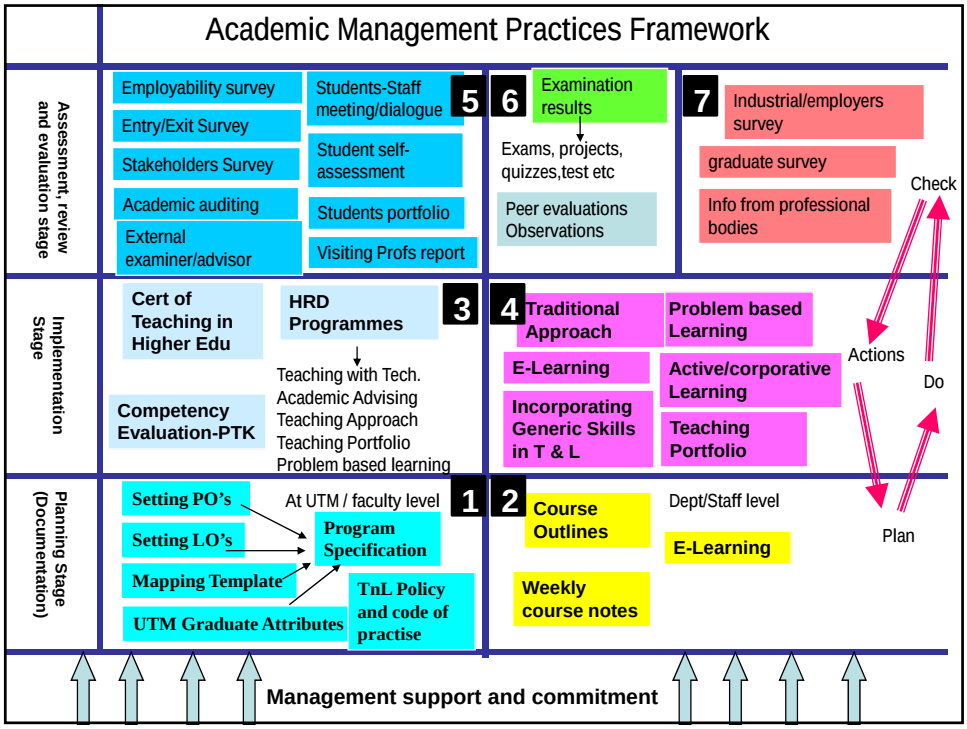
Academic Management Practices Framework
Assessment, review and evaluation stage
Implementation Stage
Planning Stage (Documentation)
Employability survey
Entry/Exit Survey
Stakeholders Survey
Academic auditing
External examiner/advisor
Students-Staff meeting/dialogue
Student self-assessment
Students portfolio
Visiting Profs report
5
6
Examination results
Exams, projects, quizzes,test etc
Peer evaluations Observations
7
Industrial/employers survey
graduate survey
Info from professional bodies
Check
Cert of Teaching in Higher Edu
Competency Evaluation-PTK
HRD Programmes
3
Teaching with Tech.
Academic Advising
Teaching Approach
Teaching Portfolio
Problem based learning
4
Traditional Approach
Problem based Learning
E-Learning
Active/corporative Learning
Incorporating Generic Skills in T & L
Teaching Portfolio
Actions
Do
Setting PO's
Setting LO's
Mapping Template
UTM Graduate Attributes
At UTM / faculty level
Program Specification
TnL Policy and code of practise
1
2
Course Outlines
Weekly course notes
Dept/Staff level
E-Learning
Plan
Management support and commitment


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Planning Stage
Preparation for Curriculum Delivery and Assessment
• Developing Learning Outcomes (PEOs, POs and COs)
• Programme Specification (overview of the programme)
• Course Outlines /Teaching Plan/ Profoma /Course Plan
• Policy and Code of Practices in Teaching and Learning
• Assessment Plan
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## Definitions of Learning Outcomes

i. **Learning outcomes are statements of what students know and can do as a result of their respective courses of study**

**Councils for Higher Education Accredition Board of Directors, USA 2002**

ii. **A learning outcome is a statement of what a learner is expected to know, understand or be able to do as a result of a learning process.**

**Centre for the Advancement of Teaching and Learning, The Universty of Western Australia, 2004.**





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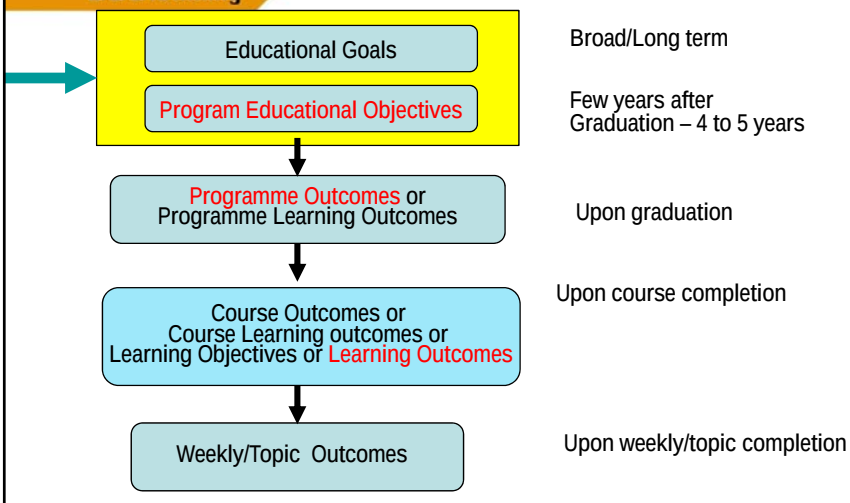
## Different Levels of Learning Outcomes



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## Why are learning outcomes important?

Learning outcomes are the most important section of your.
They are essential because they:

- define the type and depth of learning students are expected to achieve
- provide an objective benchmark for formative, summative, and prior learning assessment
- clearly communicate expectations to learners
- clearly communicate graduates' skills to the stakeholders
- guide and organize the instructor and the learner.





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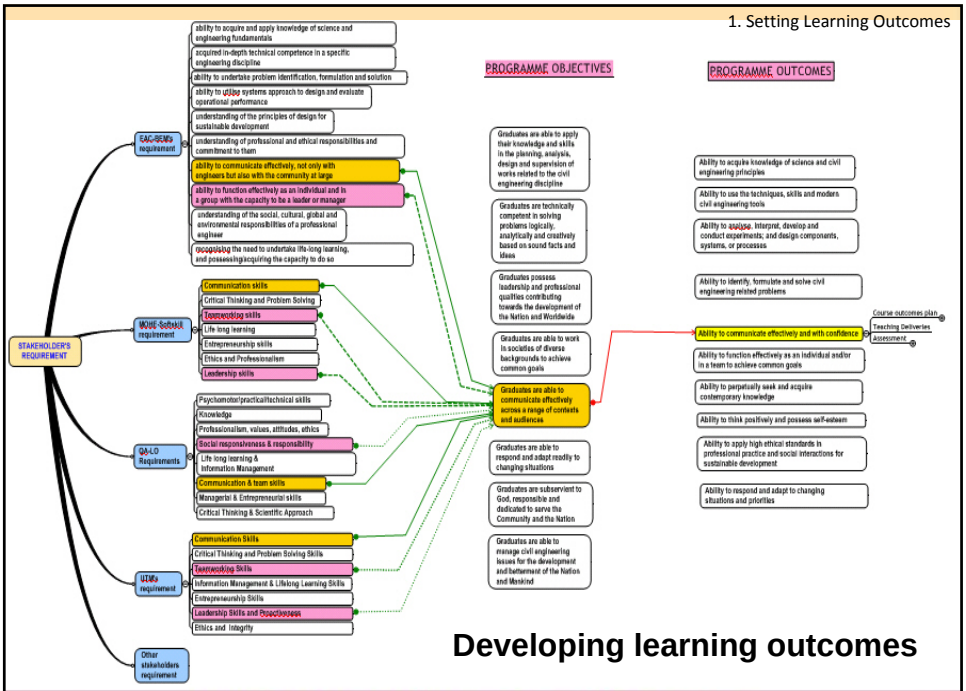
## Learning Outcomes (LOs)

- LO will usually involve a combination of (cognitive, psychomotor and affective):
  - Knowledge and understanding
  - Intellectual abilities
  - Practical, subject-specific skills
  - Generic or transferable skills
- LO should always inform:
  - The learning and teaching methods employed
  - The types of assessment used




## Developing learning outcomes

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## CO-PO Mapping (traditionally?)

| CORE COURSES OFFERED (based on year and semester) | | | | PROGRAMME OUTCOMES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ability to acquire knowledge of science and civil engineering principles. | Ability to use the techniques, skills and modern civil engineering tools. | Ability to analyse, interpret, develop and conduct experiments; and design components, systems or processes. | Ability to think critically, identify, formulate and solve civil engineering related problems. | Ability to communicate effectively and with confidence. | Ability to identify business opportunities and embark on entrepreneurship. | Ability to function effectively as an individual in a team to achieve common goals | Ability to perpetually seek and acquire contemporary knowledge. | Ability to lead, communicate and manage effectively with confidence | Ability to apply high ethical standards in professional practice and socia interactions for sustainable development. |
| | | | | LO1 | LO2 | LO3 | LO4 | LO5 | LO6 | LO7 | LO8 | LO9 | LO10 |
| YEAR 1 | S1 | SAB 1011 | Engineering Survey – Fieldwork | / | / | / | | | | | | | |
| | | SAB 1023 | Engineering Survey | / | / | / | | | | | | | |
| | | SAB 1713 | Soil Mechanics | / | / | / | | | | | | | |
| | | SSE 1792 | Calculus | / | | / | | | | | | | |
| | | SSE 1893 | Engineering Mathematics | / | | / | | | | | | | |
| | | UHB 1412 | English for Academic Communications | / | | / | | | | | | | |
| | | ULT 1022 | Islamic and South East Asian Civilisation | / | / | / | / | | / | / | / | / | / |
| | S2 | SAB 1042 | Civil Engineering Laboratory I | / | | / | | | | | | | |
| | | SAB 1213 | Applied Mechanics | / | | / | | | | | | | |
| | | SAB 1423 | Civil Engineering Drawing | / | | / | | | | | | | |
| | | SAB 1513 | Fluid Mechanics | / | / | / | | | | | | | |
| | | SSE 1793 | Differential Equations | / | | / | | | | | | | |
| | | UQ 1##1 | Co-curriculum | / | | / | / | | / | / | / | / | / |
| | S3 | SAB 1031 | Survey Camp | / | / | / | | | | | | | |

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## CO-PO Mapping (more balanced)

| CORE COURSES OFFERED (based on year and semester) | | | | PROGRAMME OUTCOMES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ability to acquire knowledge of science , and engineering principles and related issues. | Ability to use the techniques, skills and modern engineering tools. | Ability to analyse, interpret, develop and conduct experiments; and design components, systems or processes. | Ability to think critically, identify, formulate and solve civil engineering related problems. | Ability to communicate effectively and with confidence. | Ability to identify business opportunities and embark on entrepreneurship. | Ability to function effectively as an individual in a team to achieve common goals | Ability to perpetually seek and acquire contemporary knowledge. | Ability to lead, communicate and manage effectively with confidence | Ability to apply high ethical standards in professional practice and social interactions for sustainable development. |
| | | | | LO1 | LO2 | LO3 | LO4 | LO5 | LO6 | LO7 | LO8 | LO9 | LO10 |
| YEAR 1 | S1 | SAB 1011 | Engineering Survey – Fieldwork | / | / | | | | | / | | | |
| | | SAB 1023 | Engineering Survey | / | / | / | | | | | | | |
| | | SAB 1713 | Soil Mechanics | / | / | | / | | / | / | | | |
| | | SSE 1792 | Calculus | / | | / | | | | | / | | |
| | | SSE 1893 | Engineering Mathematics | / | | / | | / | | | | / | |
| | | UHB 1412 | English for Academic Communications | / | | / | | | | | | | |
| | | ULT 1022 | Islamic and South East Asian Civilisation | / | / | / | / | | / | | | / | / |
| | S2 | SAB 1042 | Civil Engineering Laboratory I | / | | / | | | | | | | |
| | | SAB 1213 | Applied Mechanics | / | | / | | | | | / | | |
| | | SAB 1423 | Civil Engineering Drawing | / | | | | / | | | | | |
| | | SAB 1513 | Fluid Mechanics | / | / | / | | | | | | | |
| | | SSE 1793 | Differential Equations | / | | | | | | / | / | | |
| | | UQ 1##1 | Co-curriculum | / | | / | / | | / | / | | | / |
| | S3 | SAB 1031 | Survey Camp | / | / | / | / | | / | / | | | / |

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FACULTY OF CIVIL ENGINEERING | Page : 1 of 5

DESIGN OF STEEL AND TIMBER STRUCTURES
SAM 4324

Revision : D
Date of issue : 1st June 2003
Last Amendment: 10th Novembe 2004
Edition: 1
Procedure No. : FKA/PG/NTS/SAM4324

| | |
|---|---|
| **PREREQUISITE:** | SAM 3223 – THEORY OF STRUCTURES |
| **SEMESTER :** | SEMESTER 1 / SEMESTER 2 / SEMESTER 3 |
| **LECTURES HOURS:** | 3 HOURS LECTURE<br>2 HOURS PRACTICAL |

| **LECTURERS:** | **E-mail** | **Room number** | **Phone number** |
|---|---|---|---|
| 1. Dr. A. Aziz Saim | azizsaim@fka.utm.my | C09-316 | 31684 |
| 2. PM Ir Dr Mahmood Md Tahir | mahmood@fka.utm.my | C08-231 | [illegible] |
| 3. PM Dr Shahrin Mohammad | shahrin@fka.utm.my | [illegible] | [illegible] |
| 4 Dr Mohamad Ismail | mohammad[illegible] | [illegible] | [illegible] |

**SYNOPSIS:**

This is a core subject. It will expose the students to the analysis and design of steel and timber structural elements. For the steel design, the topics covered include the advantages and the general concepts of steel constructions, analysis and design of restrained and unrestrained beams, columns with axial load, columns with axial load and bending moment, trusses, bolt and weld connections, and elastic and plastic design of portal frames. For timber structures, the topics covered include the design of beams

**Lecture Plan or course outlines**

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If you fail to PLAN then you are PLANNING to fail..

So PLAN your work and work your PLAN

..... ???

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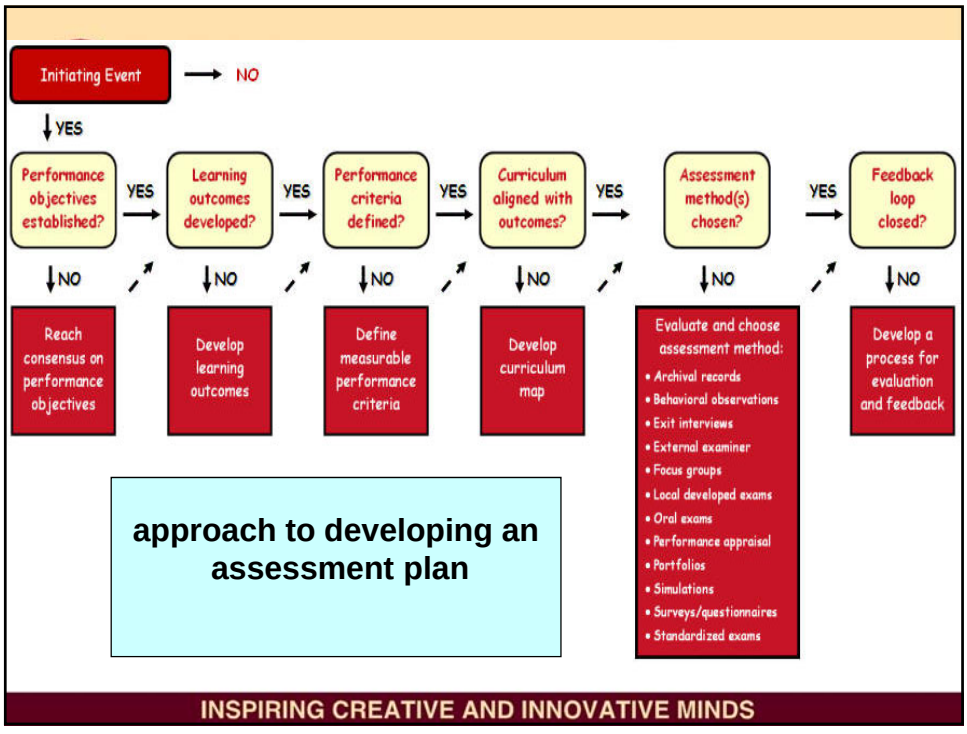


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# Performance criteria

**LO7 : Ability to function effectively as an individual in a team to achieve common goals**

| NO. | CRITERIA | LEVEL 1 | LEVEL 2 | LEVEL 3 | LEVEL 4 | LEVEL 5 |
|---|---|---|---|---|---|---|
| 1. | Working responsibility as a team member | Did not work to contribute to the success of the group. Was not a valuable asset to the group | Minimum effort to contribute to the team work. Often misses the group meeting and discussion. Most of the time depends on other team members | Average effort to contribute to the team work and sometime need reminder | Significant effort to contribute to the team work and attend group meeting and discussion | Very significant effort to contribute to the team work. Always completed individual task and contributed to the group succedss as a valuable team player |
| 2. | Contribution to the team project | Does not provides useful ideas and relevant information when participating in the team discussion. | Rarely provides useful ideas when participating in the team discussion. | Sometimes provides useful ideas when participating in the team discussion. A strong group member who tries hard. | Generally provides useful ideas when participating in the group and project discussion. | Always provides useful ideas and relevant information when participating in the group and project discussion. Conducted extensive search or information |
| 3. | Interactive and group skills | Has problems working with others/avoids work with others. No effort to develop interactive skill. Does not consider the ideas of others or contributes inappropriately in groups. | Rarely makes and effort to develop interactive skills. Uses only basic interactive skills. | Sometimes show an effort to develop interactive skill. Meets obligations to others; can offer and/or support initiatives. | Generally interact effectively within a group, giving and receiving information and ideas and modifying responses where appropriate. | Always interact effectively within a group. Can recognize or support the idea from team members. |
| 4. | Valuing others | Discourteous to other group member. Often argues and occasional personal attacks and "put-down", wants to have things done his way. | Rarely pay much attention when others talk and often assume their ideas will not work. | Sometimes consider and listen to the views of team members. | generally listen to otherr points of view, always uses appropirate and respectful language. | Always listens to others and their ideas; helps them develop their ideas while giving them full credit, wlways helps the team reach a fair decision. |

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# Assessment Plan

| | Program Outcomes | Assessment tools or methods used | When will the data collection/analysis carried out and presented | What will be the the indicator that the outcome is achieved *** | What are the outcomes of the analysis? | Continuous Quality Improvement Initiatives | Who is responsible? (collection and analysis) |
|---|---|---|---|---|---|---|---|
| PO3 | Ability to analyse, interpret, develop and conduct experiments; and design components, systems, or processes. | Student examination performance in selected **lab based** courses | Every year starting 2006 | 70% getting B and above in each courses | | | TD(A) |
| | | Student examination performance in selected **analysis based** courses | Every year starting 2006 | 70% getting B and above in each courses | | | TD(A) |
| | | Student examination performance in selected **design or system/process based** courses | Every year starting 2006 | 70% getting B and above in each courses | | | TD(A) |
| | | Employers perception survey | Once in two years | > 80% giving a positive feedback by the employer | | | TP(A) |
| | | Student Perception based on Exit survey (D) | Every year | > 80% indicating a satisfactory feedback by graduating student (exit survey) | | | TP(A) |
| PO4 | Ability to think critically, identify, formulate and solve civil engineering related problems. | Employers perception survey | Once in two years | >75% of the student obtaining at least level 3 | | | TD(A) |
| | | Fedback on students performance from "Industrial training supervisor" | Every year | > 80% giving a positive feedback by the employer | | | TP(A) |
| | | Student "generic skill" performance in selected courses | Every semester commencing 2007-08 semester II | > 80% indicating a satisfactory feedback by graduating student (exit survey) | | | TP(A) |

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## CREDIT & STUDENT LEARNING TIME

MQF Credit System (Notional Credit Hour Concept):

The Student academic load is the learning effort or volume of learning an "average student" must undertake to achieve a defined group of learning outcomes. It represents all forms of learning in hours, whether lecture-based, tutorial, work-based, research, experiential, practical activities, private study, preparation for assessment or whatever that is required of an average student to achieve a specified set of learning outcomes. It does not simply relate to formal teaching but the "knowledge currency", hence the concept of notional credit hour.

INSPIRING CREATIVE AND INNOVATIVE MINDS Prof Zainai's slide

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## DEFINITION OF CREDIT & STUDENT LEARNING TIME

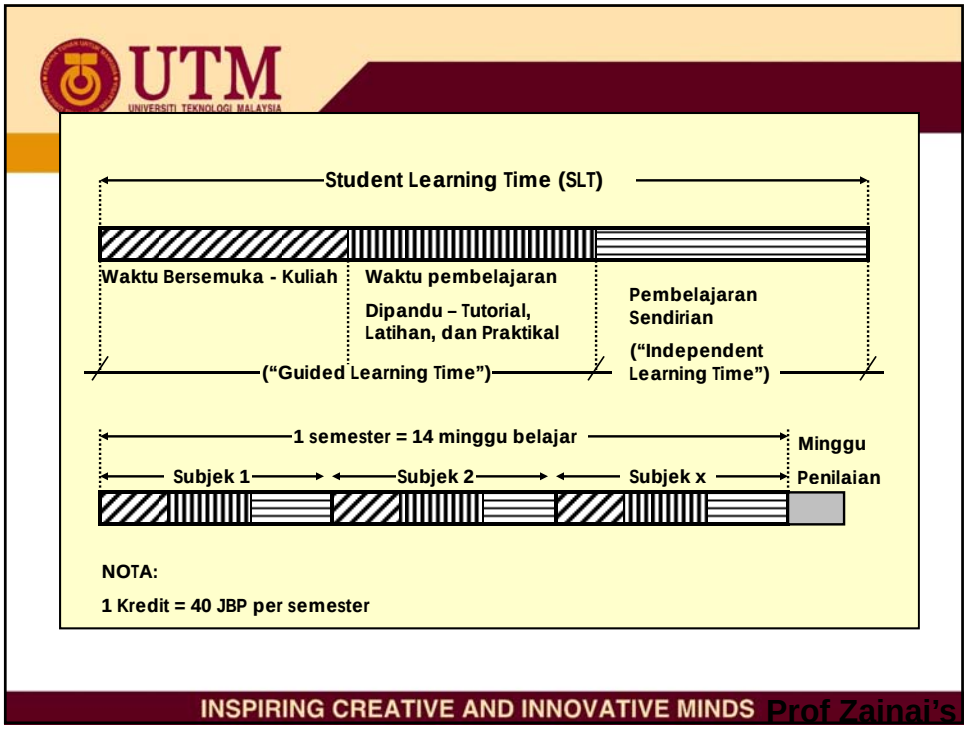
- Teacher-centred approach (traditional):

  e.g. weekly contact time based : 1 hour lecture, or 2 hours tutorial, or 2-3 hours laboratory session defines a credit.

- Student-centred output-oriented approach (MQF):

  e.g. valuing the student effort. A notional value of 40 hours effort (learning time) for a credit. It is a nominal effort of an average achiever in a semester of 14 weeks (delivery) duration). It includes all the learning components or learning activities (attending the formal instruction (guided) and independent study).

INSPIRING CREATIVE AND INNOVATIVE MINDS Prof Zainai's slide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Student Learning Time (SLT)
Waktu Bersemuka - Kuliah
Waktu pembelajaran
Dipandu – Tutorial, Latihan, dan Praktikal
("Guided Learning Time")
Pembelajaran Sendirian
("Independent Learning Time")
1 semester = 14 minggu belajar
Minggu
Subjek 1
Subjek 2
Subjek x
Penilaian
NOTA:
1 Kredit = 40 JBP per semester
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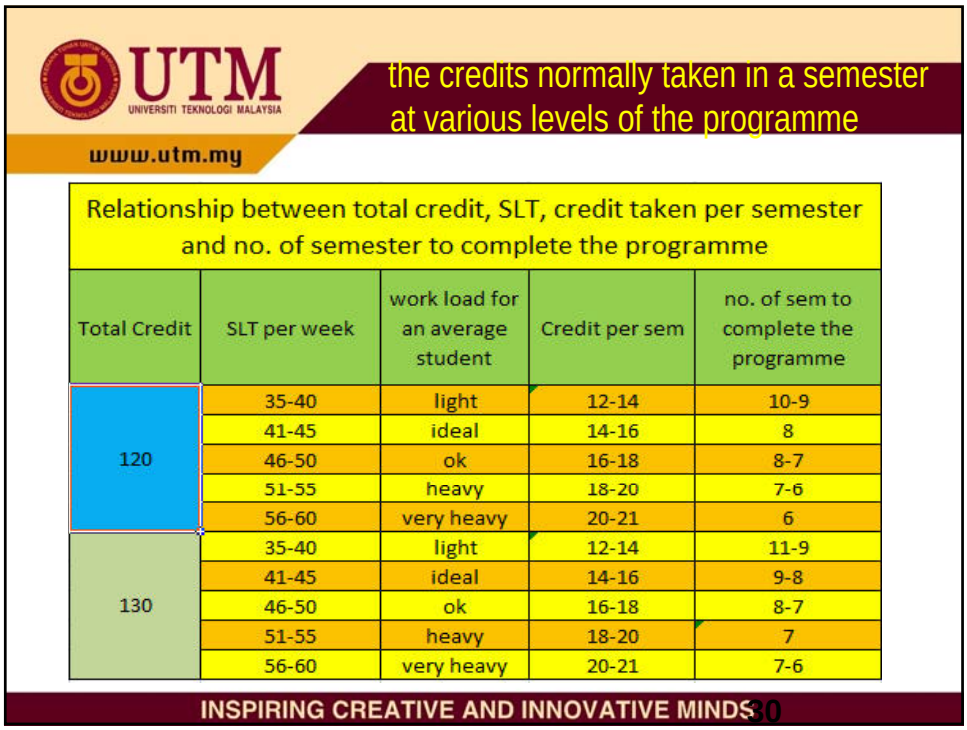
Prof Zainai's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the credits normally taken in a semester at various levels of the programme
Relationship between total credit, SLT, credit taken per semester and no. of semester to complete the programme
Total Credit
SLT per week
work load for an average student
Credit per sem
no. of sem to complete the programme
120
35-40 light 12-14 10-9
41-45 ideal 14-16 8
46-50 ok 16-18 8-7
51-55 heavy 18-20 7-6
56-60 very heavy 20-21 6
130
35-40 light 12-14 11-9
41-45 ideal 14-16 9-8
46-50 ok 16-18 8-7
51-55 heavy 18-20 7
56-60 very heavy 20-21 7-6
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Implementation Stage –
The Curriculum Delivery
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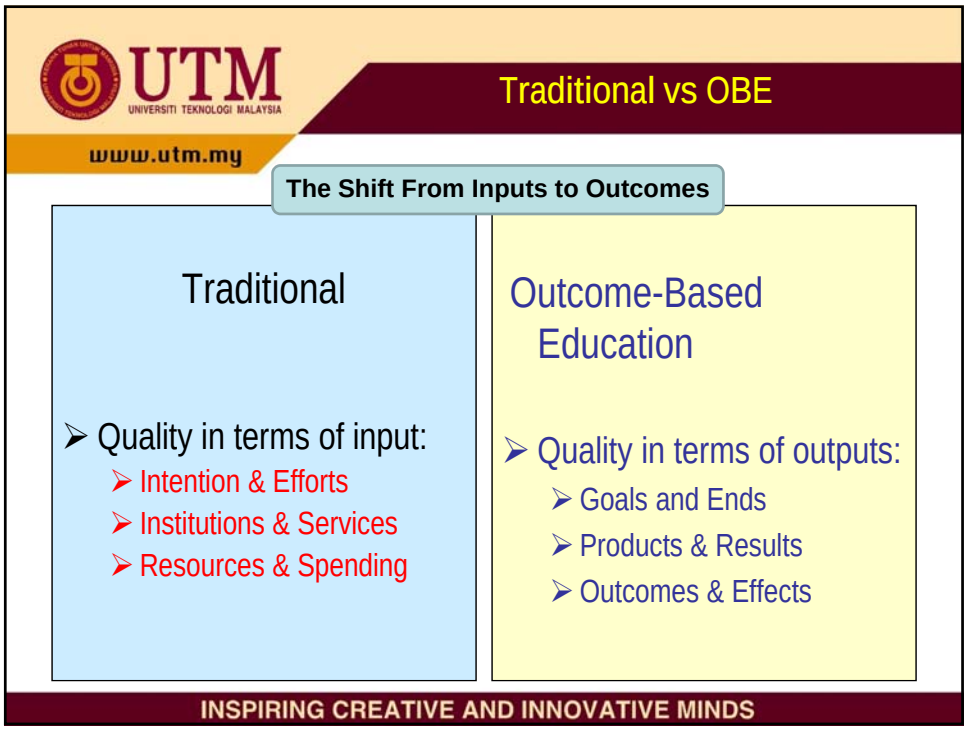
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Traditional vs OBE
The Shift From Inputs to Outcomes
Traditional
Quality in terms of input:
Intention & Efforts
Institutions & Services
Resources & Spending
Outcome-Based Education
Quality in terms of outputs:
Goals and Ends
Products & Results
Outcomes & Effects
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| Content Based Learning System | Outcomes Based Learning System |
|---|---|
| Passive students | Active learners |
| Assessment process – exam & grade driven | Continuous assessment |
| Rote learning | Critical thinking, reasoning, reflection & action |
| Content based/broken into subjects | Integration knowledge, learning relevant/ connected real life situations |
| Textbook/worksheet focused & teacher centred | Learner centred & educator/ facilitator use group/ teamwork |
| See syllabus as rigid & non negotiable | Learning programmes seen as guides that allow educators to be innovative & creative in designing programmes/ activities |
| Teachers/trainers responsible for learning - motivated by personality of teacher | Learners take responsibility for their learning, learners motivated by constant feedback/ affirmation of worth |
| Emphasis what teacher hopes to achieve | Emphasis outcomes – what learner becomes & understands |
| Content placed in rigid time frames | Flexible time frames - learners work at own pace |
| Stay in single learning institution until complete | Learners can gather credits different institutions until achieve Qualification |
| Previous knowledge & experience in learning field ignored – Each time attends whole course | Recognition of prior learning: after pre-assessment, learners credited outcomes demonstrated or transfer credits elsewhere |

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## Ruth Stiehl, "Teaching Toward Significant Outcomes," Oregon State U, www.c2t2.ca

| | Content Framework (Traditional) | Competency Framework (60's model) | Outcome Framework (21st century) |
|---|---|---|---|
| **Intent** | "Cover Topics" | Check-off discrete tasks | Demonstrate significant "whole" task |
| **Instructor** | Expert: Disseminator of information | Give instruction and check-off tasks | Coordinate collaborative investigation |
| **Student Role** | Receiver: Stores and returns information | Practices and demonstrates small, isolated tasks | Active collaborator and investigator; synthesizer |
| **Content** | Topics | Performance Objective | Concepts and process skills |
| **Materials** | Cover textbooks | Use Multimedia | Access multiple sources |
| **Evaluation** | Competitive: quiz and test | Meet minimum standard | Assessment against quality standards; continuous, self, peer and instructor assessment |

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## Differences in the Teaching and Learning Paradigms

| Traditional Paradigm "Teaching" | Constructivist Paradigm "Learning" |
|---|---|
| Memorization | Understanding |
| Recall | Discovery |
| Repetition | Transfer and construction |
| Acquisition of facts | Facts + conceptual framework |
| Isolated facts | Organized conceptual schemas |
| Transmission | Construction |
| Teacher = master and commander | Teacher = expert and mentor |
| Fixed roles | Mobile roles |
| Fixed classrooms | Mobile, convertible classrooms |

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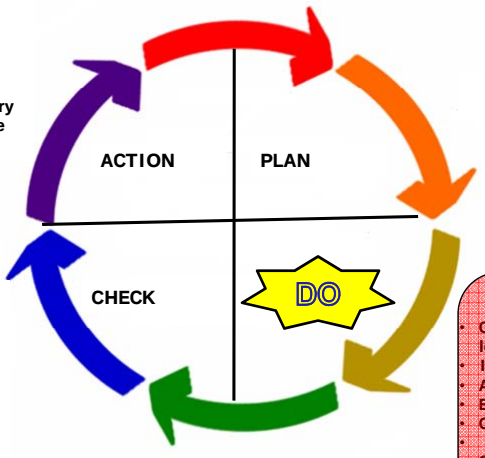
## Programme Outcomes CQI Cycle

- Communicate the results
- Identify best practices
- Identify new project
- Make necessary changes to the plan



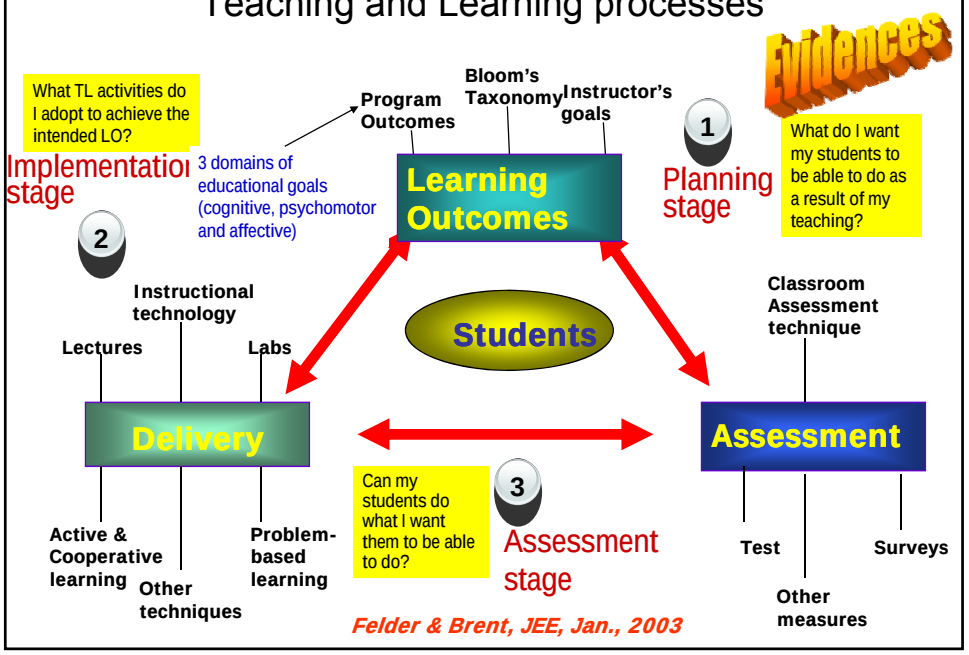

- Identify program objectives (P-obj)
- Identify program outcomes (PO)
- Map P-Obj with PO
- Map CO with PO
- Specify Curriculum content, TnL approaches, Performance Criteria and level
- Develop assessment plan

- Analyse the data
- Share results
- Compare results with what has been plan using CQI tools
- Review the gap
- What can be learn and need to be monitored

- Carry out TnL approaches at course level
- Implement out-of-class activities
- Assess the students learning
- External examiners visit
- Carry out stakeholders survey
- Involvement of external advisors
- Collect appropriate data
- Carry out Academic Auditing

**UTM CQI Model**

## The three main stages in the Teaching and Learning processes

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## The Net Generation

- Digitally Literate
- Connected
- Immediate
- Experiential
- Multi-tasking
- Teams
- Visual and Kinesthetic

INSPIRING CREATIVE AND INNOVATIVE MINDS

# What's happening elsewhere?

At M.I.T., Large Lectures Are Going the Way of the Blackboard

Jodi Hilton for The New York Times

The Massachusetts Institute of Technology has changed the way it offers some introductory classes. Prof. Gabriella Sciolla at a class on electricity and magnetism.

By SARA RIMER
Published: January 12, 2009

COMMENTS (66)
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CAMBRIDGE, Mass. — For as long as anyone can remember, introductory physics at the Massachusetts Institute of Technology was taught in a vast windowless amphitheater known by its number,

January 13, 2009—New York Times
http://www.nytimes.com/2009/01/13/us/13physics.html?em

EDUCATION

## Farewell, Lecture?

Eric Mazur

A physics professor describes his evolution from lecturing to dynamically engaging students during class and improving how they learn.

Discussions of education are generally predicated on the assumption that we know what education is. I hope to convince you otherwise by recounting some of my own experiences. When I started teaching introductory physics to undergraduates at Harvard University, I never asked myself how I would educate my students. I did what my teachers had done—I lectured. I thought that was how one learns. Look around anywhere in the world and you'll find lecture halls filled with students and, at the front, an instructor. This approach to education has not changed since before the Renaissance and the birth of scientific inquiry. Early in my career I received the first hints that something was wrong with teaching in this manner, but I had ignored it. Sometimes it's hard to face reality.

When I started teaching, I prepared lecture notes and then taught from them. Because my lectures deviated from the textbook, I provided students with copies of these lecture notes. The infuriating result was that on my end-of-semester evaluations—which were quite good otherwise—a number of students complained that I was "lecturing straight from (his) lecture notes." What was I supposed to do? Develop a set of lecture notes different from the ones I handed out? I decided to ignore the students' complaints.

Click here. Students continually discuss concepts among themselves and with the instructor during class. Discussions are spurred by multiple-choice conceptual questions that students answer using a clicker device. See supporting online text for examples of such "clicker questions."

A few years later, I discovered that the students were right. My lecturing was ineffective, despite the high evaluations. Early on in the physics curriculum—in week 2 of a typical introductory physics course—the Laws of Newton are presented. Every student in such a course can recite Newton's third law of motion, which states that the force of object A on object B in an interaction between two objects is equal in magnitude to the force of B on A—I sometimes is known as "action is reaction." One day, when the course had progressed to more complicated material, I decided to test my students' understanding of this concept not by doing traditional problems, but by asking them a set of basic conceptual questions (1,2). One of the questions, for example, requires students to compare the forces that a heavy truck and a light car exert on one another when they collide. I expected that the students would have no trouble tackling such questions, but much to my surprise, hardly a minute after the test began, one student asked, "How should I answer these questions? According to what you taught me or according to the way I usually think about these things?" To my dismay, students had great difficulty with the conceptual questions. That was when it began to dawn on me that something was amiss.

In hindsight, the reason for my students' poor performance is simple. The traditional approach to teaching reduces education to a transfer of information. Before the industrial revolution, when books were not yet mass commodities, the lecture method was the only way to transfer information from one generation to the next. However, education is so

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www.sciencemag.org

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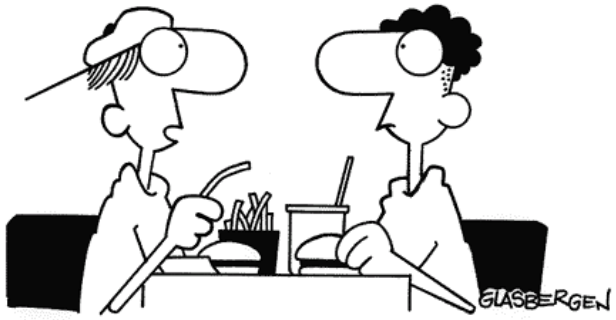


"I forgot to make a back-up copy of my brain, so everything I learned last semester was lost."

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## Do the Best Learning Outcomes Occur When Teaching Style Matches Learning Style?

- when students' learning preferences match their instructor's teaching styles, student motivation & achievement usually improve

  Miller (2001); Stitt-Gohdes (2003)

- Other studies show that matching teaching & learning styles is not . . . for adult learners, because learning style may differ according to age and situational factors such as the type of class or subject being studied

  Spoon & Shell (1998)

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## Learning Style Model

| | | |
|---|---|---|
| • Perception | Sensing | Intuitive |
| • Input Modality | Visual | Verbal |
| • Processing | Active | Reflective |
| • Understanding | Sequential | Global |

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| Sensing (S) Learning | Intuitive (N) Learners |
|---|---|
| Focus on external input (see, hear, taste, touch, smell) | Focus on internal input (thoughts, memories, image) |
| Practical | Imaginative |
| Observant (notice details of environment) | Look for meanings (miss detail) |
| Concrete thinking (facts, data, hands-on-work) | Abstract thinking (theories, math model) |
| Learn through repetition (drills, numerous examples, replication of experiments) | Like variety in learning experiences (bored with repetition) |
| Methodical | Quick |
| Like working with details | Like working with concepts |
| Complaint about courses: No apparent connection to real world | Complaint about courses: "Plug & Chug" (Lots of memorization, repetitive formula substitution) |
| Problem with exams: Run out of time | Problem with exams: Careless mistakes |

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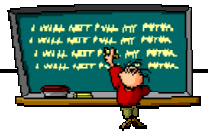
| Visual (Vs) Learners | Verbal (Vb) Learners |
|---|---|
| ▪ "Show me"<br>- pictures<br>- diagrams<br>- sketches<br>- schematics<br>- flow charts<br>- plots | ▪ "Explain it to me"<br>- spoken words<br>- written words, symbols (seen, but translated by brain into their<br>Oral equivalents) |



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| Active (A) Learners | Reflective (R) Learners |
|---|---|
| Tend to process actively (doing something physical with presented material, then reflecting on it) | Tend to process reflectively (thinking about presented material, then doing something with it) |
| Think out loud | Work introspectively |
| "let's try it out and see how it goes" | "Let's think it through and then try it" |
| Tend to jump in prematurely | Tend to delay starting |
| Like group work | Like solo or pair work |

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| Sequential (Sq) Learners | Global (G) Learners |
|---|---|
| Built understanding in logical sequential steps | Absorb information randomly, then synthesize the big picture |
| Function with partial understanding of information | Need the big pictures (interrelations, connections to other subjects and personal experience) in order to function with information |
| Make steady progress | Large leaps in understanding with little progress between them |
| Explain easily | Can't explain easily |
| Good at analytical thinking (the trees) | Synthesis, holistic thinking (the forest) |

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## Learning and Teaching Styles

SO WHAT?

Mismatch between learners and teachers. Teachers usually intuitive but learners can be any of the 4 types.

WHAT TO DO?

Include various active teaching techniques to address ALL learning styles centered on the students i.e. Student Centered Learning (SCL)

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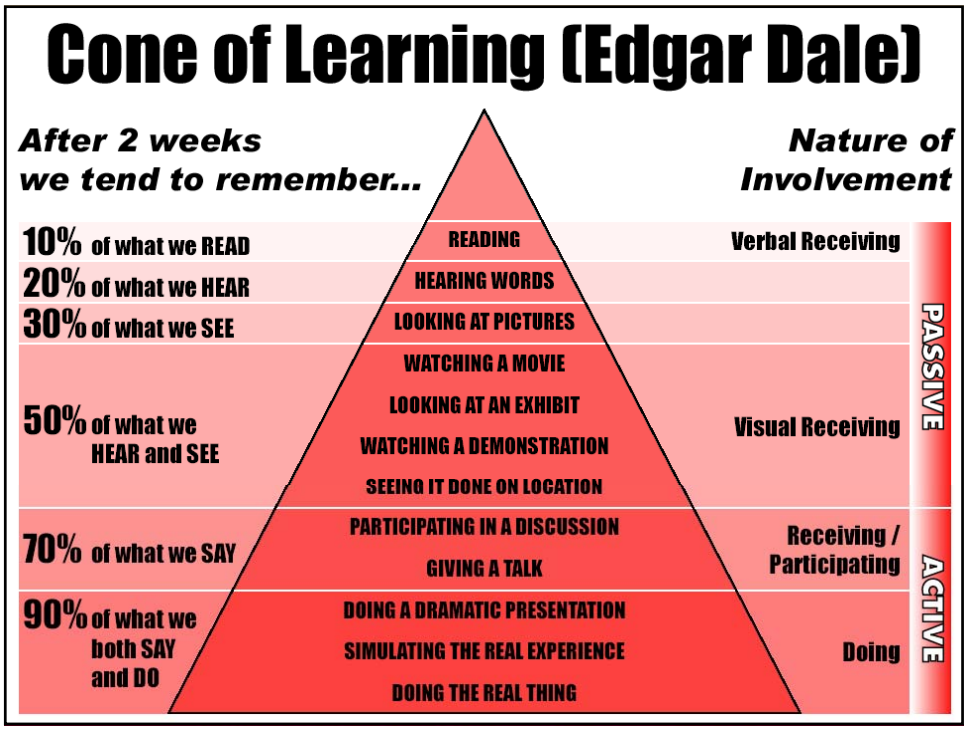

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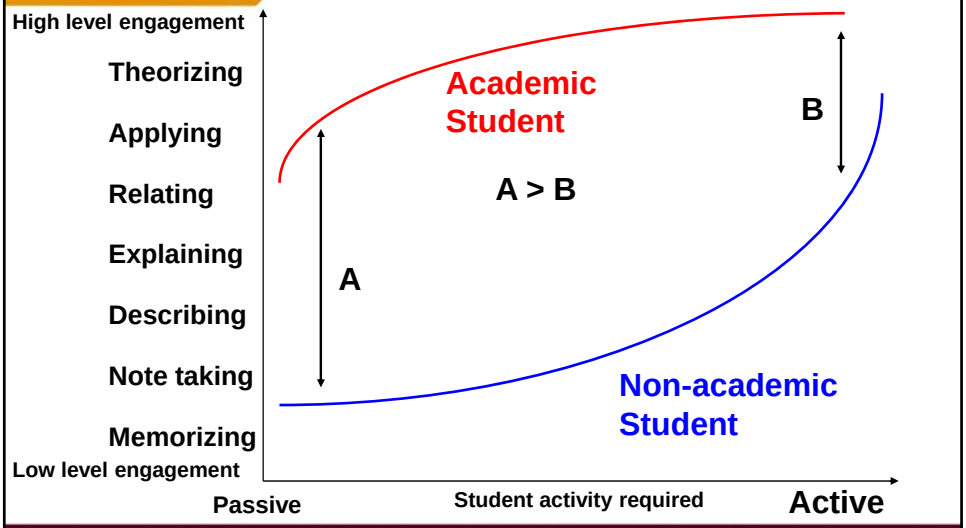
## Why engage students?




*Biggs 2003, p. 4*



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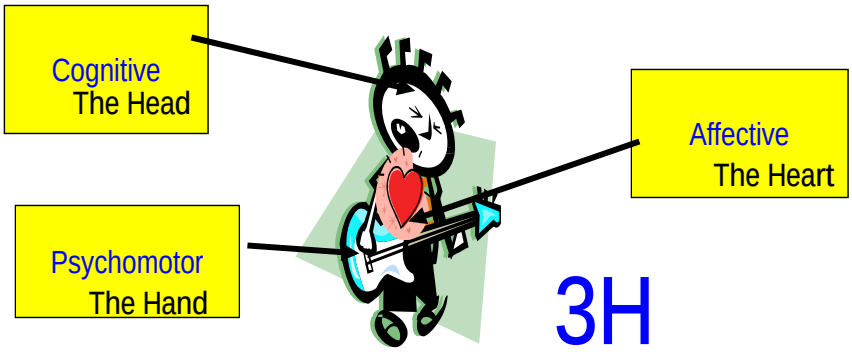
## The 3 Domains of Educational Goals



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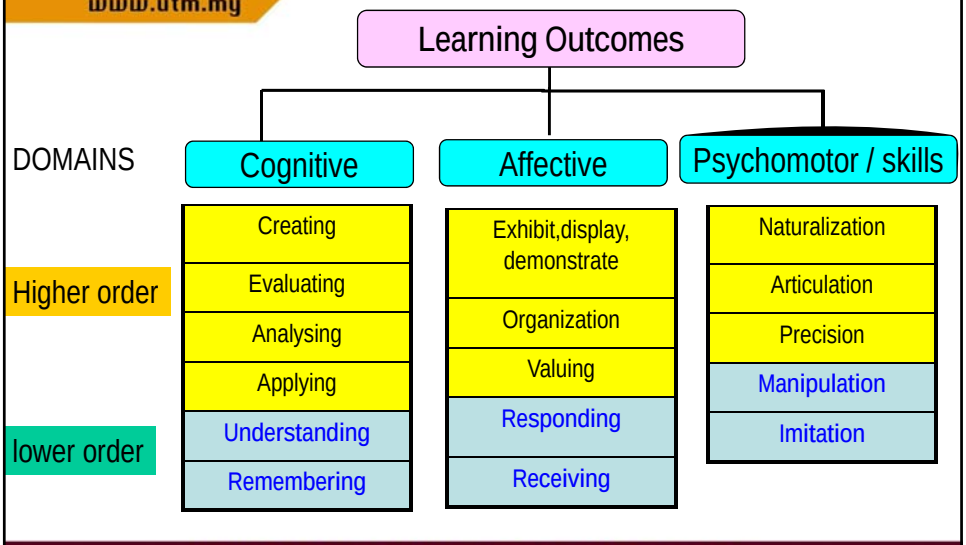
## LEARNING OUTCOMES DOMAINS

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## Educating Engineers:

## Designing for the Future of the Field

**(Carnegie Foundation for the Advancement of Teaching, 2008)**

- PRINCIPLE 1 *Provide a professional spine.* Engaging students in increasingly practice-like experiences
- PRINCIPLE 2 *Teach key concepts for use and connection.* Organizing what kind of theoretical, scientific, and technical knowledge is fundamentally important.
- PRINCIPLE 3 *Integrate identity, knowledge, and skills through approximations to practice. E*ducators need to find creative ways to structure and support students' beginning efforts to imitate competent performance and to provide timely and informative feedback on those performances.
- PRINCIPLE 4 *Place engineering in the world: encourage students to draw connections.*

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## Seven Principles for Good Practice in Undergraduate Education

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

**Chickering, A.W., dan Gamson, Z.F. (1999). Development and Adaptation of the Seven Principles for Good Practice in Undergraduate Education. New Directions for Teaching and Learning. Number 80, Winter 1999. San Francisco: Jossey-Bass Inc.**

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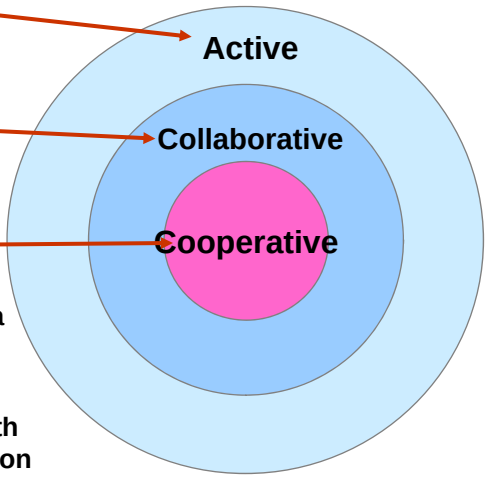
Next

## Common Terms to Describe Student-Centered Learning

**Getting students to do anything active (individually or in groups)**

**Getting students to work in pairs or groups**

**Getting students to work together in a structured group activity that meets specified criteria**




**+**

**Inductive learning: Start with problems, then teach solution methods (PBL, inquiry,…)**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## What is Cooperative Learning?

- Cooperative learning is working actively
  - in small groups
  - to maximize learning
  - toward a common goal

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## What is Cooperative Learning?

- CL is NOT:
  - Students sitting around a table studying together
  - Group projects with one or two students doing all the work
- Normally used when students are assigned in teams for projects
- Not only for tutorials and projects, but also while teaching

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## Comparison of Learning Groups

| Less Structured (Traditional) | More Structured (Cooperative) |
|---|---|
| Low interdependence. Members take responsibility only for self. Focus is on individual performance only. | High positive interdependence. Members are responsible for own and each other's learning. Focus is on joint performance. |
| Individual accountability only | Both group and individual accountability. Members hold self and others accountable for high quality work. |
| Assignments are discussed with little commitment to each other's learning. | Members promote each other's success. The do real work together and help and support each other's efforts to learn. |
| Teamwork skills are ignored. Leader is appointed to direct members' participation. | Teamwork skills are emphasized. Members are taught and expected to use social skills. All members share leadership responsibilities. |
| No group processing of the quality of its work. Individual accomplishments are rewarded. | Group processes quality of work and how effectively members are working together. Continuous improvement is emphasized. |

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## Principles of Cooperative Learning

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- Active learning that involves collaboration and interaction of students in groups that are intentionally formed where there are:
  - Positive interdependence (each individual depends on and is accountable to the others - a built-in incentive to help, accept help, and root for others)
  - Individual accountability (each person in the group learns the material)
  - Face to face interaction (group members help one another, share information, offer clarifying explanations)
  - Appropriate use of interpersonal skills (leadership, communication)
  - Regular self-assessment of group functioning (assessing how effectively they are working with one another)



## Realising Positive Interdependence

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- mutual goals (goal interdependence);
- divisions of labor (task interdependence);
- dividing materials, resources, or information among group members (resource interdependence);
- assigning students differing roles (role interdependence); and,
- by giving joint rewards (reward interdependence).

**A learning situation is cooperative if students perceive that they are positively interdependent with other members of their learning group.**

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## Positive Interdependence

- Individual success depends on the team's success
- Require consensus
- Assign roles
- Share resources
- Individual reward based on team's success

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## Individual Accountability

- Individual accountability reinforces positive interdependence
- Evaluate performance individually and collectively
- Peer evaluation

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## Face-to-face Interaction

- Cooperative learning requires face-to-face interaction
- Interaction can be structured
- Provide sufficient time for interaction



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## Teamwork Skills

- Students often lack teamwork skills
- Identify relevant social skills
  - Active listening
  - Expression of differences
- Teamwork taught like course material
- Monitor and assess

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## Group Processing

- Group processing needed to keep a team functioning smoothly
- Regularly review performance
- Explain purpose and relationship to social skills

Back to Content

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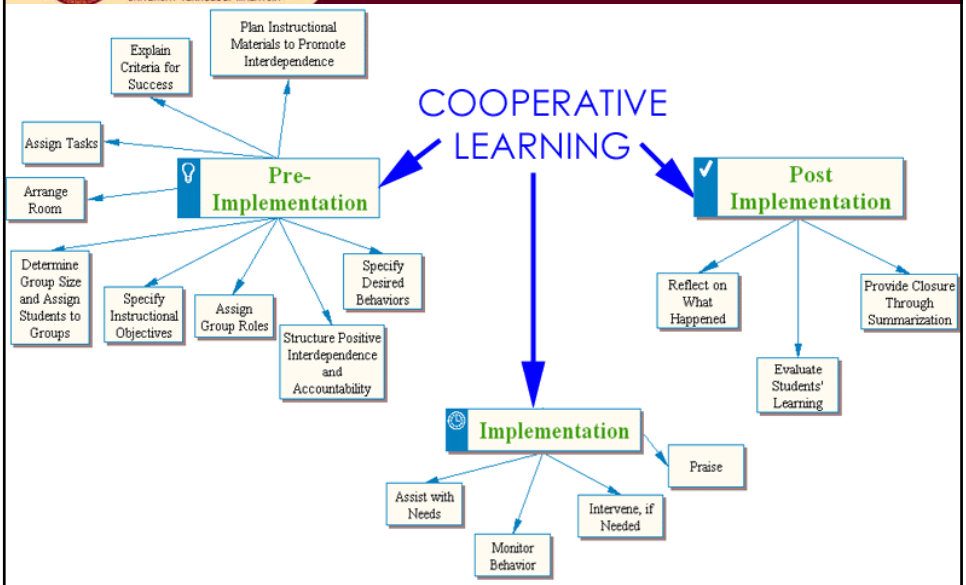
## PHASES OF IMPLEMENTING CL

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## What is Problem-Based Learning (PBL) ?

Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered **first** in the learning process. (Barrows and Tamblyn, 1980)

Core Features of PBL

- Learning is student-centered
- Learning occurs in small student groups
- Teachers are facilitators or guides
- Problems are the organizing focus and stimulus for learning
- Problems are the vehicle for the development of clinical problem-solving skills
- New information is acquired through self-directed learning

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## Problem Base Learning (PBL)

### The Heart of It All : The Problem

- The Problem drives the Learning
- The starting point of learning is a Problem
- Subject matter is organised around the Problem
- Learning is triggered by the need to solve a Problem
- The "learning inertia" is greatly propelled by the ill-structured Problem
- New knowledge is learnt during the process of solving the Problem
- The Problem should allow students to incorporate prior knowledge
- The Problem should be one that students are likely to face in their future workplace
- The Problem should trigger discussion

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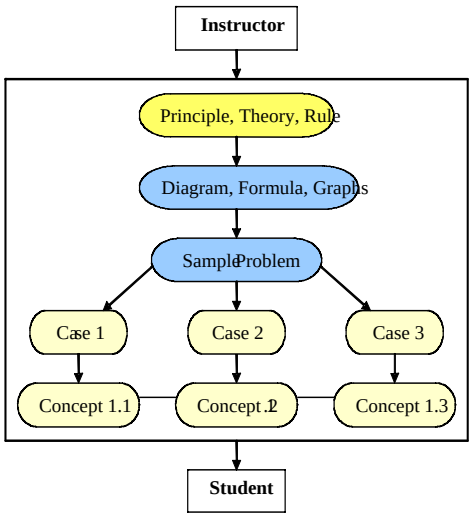
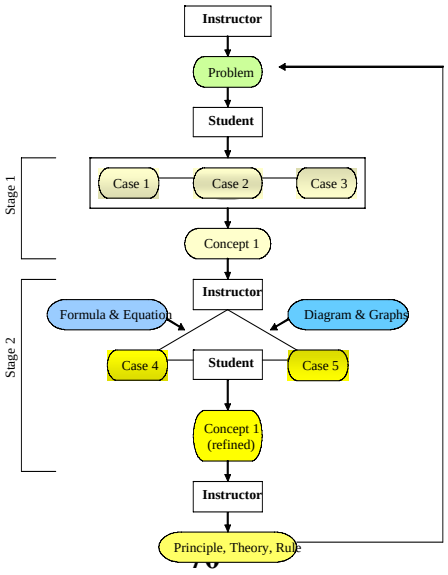
**Typical Model *Deductive Method of Teaching an Engineering Principle***




**Alternative Model *Inductive Method of Teaching an Engineering Principle***



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## Problem Solving Topology

**What's the Difference?**

**Problem Solving**
- Process to obtain best answer to an unknown, subject to constraints
- ill defined
- Brand-new
- No explicit statement
- More than one approach
- Algorithm to solve unclear
- Integration of knowledge
- Strong skills of presenting results

**Solving Problem**
- Process obtain the one and only answer
- Well define
- Encounter similar problem before
- Explicit, hints given
- Usually one approach to one answer
- Recall familiar solutions – usual method
- Subject by subject
- Presentation skills not required

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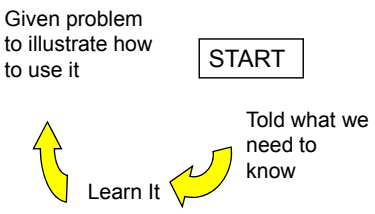
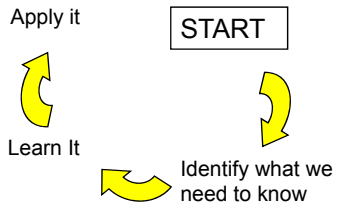
## What is Problem-Based Learning (PBL) ?

Content-based Learning




Problem-based Learning




Boud (1997): " The principle idea behind PBL is that the *starting point* for learning should be a *problem, a query or a puzzle.*"

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## The PBL philosophy

- A constructivist perception of learning and teaching:
  - **Learning** is the student's individual process of constructing knowledge and meaning
  - **Teaching** is the "setting up of a situation from which a motivated learner cannot escape without having learned" (Cowan)
- In other words: Student-Centred Learning (SCL)
- Many different models exist

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## Can we learn from problems ?

Problems

- Provide opportunity to improve a situation
- Can be a catalyst for inquiry , learning and problem solving
- Activates prior knowledge to use as a base to acquire new knowledge
- Mimic real work demands
- Multi-dimensional and integrative

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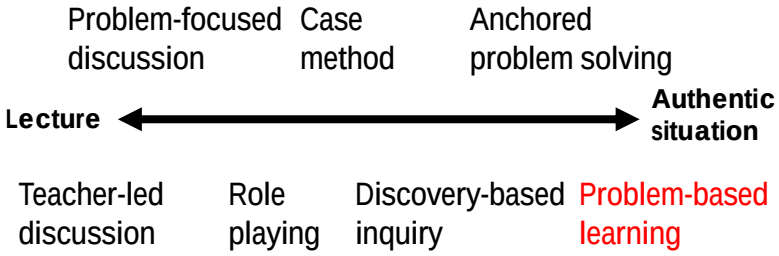
## Where is PBL?

### The Range of Teaching Methodologies

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## Why PBL?

### Research on Learning

- Brain preferences indicate that attention and arousal is enhanced with holistic, pictorial and broad-based presentation (rather than separate entities and single concepts)
- The learner is intuitively searching for context. Context provides meaning.

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## Why PBL?

- *"…. problem-based learning helps students to see that learning and life take place in contexts, contexts that affect the kinds of solutions that are available and possible."* (Savin-Baden 2003)

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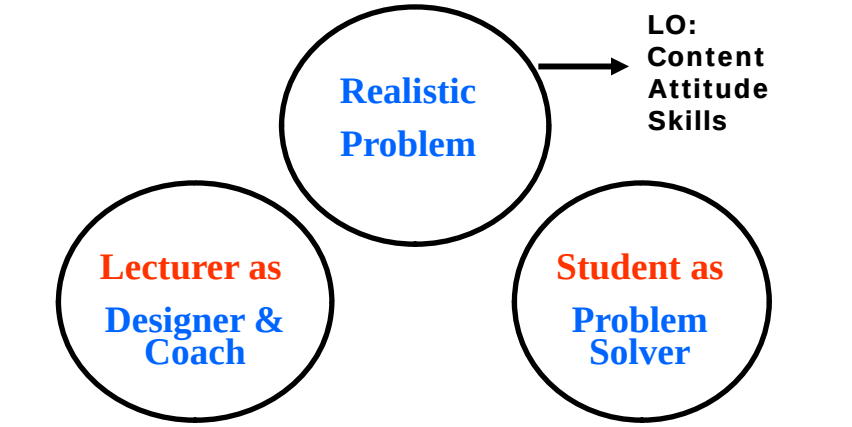
## Problem-Based Learning Approach




Facilitation skills required to make thinking visible.
Proper assessment made on both content and process. Need TRAINING!

Do not readily have the skills for PBL – must be prepared and motivated by lecturers

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# PBL Models


| | | | |
|---|---|---|---|
| Medical School Model:– University of Maastrich (UM) | One-day One-problem Model: Republic Polytechnic (RP) | Problem-oriented Project Based Learning (POPBL): Aalborg University | Cooperative Problem-based Learning (CPBL): UTM, U of Delaware, Temasek Polytechnic |



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# The Aalborg POPBL Model – Semester Timing

10 Mm / week – 1 Mm = 4 hours = ½ day

| | | | |
|---|---|---|---|
| Mm. 1 | S-course 1 | S-course 2 | |
| Mm. 2 | | | |
| Mm. 3 | P-cour | | |
| Mm. 4 | | P-cours | Project work |
| Mm. 5 | P-cr 2 | | |
| Mm. 6 | | | |
| Mm. 7 | e 1 | Project work | |
| Mm. 8 | Project work | | |
| Mm. 9 | | | |
| Mm. 10 | Free study act. | Free study act. | Free study act. |
| | 5 weeks | 5 weeks | 5 weeks |

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| | RP | UM | AAU |
|---|---|---|---|
| No. of stud. | 5 | 8 - 10 | 2 – 7 |
| Lectures - problem work | No lectures (?) | Few lectures | ½ lectures<br>½ project |
| Length of problem work | One day | One week | One semester |
| Pre-structure of problem | High | Medium | Low |
| 'Teacher' direction | High | Low | Low to medium |
| Outcome | Presentation + learning | Learning | Report, product, presentation + learning |
| Assessment | Individual<br>Daily+<br>'understand' | Individual<br>Block+progress | Individual<br>S-course+proj. |

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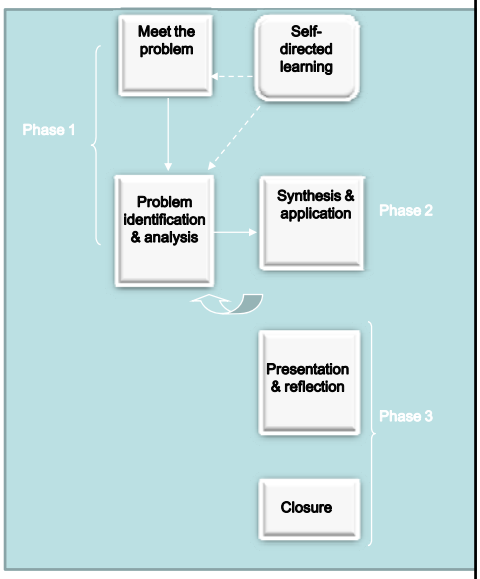
## Cooperative PBL (CPBL) Model

- Small groups (3 to 5 students per team) in a large class(60 per class) – floating facilitator
- Used to cover content – in the form of learning issues (knowledge gap) – which must be learned to solve problem
- Integrated with Cooperative Learning for scaffolding activities that promote team-working
- Duration: 1 to 4 weeks



Phase 1:

- Students read the problem scenario, reflect and articulate probable issues individually. They restate the problem in their groups
- They identify what they know, what they need to know and the learning issues. Once the problem has been identified and analysed, self-directed learning will take place.

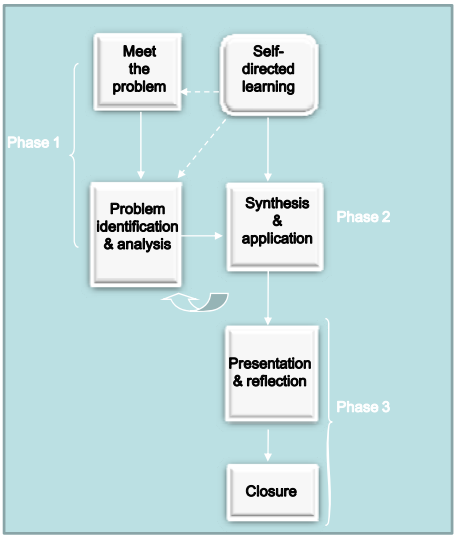
Phase 2

- Students report their discovery from research and self-directed learning to their teams. Each member prepare peer teaching notes for his team mates and submit a copy to the facilitator.
- Information is shared and critically reviewed. Facilitators must ensure that the coverage of the problem. Students may need to re-evaluate the analysis of the problem, pursue further learning, reporting and peer teaching.

Phase 3

- The solution is presented in the form of a report and an oral presentation to the class, followed by more probing questions by the facilitator to ensure deeper learning. Students are asked to reflect on the content as well as the process.
- Each student is required to submit a learning and reflection journal at the end of a case study. There is also an overall discussion on material and skills learned from the case study.

## CPBL Model




**The CPBL Process (Khairiyah, 2005)**

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## IMPLEMENTING CASE STUDY

- WHAT IS A CASE?
  - Statements describing interrelated events that have occurred in some places involving some characters and/or bodies
  - A long or short report, describes, states facts and does not assume
  - Attempts to simulate a real situation that could not be repeated but where learning could be materialized
  - It is similar to a laboratory environment as in the hard sciences
  - It has unique features as in its characteristics and contents

Harvard Business Study

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## WHY USE THE CASE METHOD

- An alternative to lecturing
- Move away from one-way communication
- Allows exchange of ideas if done in groups
- Improves verbal communication between participants
- Allows expression of ideas amongst members
- Permits participation of several individuals at any one time
- Improves comprehension, understanding
- Inculcate sense of responsibility when defending the decisions made
- Good learning experience and where decision-making is involved it does not matter if it is right or wrong

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## PROCESS OF CASE SOLVING

Recommended steps:

a. Read and understand the case
b. Who are the main players, what are the dominant factors contributing to the case being studied and what needs to be done
c. What are the subject matter that needs to be applied and the kind of analysis necessary to derive at a decision
d. In most design-oriented or management-type of cases, there are no right or wrong answers but rather HOW the decision is being derived at and why. Can the decision be defended?

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## STUDENT RESPONSIBILITIES IN CASE METHOD

- Individual student need to participate positively to gain as much as possible from the benefits of the methodology
- Positive participation requires student to be prepared on the 4 components mentioned in the previous slide

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## ROLE OF FACILITATORS

- Cases more than 2 pages usually given at least a week in advance.
- Class meetings are more to hear the group's findings and to discuss at length so as to achieve the learning objectives identified
- Lecturers not only facilitate but also coach and provide some sensible guides towards achieving learning outcome targeted
- Need to assess not only on hard document submitted but also on the effectiveness and value of group discussion in and out of class. Evaluation by group members and class peer recommended

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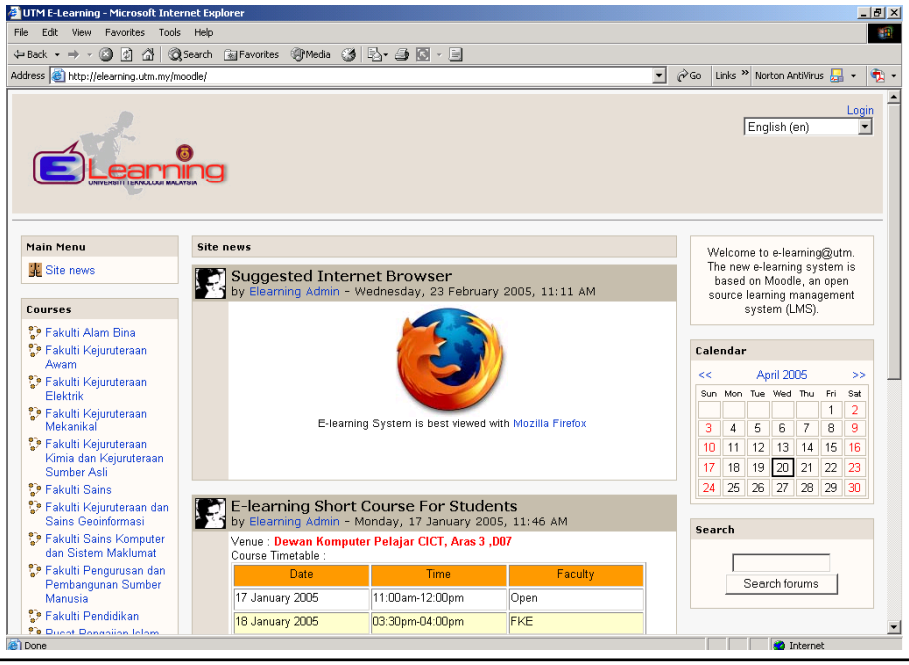
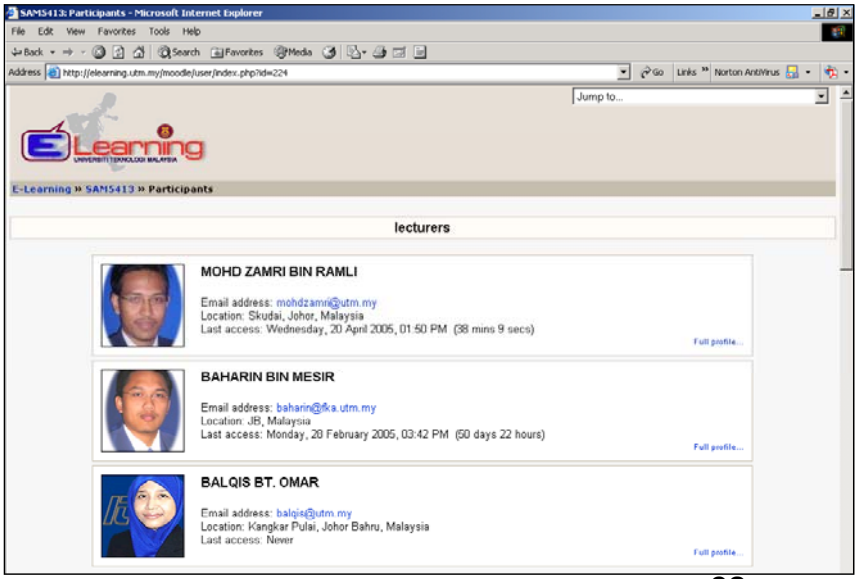
## E-Learning UTM (http://elearning.utm.my)




## E-Learning UTM (http://elearning.utm.my)

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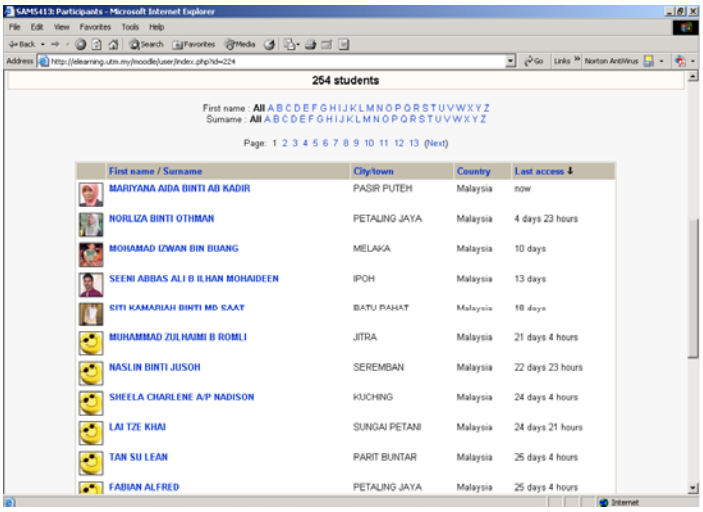
## E-Learning UTM (http://elearning.utm.my)

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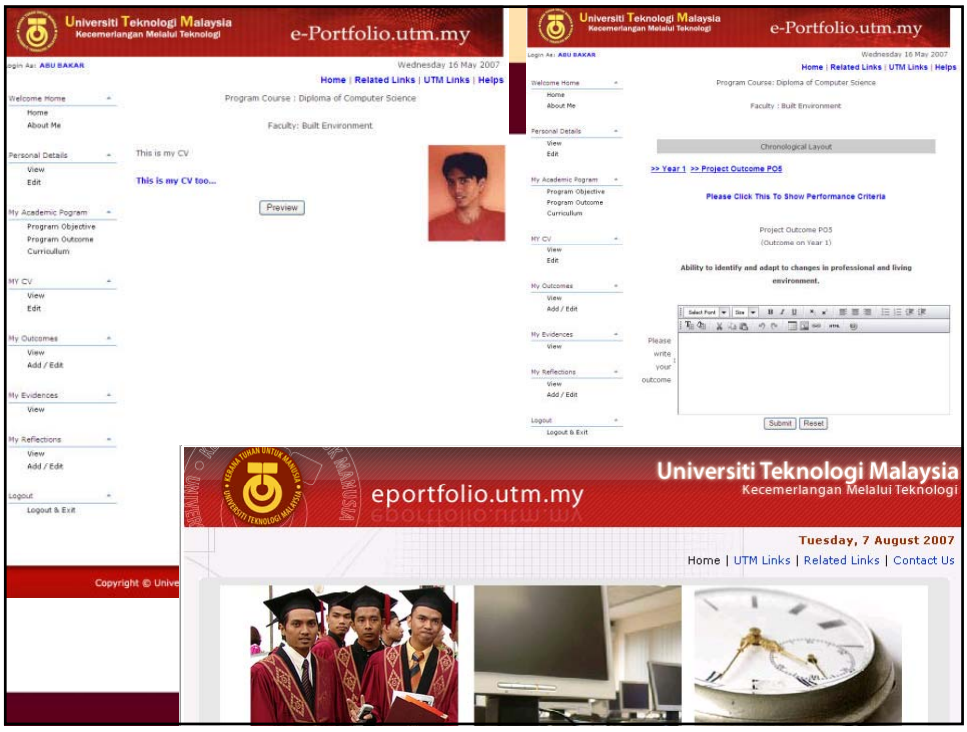

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## What is e-Portfolio

- A Student Portfolio is a collection of supporting materials and documents that provide evidence of scholarly activity (lab work, papers, exams, projects) electronically.
- A Student Portfolio contains the highlights of student's college career (in any major); it is a selection of representative works by the student.

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## Why Portfolio?

- to improve the students quality and accountability towards their own academic achievement
- to encourage students to reflect, to think critically and to acquire the skills of integrating information and knowledge
- to give added values to an effective learning culture
- to share their work with potential employers
- to inculcate the culture of writing and documenting information

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## Why Portfolio? (cont..)

- to help students to recognise their own potential and skills in terms of knowledge, technical and generic
- to help the University and the stakeholders to monitor students development from many aspects
- to assist the academic progress and career development of the student
- to be used as an instrument to assess the effectiveness of an academic programme
- to be used as a proof on student achievement as prescribed in the statement of programme learning outcome



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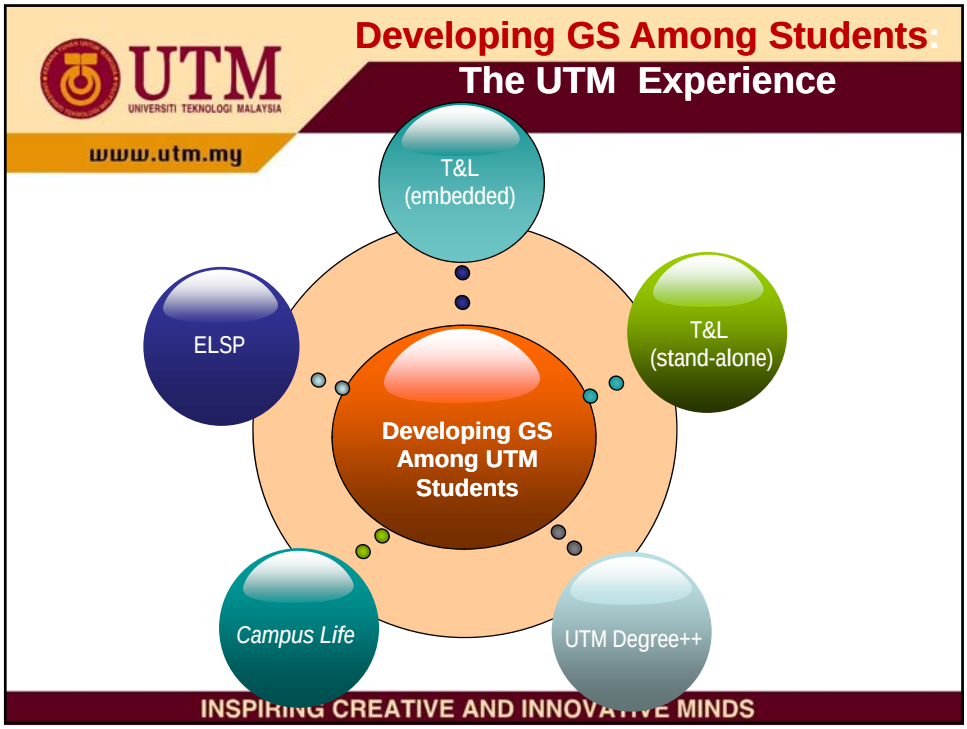
## OTHER APROACHES

- Projects on Professional Practices
- Seminars
- Industrial Training
- Laboratory or field works
- Role Play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" Inspiring creative and innovative minds "
What next?
Assessment ??
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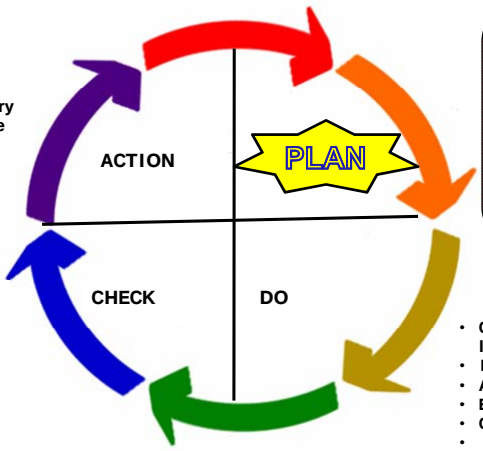
# Programme Outcomes CQI Cycle

- Communicate the results
- Identify best practices
- Identify new project
- Make necessary changes to the plan




- Identify program objectives (P-obj)
- Identify program outcomes (PO)
- Map P-Obj with PO
- Map CO with PO
- Specify Curriculum content, TnL approaches, Performance Criteria and level
- Develop assessment plan

- Analyse the data
- Share results
- Compare results with what has been plan using CQI tools
- Review the gap
- What can be learn and need to be monitored

- Carry out TnL approaches at course level
- Implement out-of-class activities
- Assess the students learning
- External examiners visit
- Carry out stakeholders survey
- Involvement of external advisors
- Collect appropriate data
- Carry out Academic Auditing

**UTM CQI Model**