The purpose of education is the holistic development of character and capabilities, the acquisition of specific skills, the realisation of intellectual, physical and spiritual potential and the training of human capital.
The objective of Malaysian Higher Education system is to produce professionals as demanded by the nation for human resources.

One purpose of higher education is to graduate students who will become productive citizens. Skills employers consistently seek from university graduates:

- communication skills
- decision-making skills which enable students to become leaders
- well developed analytical skills
- teamwork skills
- well-practiced leadership skills.
- good interpersonal skills

The objective of Malaysian Higher Education system is to produce professionals as demanded by the nation for human resources.

### MOHE's Attributes of Human Capital with First-Class Mentality*

#### Knowledge Attributes:
- Mastery of core subjects and ability to apply that knowledge
- Mastery of Bahasa Malaysia and English, and at least one other global language.
- A continuing passion for knowledge through lifelong learning.
- Excellent general knowledge and interest in current events.
- Appreciation of the arts, culture and sports.
- Sound analytical and problem-solving skills.
- Awareness of business and management principles, and technology.

#### Personal Attributes:
- Goal-oriented: proactive, self-starting, self-disciplined, confident, resilient, motivated, and fiercely competitive.
- Intellectually engaging: creative, innovative, and possessing critical thinking skills.
- Quick learner, adaptable, and flexible.
- Entrepreneurial.
- Ethically and morally upright.
- Spiritually grounded.
- Compassionate and caring (through volunteerism and social services).

#### Interpersonal Attributes:
- Able communicator and effective presenter.
- Able to relate and be comfortable with people at all levels.
- Able to develop and leverage on personal and professional networks to achieve goals.
- Natural leader.
- Team player.
The 3 Domains of Educational Goals

- Cognitive
  - The Head
- Psychomotor
  - The Hand
- Affective
  - The Heart

3H

University Education

"Give a man a fish and he will eat for a day. Teach him how to fish and he will eat for a lifetime."

Chinese Proverb
Plants are shaped by cultivation and men by education... We are born weak, we need strength; we are born totally unprovided, we need aid; we are born stupid, we need judgment. Everything we do not have at our birth and which we need when we are grown is given to us by EDUCATION. (Jean Jacques Rousseau, Emile, On Philosophy of Education)

### Learning Outcomes

At the end of day 1 workshop, participants will be able to:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Instructional Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the role of MQF and MQA in promoting and maintaining quality &amp; standards of higher education in Malaysia.</td>
<td>Lecture-discussion</td>
</tr>
<tr>
<td>2. Explain the meaning of outcome and Outcome-Based Education.</td>
<td>Lecture-discussion</td>
</tr>
<tr>
<td>3. Discuss the general and special features of OBE.</td>
<td>Lecture-discussion</td>
</tr>
<tr>
<td>4. Verbally state and visually relate the concepts &amp; terminologies used in OBE.</td>
<td>Independent reading &amp; lecture on concept map</td>
</tr>
<tr>
<td>5. Select and use the appropriate action verbs for the cognitive, psychomotor and affective learning domains.</td>
<td>Lecture-discussion</td>
</tr>
</tbody>
</table>
### Learning Outcomes

#### At the end of day 1 workshop, participants will be able to:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Instructional Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Discuss &amp; agree on a set of workable Program Educational Objectives (PEO)</td>
<td>Group discussion</td>
</tr>
<tr>
<td>7. Discuss &amp; agree on a set of workable Program outcomes (PO)</td>
<td>Group discussion</td>
</tr>
<tr>
<td>8. Complete the PO-PEO matrix &amp; the PO-PEO-ALO-MOHE Soft Skills matrix.</td>
<td>Group discussion</td>
</tr>
<tr>
<td>9. Rewrite the existing course outcomes in the present course file and hence the syllabus to suit the principles of OBE.</td>
<td>Group discussion</td>
</tr>
<tr>
<td>10. Complete the CO-PO matrix with the designated learning activities and assessment tools.</td>
<td>Group discussion</td>
</tr>
</tbody>
</table>

#### Instructional Method

- Lecture & Group discussion (workshop)
- Group discussion

### Learning Outcomes

#### At the end of day 2 workshop, participants will be able to:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Instructional Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Generate lesson outcomes (LOs) (Instructional Objectives) for 2 lessons for 5 separate courses in the program.</td>
<td>Lecture &amp; Group discussion (workshop)</td>
</tr>
<tr>
<td>2. Generate lesson outcomes for 2 laboratories for 5 separate courses in the program.</td>
<td>Lecture &amp; Group discussion (workshop)</td>
</tr>
<tr>
<td>3. Calculate and generate the Student Learning Time (SLT) for each course.</td>
<td>Lecture &amp; Group discussion (workshop)</td>
</tr>
<tr>
<td>4. Determine and confirm the notional credit hour for each course.</td>
<td>Group discussion</td>
</tr>
<tr>
<td>5. Revise the present course structure and syllabus.</td>
<td>Group discussion</td>
</tr>
<tr>
<td>6. Complete the Course-PO matrix with the designated Outcome Indicators.</td>
<td>Group discussion</td>
</tr>
</tbody>
</table>

#### Instructional Method

- Lecture & Group discussion (workshop)
- Group discussion
To promote public confidence that the quality of provision and standards of awards in higher education institutions (HEIs) are being safeguarded and enhanced.
• Conducting institutional self-review to evaluate
  – The performance of programme outcomes
  – Quality of learning opportunities
  – The institutional capacity and management of standards and quality
• Ensuring intense scrutiny and transparency of the process of institutional self-review through the use of nationally agreed guidelines on criteria and standards, a qualifications framework and procedures for quality assurance
• Reporting and making available objective and independent information on the reviews.

Quality Assurance involves

- The use of evidence
  To check that goals are being achieved
- The use of evidence
  To reshape goals and practices
- Bring about improvement
• Point of reference & joint understanding of HE Qualifications in Malaysia
• An instrument that develops and classifies qualifications based on a set of criteria that are approved nationally and benchmarked against international best practices, and which clarifies the earned academic levels, learning outcomes of study areas and credit system based on student academic load (Student Learning Time, SLT). These criteria are accepted and used for all qualifications awarded by recognised higher education providers. Hence, MQF integrates with and links all national qualifications.

Malaysian Qualification Framework (MQF)

QUALIFICATION LEVELS & PATHWAYS

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Functions of MQA

❖ To implement MQF as a reference point for Malaysian Qualifications
❖ To develop standards and criteria and all other relevant instruments as national references for the conferment of awards with the cooperation of stakeholders
❖ To assure quality of HEIs and programmes
❖ To accredit courses that fulfill the set criteria and standards
❖ To facilitate the recognition and articulation of qualifications
❖ To maintain the Malaysian Qualification Register (MQR)

MQA Code of Practice

Good Practices:

… the quality assurance process is built on the following attributes:

▸ encourages a variety of teaching and learning methods
▸ ensures the choice of credible student assessment methods appropriate for the teaching and learning methods chosen;
▸ ensures there are adequate resources to deliver the curriculum;
▸ is concerned with good outcomes rather than detailed specifications of content
Malaysian Qualifications Register (MQR)

- Registers all accredited qualifications and programmes.
- The reference point for credit transfer between programmes and qualifications that are accredited.

Motivation - Why OBE??

Quality & Accountability in Education
Institutional Audit Process

1st Stage
- Higher Education Provider conduct Internal Quality Audit
- Submit Self Review Portfolio

2nd Stage
- External evaluation
- On-site visit by independent Panel of Auditors

3rd Stage
- Authoritative Reports & Ratings, on HEP’s achievements of its mission, goals & objectives; strengths; areas of concern / enhancement

MQA
Self-study Report

MQA Code of Practice

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Criteria 6: RESOURCES FOR THE EDUCATIONAL PROGRAMME

*Education expertise*

i. What policy does the institution have to ensure that its education expertise and methodologies are appropriate for the delivery of the curriculum?

ii. Does institution have access to an expert education unit or other educational expertise and how are they used?
Change is like a shark in the ocean. Change never stops, never sleeps: it must always keep moving. The good news is if you hate the way things are, they will change. The bad news is if you love the way things are, they are certain to change as well. The only thing inevitable about life is change, not death. Change is here to stay!

“The ILLITERATE of the 21st century will not be those who can’t read or write but those who can’t learn, unlearn and relearn” Alvin Toffler

An outcome is:

- The result or consequence of a performance (in terms of success and failure).
- the way a thing turns out; a consequence

- The outcomes of the meeting between CUEPACS & the Prime Minister were…
- After 3-4 years of formal & and non-formal education at FSG, students must be able to…
- This workshop will produce….
Learning Outcomes are statements that explain what students should know, understand and can do upon the completion of a period of study.

Learning outcomes are references for standard and quality as well as for the development of curriculum in terms of teaching and learning, determination of credits and the assessment of students.

Learning outcomes are linked to the credit system which gives value to all student learning time and are not based on the contact hours between lecturers and students.

What is a Program/Course/Lesson Outcome??

A statement of what students will be able to do when they have completed the program/course/lesson and it involves graduate's skills and knowledge that arise from the educational activities of the program/course/lesson which lead to the achievement of the Program Objectives

An outcome has three major components:

- A description of what the students will be able to do
- The conditions under which the students will perform the task.
- The criteria for evaluating students' performance.
At the end of this activity, you will be able to write at least 5 attributes of your graduates for the program you are developing.

An outcome at the course level

**Condition**
- Action
- Observable
- Measurable

**Criteria**

Institutional Attributes
- Program level (Still general)
- Course Level (Specific but not measurable)
- Lesson Level (Very specific & MUST be measurable)

MOHE
- Very general (not measurable)
- General (not measurable)
OBE is a method of curriculum design and teaching that focuses on what students can actually do after they are taught. OBE addresses the key questions as:

- Why do you want them to learn it? – Vision, Mission, PEOs, POs
- What do you want the students to learn? – course structure
- How can you best help students learn it? – Learning Activities
- How will you know what they have learnt? - Assessment

Towers (1996) listed four points to the OBE system that are necessary to make it work:

a) What the student is to learn must be clearly identified.
b) The student’s progress is based on demonstrated achievement.
c) Multiple instructional and assessment strategies need to be available to meet the needs of each student.
d) Adequate time and assistance need to be provided so that each student can reach the maximum potential.
The desired outcome is selected first and the curriculum, instructional materials and assessments are created to support the intended outcome (Spady 1988; 1993).

All curriculum and teaching decisions are made based on how best to facilitate the desired final outcome.

OBE’s instructional planning process is a reverse of that associated with traditional educational planning.

OBE is able to measure—‘what the students are capable of doing’

Choosing an answer from 5 options in a multiple-choice question do not allow students to demonstrate what they have learnt. Ideally, students should have an understanding of the content, which is a cognitive skill that goes much deeper than finding the correct answer. OBE requires the students to understand the contents by “extending the meaning of competence far beyond that of narrow skills and the ability to execute structured tasks in a particular subject area and classroom” (Spady, 1995).
OBE goes beyond ‘structured tasks’ (e.g. memorization)

OBE demands that students demonstrate his/her skills through more challenging tasks like writing project proposals and completing the projects, analyzing case studies and giving case presentations etc. Such exercises require students to practice and demonstrate their ability to think, question, research, make decisions and give presentations.

OBE involves students in a complete course of learning, developing their skills in designing to completing a whole process (Spady, 1994a, 1995).

OBE also identifies higher levels of thinking (e.g. creativity, ability to analyze and synthesize information, ability to plan and organize tasks). Such skills are emphasized especially when students are assigned to organize and work as a community or entrepreneurial service teams to propose solutions to problems and market their solutions.
1. Clarity of focus about outcomes
   - Always have the significant, culminating exit outcomes as the focus.
   - Let the students know what they are aiming for.

2. Designing backwards
   - Design curriculum backward by using the major outcomes as the focus and linking all planning, teaching and assessment decisions directly to these outcomes.

3. Consistent, high expectations of success
   - Set the expectation that OBE is for ALL learners.
   - Expect students to succeed by providing them encouragement to engage deeply with the issues they are learning and to achieve the high challenging standard set (Spady, 1994b).

4. Expanded opportunity
   - Develop curriculum to give scope to every learner to learn in his/her own pace.
   - Cater for individual needs and differences, for example, expansion of available time and resources so that all students succeed in reaching the exit outcomes.
1. Individually, list out 12 attributes of graduates of DIC
2. Discuss with your neighbour and justify your choices.
3. Agree on 7 of the most important attributes.

MOHE 8 Learning Outcomes

Academic Learning Domains (ALDs)

1. Knowledge (K)
2. Practical Skills (P)
3. Social skills and responsibility (A)
4. Values, attitudes and professionalism (A)
5. Communication, leadership and team skills (P/A)
6. Problem solving and scientific skills (K/P)
7. Information management and lifelong learning skills (P/A)
8. Managerial and entrepreneurial skills (K/P/A)
1. Communication skills (P)
2. Critical thinking and problem solving (P)
3. Lifelong learning and information management (A)
4. Group working skills (A)
5. Entrepreneurship skills (P)
6. Ethics and professionalism (A)
7. Leadership skills (A)
SECTION 2 of MQA Code of Practice in Perspective

MQF – Diploma (Skills)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Knowledge</th>
<th>Intellectual skills</th>
<th>Psychomotor skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification Level: Diploma for skills training</td>
<td>breadth, depth and complexity of knowledge for complex skills (degree of emphasis on breadth as against depth of knowledge may vary between qualifications granted at this level)</td>
<td>substantial degree of judgment for problem solving</td>
<td>perform a broad range of complex technical operations</td>
</tr>
</tbody>
</table>

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MQF – Diploma (Skills)

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Information Management, communication &amp; Learning skills</th>
<th>Personal attributes, professionalism &amp; responsibility</th>
<th>Contexts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification Level: Diploma for skills training</td>
<td>Communication &amp; participation in teams Exercise responsibility and substantial autonomy for own continuing learning</td>
<td>Work related attitudes and ethics shown in exercise of responsibility and substantial autonomy for own output in work and responsibility for the work of others</td>
<td>Performed in a variety of contexts possess qualities for employment in situations requiring the exercise of personal responsibility and decision-making</td>
</tr>
</tbody>
</table>

**Desiders**

**Science Standards**

---

**Education**

"...we discovered that education is a natural process which develops spontaneously in the human being. It is not acquired by listening to words, but in virtue of experiences in which the individual acts on his environment. The teacher’s task is not to talk, but to prepare and arrange a series of motives for cultural/scientific activity in a special environment made for the individual”

Dr. Maria Montessori
UiTM’s VISION (2006)
To establish UiTM as a premiere university of outstanding scholarship and academic excellence capable of providing leadership to Bumiputera’s dynamic involvement in all professional fields of world-class standards in order to produce globally.

UiTM’s PHILOSOPHY (2006)
A belief that every individual has the ability to attain excellence through the transfer of knowledge and the assimilation of moral values so as to become professional graduates capable of developing knowledge, self, society and the nation.

UiTM’s MISSION (2006)
To enhance the knowledge and expertise of Bumiputera’s in all fields of study through professional programmes, research work and community service based on moral values and professional ethics.
FSG’s VISION
➢ To Become The Premier Institution In Science And Technology Through Quality Teaching, Research, And Service.

FSG’s MISSION
➢ Contributing to the country’s growth & sustainability through teaching & learning by:
  ➢ Developing student’s potential via the most effective instructional strategies & producing graduates who are knowledgeable, creative, innovative, competitive, skillful in science & thinking skills and having personal & moral attributes coherent with the social, religious, societal and professional needs.

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Cognitive Domain
(thinking, knowledge)

IN VolVES KNOWLEDGE AND THE DEVELOPMENT OF INTELLECTUAL SKILLS

**Knowledge**
- Definition: Recalls previously learned material.
- Sample Verbs: define, identify, list, name, recall, state.

**Comprehension**
- Definition: Understands the meaning of material (highest level of understanding).
- Sample Verbs: describe, explain, illustrate, locate, paraphrase, give examples, translate.

**Application**
- Definition: Uses learning in new and social situations (higher level of understanding).
- Sample Verbs: apply, carry out, demonstrate, illustrate, explain, present, solve.

**Analysis**
- Definition: Understands both the content and structure of material.
- Sample Verbs: analyze, compare, contrast, differentiate, evaluate, outline.

**Synthesis**
- Definition: Formats new problems from existing knowledge and skill.
- Sample Verbs: combine, create, design, develop, generate, plan, propose.

**Evaluation**
- Definition: Judges the value of material for a given purpose.
- Sample Verbs: assess, criticize, interpret, justify, select, report.

---

Based on "Taxonomy of Educational Objectives", B. S. Bloom, Editor, 1956
Psychomotor Domain

Doing, skills

Psychomotor Domain includes physical movement, coordination & use of the motor skill areas.

Higher order

Lower order

Guided Response

Definition: Indicates and demonstrates skills, often in deliberate situations.

Sample Verbs: copy, duplicate; manipulate with guidance; operate under supervision; practice; try

Affective Domain

Feeling, attitudes

Affective Domain includes manner we deal with things emotionally (e.g. feelings, interests, attitudes, appreciation, enthusiasms, motivations) - that might result from instruction.

Higher order

Lower order

Perception

Definition: Awareness of stimuli that guide motor activity.

Sample Verbs: detect, hear, see, observe, recognize, sense, feel

Organization

Definition: Integrates the values into a value system that determines behaviors.

Sample Verbs: act upon, adopt, absorb, adopt, absorb, adopt, absorb

Based on “Taxonomy of Educational Objectives”, B.S. Bloom Editor, 1956

Based on “Taxonomy of Educational Objectives”, B.S. Bloom Editor, 1956
Presently: On completion of this course, students should be able to:

1. Identify prokaryotic and eukaryotic cell structures.
2. Understand and differentiate the general structures of plant and animal cells.
3. Understand the movement in and out of cell.
4. Understand the processes involved in prokaryotic and eukaryotic cell reproduction.
Presently: On completion of this course, students should be able to:

1. Acquaint the students of the vast range of microorganisms involved in food spoilage and food poisoning.
2. Make aware the principles and methods which can be carried out to prevent food spoilage by contaminating microorganisms.
3. Introduce some aspects of industrial fermentations such as organic acids, enzymes and oriental foods.

Format: Lecture/Tutorial/Lab : 240

Presently: On completion of this course, students should be able to:

1. Provide the student with basic knowledge of applied microbiology in industry.
2. Provide the student with sufficient technical skills to participate in the development of biotechnology and to set up small-scale industries.

Format: Lecture/Tutorial/Lab : 304
Presently: On completion of this course, students should be able to:

1. Describe and analyse bacterial growth in batch and continuous cultures
2. Describe the processes used by microbes to generate energy
3. Describe how metabolic activities can be controlled in the cell
4. Describe the various types of antibiotics, their mode of actions and how microbes acquire resistance.
Course Outcomes: Upon completion of this course, students will be able to:

1. write and explain the concepts in electrostatics, electricity, magnetism, introductory atomic physics and modern physics (C-Knowledge)

2. Represent and relate the concepts in electrostatics, electricity, magnetism, light, introductory atomic physics and modern physics verbally, visually (pictures & graphs) and algebraically. (C-Comprehension)

3. Apply the concepts in electrostatics, electricity, magnetism, light, introductory atomic physics and modern physics to solve textbook problems numerically, visually and verbally. (C-Application)

4. Analyze, summarize and discuss solution to real world problems associated with electrostatics, electricity, magnetism, light, introductory atomic physics and modern physics.

5. Observe, plan, conduct and justify scientific investigations in areas of electrostatics, electricity and magnetism.

6. Communicate to peers verbally and to the facilitator in writing, the science investigations and justification in areas of electrostatics, electricity and magnetism.
Coles (2003) argues that:
A curriculum is more than a list of topics to be covered by an educational programme, for which the more commonly accepted word is a 'syllabus'. A curriculum is:

- first of all a policy statement about a piece of education, and
- secondly an indication as to the ways in which that policy is to be realised through a programme of action.
In practice, a working definition of a curriculum is

- the sum of all the activities, experiences and learning opportunities for which an institution (such as the Society) or a teacher (such as a faculty member) takes responsibility – either deliberately or by default. This includes in such a broad concept of curriculum the formal and the informal, the overt and the covert, the recognised and the overlooked, the intentional and the unintentional.

Designing Curriculum: curriculum is an academic plan. It is a total blueprint for actions where:

- the objectives (PEOs), outcome (POs) of the curriculum are clarified;
- the processes to achieve these are identified; (course structure & instructional strategies)
- the ways to measure whether success has been achieved (assessment); and
- systematic review and adjustment are also part of the plan (evaluation & CQI).
Science programmes must focus on presentations, discussions and practical work that enable students to demonstrate understanding of theory, skills in analysis, ability to speak, write, plan and manage as well as teamwork and leadership.

Industrial training is a must for Applied Science programmes.
Different writers ascribe different meanings to lifelong education and lifelong learning. One such meaning is:

"The single crucial element in the notion of lifelong education is to be found in the word 'lifelong': it embraces a set of guidelines for developing educational practice ('education') in order to foster learning throughout life ('lifelong'). Lifelong education thus defines a set of organisational, administrative, methodological and procedural measures which accept the importance of promoting lifelong learning."

(Knapper and Cropley, 2000, p.9)

In essence, the basic idea behind the term 'lifelong learning' is that deliberate, focused learning does and should occur throughout a person's lifetime.

What would a lifelong learner look like? Deep learners rather than surface learners...

Consider the following criteria adapted from Knapper and Cropley
Lifelong learners:

- Plan their own learning
- Assess their own learning
- Are active rather than passive learners
- Learn in both formal and informal settings
- Learn from their peers, teachers, mentors etc.
- Integrate knowledge from different subject areas when required
- Use different learning strategies for different situations.

Achieved through doing research
It's not what & how much students learn but **HOW**

<table>
<thead>
<tr>
<th>Lifelong Learning Criteria</th>
<th>Teaching for Lifelong Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students plan their own learning</td>
<td><strong>Formalise the process of planning learning goals collaboratively</strong>—If students can participate in developing their own learning they are more likely to feel internally committed to it. Internal commitment to learning is a hallmark of lifelong learning.</td>
</tr>
</tbody>
</table>

---

It's not what & how much students learn but **HOW**

<table>
<thead>
<tr>
<th>Lifelong Learning Criteria</th>
<th>Teaching for Lifelong Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students plan their own learning (cont..)</td>
<td>Use formative assessment (i.e. ongoing feedback)—this allows students to experience the learning benefits of assessment. They can uncover errors or deficits and use this knowledge to direct their learning.</td>
</tr>
<tr>
<td></td>
<td>Develop focussed internships—these can give students concrete real world learning goals that they will need to respond to with their own initiative.</td>
</tr>
</tbody>
</table>
It’s not what & how much students learn but **HOW**

<table>
<thead>
<tr>
<th>Lifelong Learning Criteria</th>
<th>Teaching for Lifelong Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students assess their own learning</td>
<td>Use self-assessment and peer assessment—students learn to take control of the crucial first step in learning; finding out what it is they do not know. Peer and self assessment assumes assessment is a skill that is vital for students to learn if they are to monitor their learning in</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Lifelong Learning Criteria</th>
<th>Teaching for Lifelong Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning in informal settings</td>
<td>Use learning and teaching strategies that start with the students’ present understandings—learning how to learn in informal settings first requires students to value the knowledge they have acquired informally.</td>
</tr>
</tbody>
</table>

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Use a research oriented curriculum—where students are seeking knowledge rather than being passive receivers. They learn how to acquire and filter information.

Use peer assessment and group learning—this helps students to learn from each other and also develops explicit peer learning skills.

**Lifelong Learning Criteria** | **Teaching for Lifelong Learning**
---|---
Active Learning | Use a research oriented curriculum—where students are seeking knowledge rather than being passive receivers. They learn how to acquire and filter information.
Peer Learning | Use peer assessment and group learning—this helps students to learn from each other and also develops explicit peer learning skills.

Problem-Based-Learning is the prime example here, because it usually takes ‘messy’ real-world problems that almost invariably take the student across discipline boundaries.

Use strategies that stress the learning process at least as much as learning content—here students are explicitly instructed in how to learn. This can incorporate teaching attitudes and skills, and then assessing them.
1. Explain the gravitational forces acting on any object.
2. Mathematically represent the gravitational force and describe its impact on physical events.
3. Describe existence of electrical charges in matter and its quantization property.
4. Sketch and explain the charging by induction and charging by contact.
5. Mathematically represent forces acting between electrical charges (Coulomb's Law).
6. Represent forces acting between charges both pictorially and vectorially.
7. Describe and explain gravitational and electric field.
Lesson Outcomes: Upon completion of this activity, you will be able to:

1. Propose 3 research questions you want to investigate
2. Make some predictions in your investigation.
3. Operationally define the variables involved.
4. Sketch & label the devices used in the experiment.
5. Outline the procedure to conduct the investigation/experiment.
6. Explain the purpose of each of the apparatus used.
7. Conduct a virtual experiment to test your predictions.
8. Communicate and justify orally your findings to your peers.
The 3 Domains of Educational Goals

- Cognitive (Head)
- Affective (Heart)
- Psychomotor (Hand)

3H
Outcome Based Education

Course outcomes

DOMAINS

Cognitive
- Evaluation
- Synthesis
- Analysis
- Application
- Comprehension
- Knowledge

Affective
- Exhibit, display, demonstrate
- organisation
- Valuing
- Responding
- Receiving

Psychomotor / skills
- Naturalisation
- Articulation
- Precision
- Manipulation
- Imitation

Higher order

lower order

Cognitive Domain
(thinking, knowledge)

INvolves knowledge and the development of intellectual skills

Knowledge
Definition: Remembers previously learned material.

Sample Verbs:
- define
- identify
- list
- name
- recall
- state

Comprehension
Definition: Understands the meaning of material (lowest level of understanding).

Sample Verbs:
- describe
- explain
- infer
- locate
- paraphrase
- give examples
- translate

Application
Definition: Uses the learning in new and complex situations (higher level of understanding).

Sample Verbs:
- apply
- carry out
- demonstrate
- evaluate
- examine
- prepare
- solve
- use

Analysis
Definition: Analyzes the content and structure of material.

Sample Verbs:
- conclude
- contrast
- design
- develop
- discriminate
- outline

Synthesis
Definition: Combines new principles from existing knowledge and skills.

Sample Verbs:
- agree
- combine
- create
- classify
- interpret

Evaluation
Definition: Judges the value of material for a given purpose.

Sample Verbs:
- assess
- criticise
- evaluate
- justify
- select

Based on "Taxonomy of Educational Objectives", B.S. Bloom Editor, 1966
### Outcome Based Education

#### Bloom's Taxonomy

**Categories in the Cognitive Domain**
*(Taxonomy of Educational Objectives, Bloom, 1956)*

<table>
<thead>
<tr>
<th>Level 1 – Knowledge</th>
<th>Level 2 – Comprehension</th>
<th>Level 3 – Application</th>
<th>Level 4 – Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>The remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is the bringing to mind of the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain.</td>
<td>The ability to grasp the meaning of material. This may be shown by translating material from one form to another, by interpreting material (explaining or summarising), and by estimating future trends (predicting consequences or effects). These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.</td>
<td>The ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws and theories. Learning outcomes in this area require a higher level of understanding than those under ‘Comprehension’.</td>
<td>The ability to break down material into its component parts so that its organisational structure may be understood. This may include the identification of the parts, analysis of the relationships between parts, and recognition of the organisational principles involved. Learning outcomes here represent a higher intellectual level than ‘Comprehension’ and ‘Application’ because they require an understanding of both the content and the structural form of the material.</td>
</tr>
<tr>
<td>Defines, describes, identifies, labels, lists, matches, names, outlines, reproduces, selects, states.</td>
<td>Converts, defends, distinguishes, estimates, explains, extends, generalises, gives examples, infers, paraphrases, predicts, rewrites, summarises.</td>
<td>Changes, computes, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.</td>
<td>Breaks down, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, points out, relates, selects, separates, subdivides</td>
</tr>
<tr>
<td>Eg.</td>
<td>Eg.</td>
<td>E.g.:</td>
<td>e.g.:</td>
</tr>
<tr>
<td>List the six levels in the cognitive domain of Bloom’s taxonomy.</td>
<td>State the main principles of Theory X.</td>
<td>Construct measurable learning outcomes that include lower and higher order cognitive skills for a one-semester course.</td>
<td>Analyse authentic data from various sources and prepare...</td>
</tr>
</tbody>
</table>
Outcome Based Education

Bloom’s Taxonomy

**Level 5 – Synthesis**

The ability to put parts together to form a new whole. This may involve the production of a unique communication (theme or speech), a plan of operations (research proposal), or a set of abstract relations (scheme for classifying information). Learning outcomes in this area stress creative behaviours, with major emphasis on the formulation of new patterns or structures.

Categorises, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organises, plans, rearranges, resolves, rewrites, summarises, tells, writes.

*e.g.*: Analyse authentic data from various sources and prepare a recommendation report for a specified audience.

**Level 6 – Evaluation**

The ability to judge the value of material. The judgements are to be based on definite criteria. These may be internal criteria (organisational) or external criteria (relevance to the purpose) and the student may determine the criteria or be given them. Learning outcomes in this area are highest in the cognitive hierarchy because they contain elements of all the other categories, plus conscious value judgements based on clearly defined criteria.

Appraises, compares, concludes, contrasts, criticises, describes, discriminates, explains, justifies, interprets, relates, summarises, supports.

*e.g.*: Evaluate the strengths and weaknesses of the cognitive domain of Bloom’s taxonomy in relation to the National Educational Philosophy.

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**Psychomotor Domain**

(doing, skills)

**Lower order**

**Guided Response**

- Definition: (or manually, emotionally, and physically ready to do)

- Sample Verbs: detect, hear, react, observe, discover, recognize, examine, search, sense, respond, detect, test, test, assess, watch

**Complete Overt Response**

- Definition: Performed automatically.

- Sample Verbs: adapt, generalize, apply, implement, change

**Psychomotor Domain includes physical movement, coordination & use of the motor skill areas**

**Higher order**

**Adaptation**

- Definition: Creates new patterns for specific situations.

- Sample Verbs: designs, originates, conceives, composes, constructs

**Organization**

- Definition: Creates new patterns for specific situations.

- Sample Verbs: designs, originates, conceives, composes, constructs

Based on “Taxonomy of Educational Objectives.” B.S. Bloom Ed. 1956
**Affective Domain**

*(feeling, attitudes)*

<table>
<thead>
<tr>
<th>Higher Order</th>
<th>Lower Order</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receiving</strong></td>
<td><strong>Responding</strong></td>
</tr>
</tbody>
</table>

**Definition:**
- Selectively attends to stimuli.

**Sample Verbs:**
- accept
- detect
- respond
- recall
- evaluate
- relate

<table>
<thead>
<tr>
<th><strong>Valuing</strong></th>
<th><strong>Affecting</strong></th>
</tr>
</thead>
</table>

**Definition:**
- Attaches value or worth to something.

**Sample Verbs:**
- adapt
- adjust
- change
- cope

**Organization**

<table>
<thead>
<tr>
<th>Definition</th>
<th>Sample Verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitively integrates the valued and realized knowledge and behavior.</td>
<td>adapt, adjust, change, cope</td>
</tr>
</tbody>
</table>

**Internalizing**

<table>
<thead>
<tr>
<th>Definition</th>
<th>Sample Verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrates the value into a value system that controls behavior.</td>
<td>accept, detect, relate, evaluate, respond</td>
</tr>
</tbody>
</table>

Based on "Taxonomy of Educational Objectives", B.S. Bloom Editor, 1956.

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**Selecting Appropriate courses to Fulfil the Program Outcomes**

**Guided by the Program Outcomes & The MQF Science Standards & the MQF Level Descriptors & Academic Load**

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MQF Framework for Diploma level-Outcomes

Diploma level education balances theory and practice or practical, and stresses on the installation of values, ethics and attitudes to enable students to:

(i) use knowledge, comprehension and practical skills at work;
(ii) assess and decide, taking into account social, scientific and ethical issues with moderate autonomy;
(iii) be confident and entrepreneurial in pursuing their own careers;
(iv) be responsible members of society;
(v) possess study skills in adapting to ideas, processes and new procedures for career development;
(vi) acquire team and interpersonal skills that are appropriate to employment; and
(vii) communicate effectively and to transmit information, ideas, problems and resolutions cogently to experts and non-experts.

Creating a course to achieve specified outcomes requires effort in three domains:

✓ planning (identifying course content and defining measurable learning outcomes for it)
✓ Instruction (selecting and implementing the methods that will be used to deliver the specified content and facilitate student achievement of the outcomes)
✓ assessment and evaluation (selecting and implementing the methods that will be used to determine whether and how well the outcomes have been achieved and interpreting the results)
3 domains of educational goals (cognitive, psychomotor and affective)

Taxonomy level

Planning stage

Implementation stage

Assessment stage

Learning Outcomes

Students

Instruction

Assessment

Instructional technology
Lectures
Labs
Active & cooperative learning
Problem-based learning
Other techniques

Program outcomes
Instructor’s goals

What does the course want my students to be able to do as a result of my teaching?

Can my students do what the course wants them to be able to do?

Determine Credit Hours for a course: SLT & Notional

Credit and Academic Load

19. Credit is the quantitative measure that represents the volume of learning or academic load to attain the set learning outcomes.¹

20. Academic load is a quantitative measure of all learning activities required to achieve a defined set of learning outcomes. These activities include lecture, tutorial, seminar, practical, self-study, retrieval of information, research, fieldwork, as well as preparing for and sitting of an examination. In Malaysia, 40 hours of notional student learning time is valued as one credit.²

More breadth than depth More Practical Skills & Generic Skills

Must Map Courses with POs & Designate the Outcome Indicators

MQF

SLT

OI

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Credit system based on Student Learning Time (SLT)

SLT - The number of learning hours spent by student for each learning activities need to be identified i.e. learning load – basis of determining the credit for a course

Credit is the quantitative measure that represents the learning load in order to attain the set of outcomes.

1 credit = 40 hrs of Student Learning Time

- Standard Lecture
- New approach