เอกสารประกอบการบรรยายโครงการอบรมเชิงปฏิบัติการ
ระบบการประกันคุณภาพการศึกษาระดับหลักสูตร
ตามเกณฑ์ AUN QA ครั้งที่ 2

ระหว่างวันที่ 22 - 23 เมษายน 2559 เวลา 09.00 - 17.00 น.

ณ ห้องกมลทิพย์ 1 - 2 ชั้น 2

โรงแรมเดอะสุโกศล

Developing and Writing

AUN-QA SAR

Developing and Writing AUN-QA SAR

Chavalit Wongse-ek, AUN Council Member and Expert
Veeradeth Panvisavas, Mahidol University
Thasaneeya R Nopparatjamjomras, Mahidol University

Learning Outcomes

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- Formulate and Write properly the statement of Programme (expected) learning outcomes (PLOs)
- Translate PLOs to programme structure and content
- Apply constructive alignment to curriculum design
- Develop properly teaching-learning activities and assessment methods co-ordinated with Course Learning Outcomes (CLOs)
- Develop and Write AUN-QA SAR
- Q&A

April 22, 2016

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08.30	Outcome Based Education and AUN-QA Criteria
10.00	workshop *Formulating Program Learning Outcomes*
13.00	workshop Backward Curriculum Design
16.00	AAR share and learn

April 23, 2016

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08.30	BAR share and learn
09.00	Group Presentation and Discussion (15 min each)
13.00	Workshop: SAR Development
16.00	AAR and Homework

Workshop: April 22, 2016

5

E1: Understand Programme Learning Outcomes from the example
E2: Formulating Programme Learning Outcomes
E3: Categorise the Programme Learning Outcomes
E4: Align Stakeholders' Requirements to the PLOs
E5: Construct a curriculum mapping
E6: Design course structure
E7: Formulating course learning outcomes (CLOs)
E8: Constructive alignment at course level
E9: Develop Course Specification and Programme Specification

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Outcome Based Education and AUN-QA Criteria

What is outcome-based education?

7

Outcome-based education (OBE)

is a **learner-centered** learning philosophy that focuses on measuring **students' performance** (the intended learning outcomes). OBE itself is **not a teaching style** or method, it is a principle for **designing your teaching** in an effective way that enables learning happen and **helps students to achieve the intended learning outcomes.** Therefore, what matters most in OBE is "**what is learnt**" rather than "**what is taught**".

http://celt.ust.hk/learner-centered-course-design

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OBE Model

8

"Product (ELOs) defines process (SCL)"

Harden RM, et.al. Med Teacher 21(1): 7–14, 1999

Expected Learning Outcomes (ELOs) is what the student should be able to know, understand and to do at the end of the programme.

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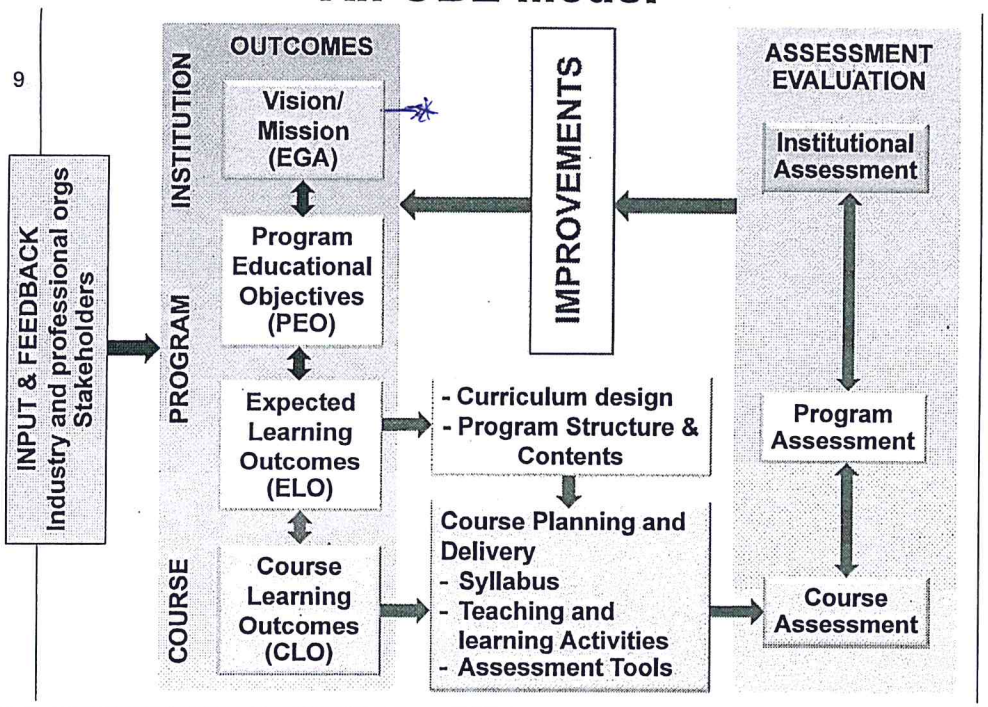
An OBE Model

9



Key Concepts and Principles of OBE

10

- **Focus on results of learning** (ELOs)
- **Backwards curriculum design** - design down (from the performances expected of graduates) and deliver up.
- **Create learning opportunities** to help different learners achieve learning outcomes
- **Constructive alignment** (assessment – learning activities – learning outcomes)

OBE: Constructive Alignment

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Expected Learning Outcomes

Statement on what students should know, understand and can do upon completion of a period of study.

Student-Centered Learning

Learning Activities

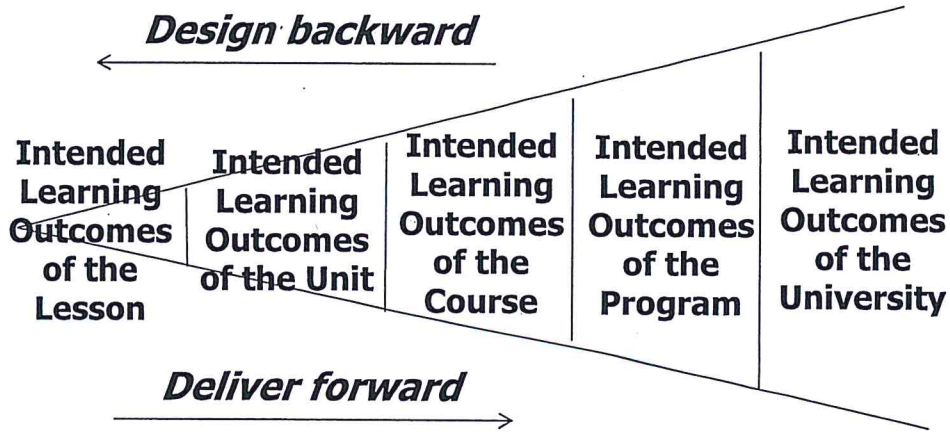
The teaching and learning methods which the teachers use to achieve each of the Learning Outcomes. Students will know exactly why they are being asked to engage in certain teaching and learning activities in their courses.

Assessments

An on-going process aims improving students' learning by measuring the learning outcomes they have achieved. Feedback will be given so that students know what they need to do in order to get better grades.

Designing and Delivering Learning Outcomes

12

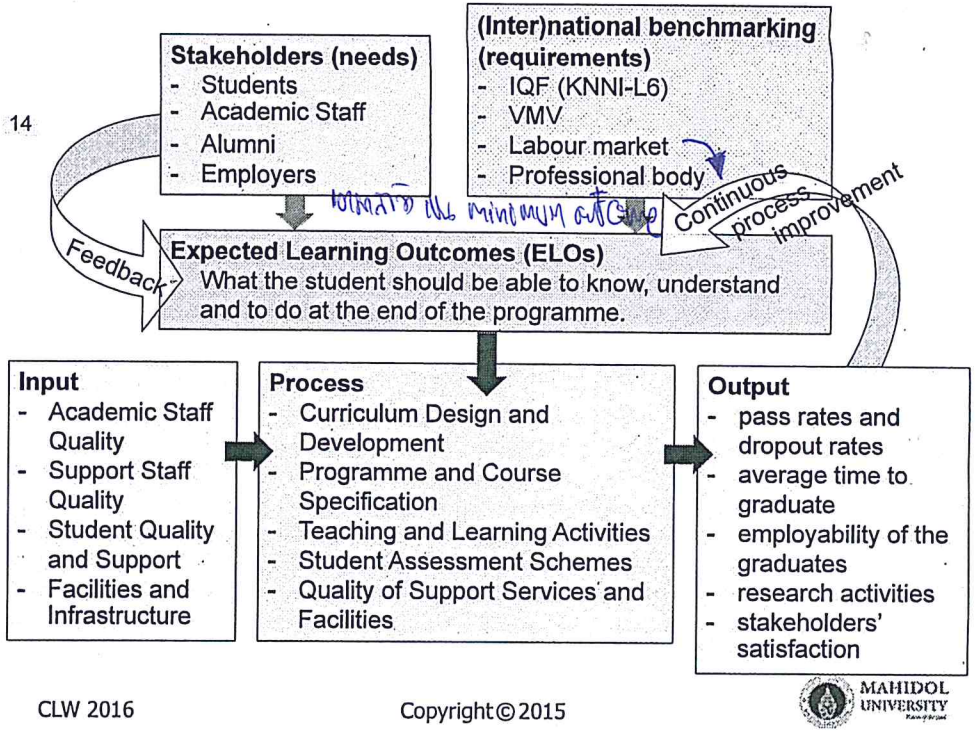


OBE Model Designed Based on ELOs

13

- Learners is the centre of designed model (OBE).
- Programme (Expected) Learning Outcomes (PLOs) should be formulated first in our design.
- Curriculum designed down from the performances expected of graduates and deliver up.
- Assessment task and teaching and learning activities are designed constructively align with the leaning outcomes.

14



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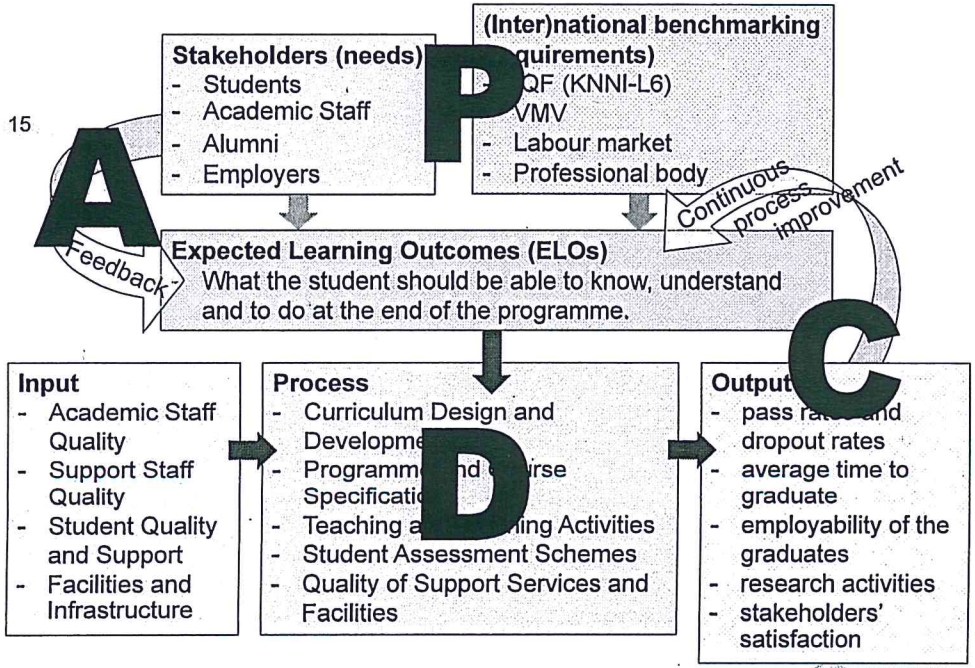


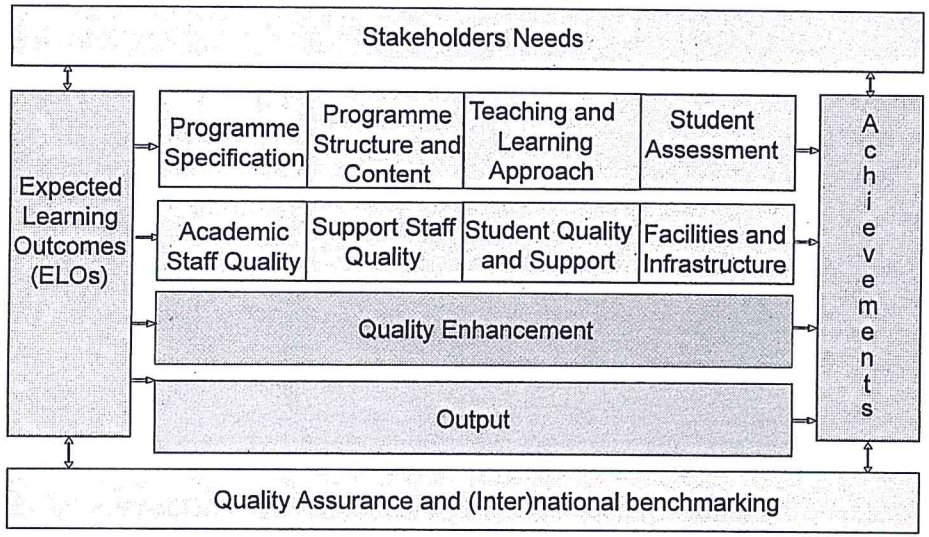
AUN-QA Model at Programme Level

16

- **Design based on OBE Framework**
- **PDCA Approach to Assessment**
- **Principles-based assessment system designed for Improvement to Best practice**

AUN-QA Model at Programme Level (V.3 2015)

17



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Criteria

18

1. Expected Learning Outcomes
2. Programme Specification
3. Programme Structure and Content
4. Teaching and Learning Approach
5. Student Assessment
6. Academic Staff Quality
7. Support Staff Quality
8. Student Quality and Support
9. Facilities and Infrastructure
10. Quality Enhancement
11. Output

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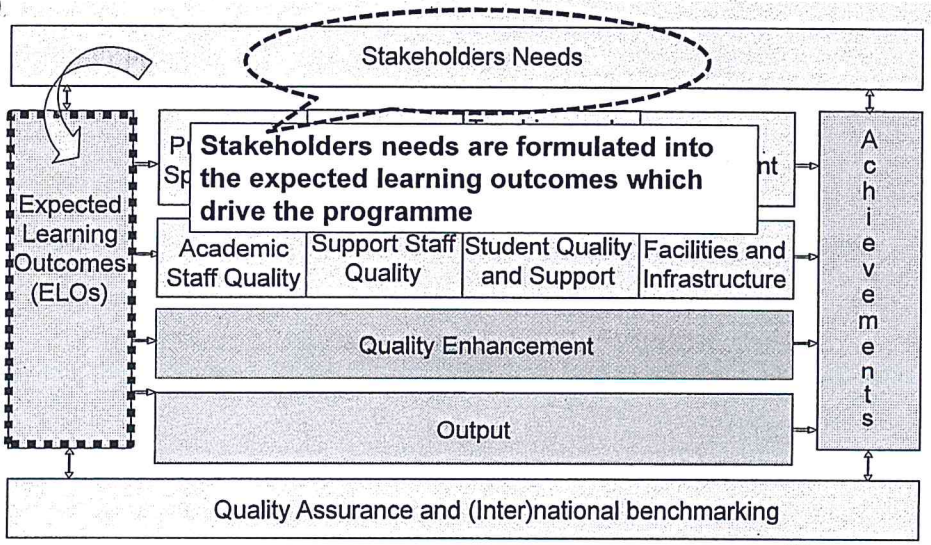
Started with Expected Learning Outcomes

19



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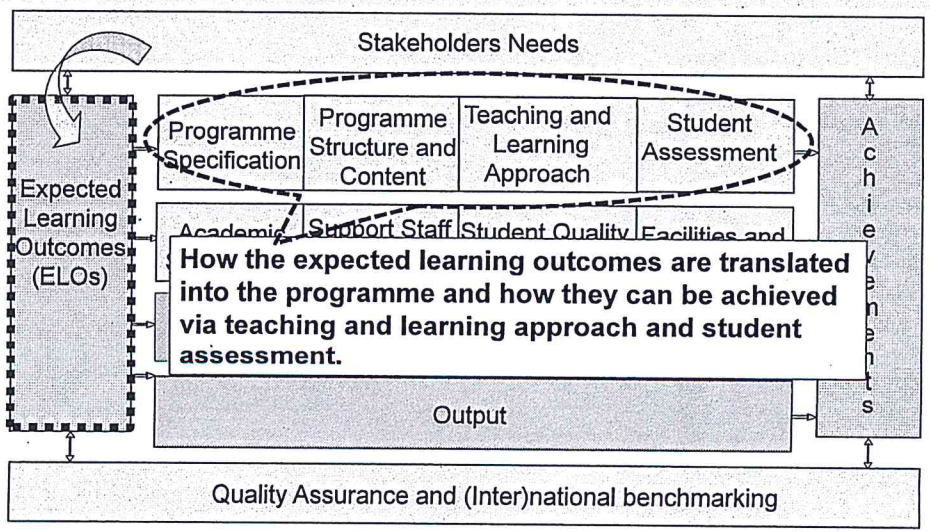

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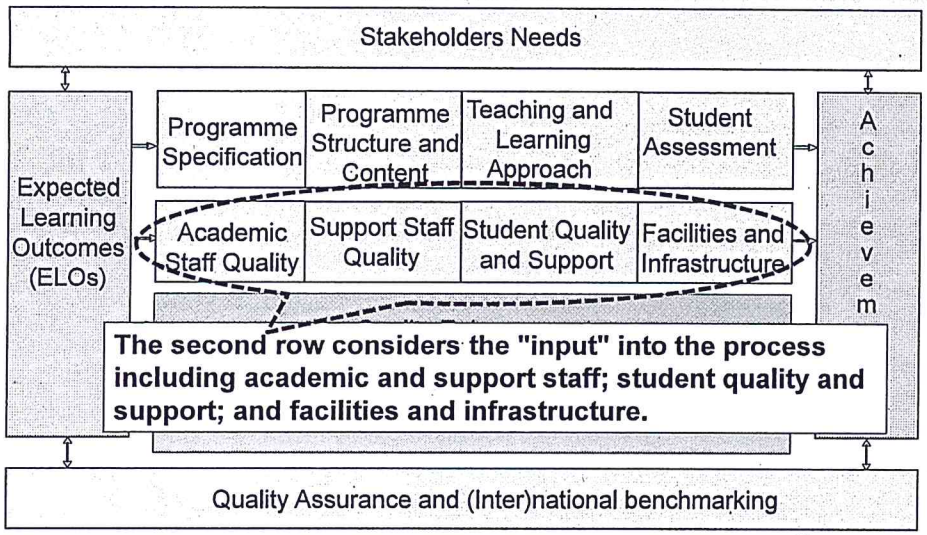

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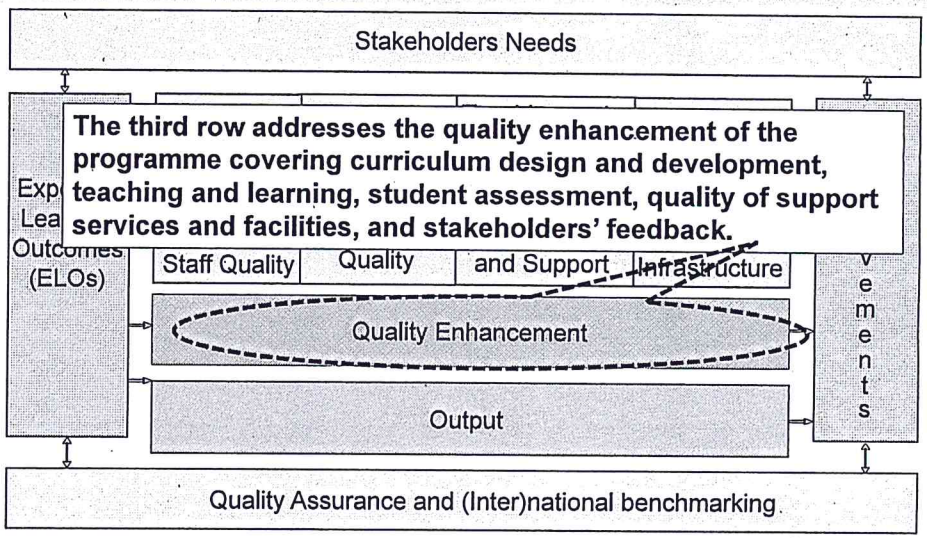

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The fourth row

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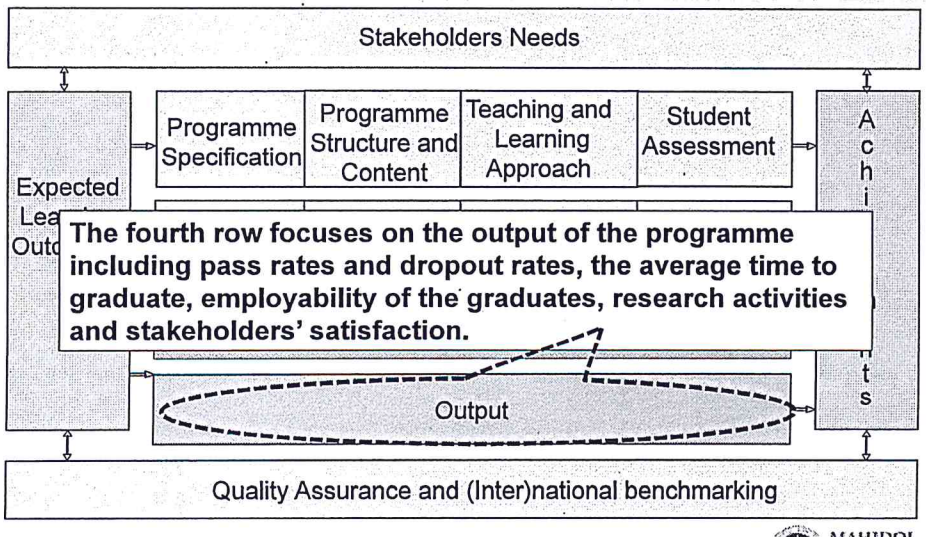

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The final column

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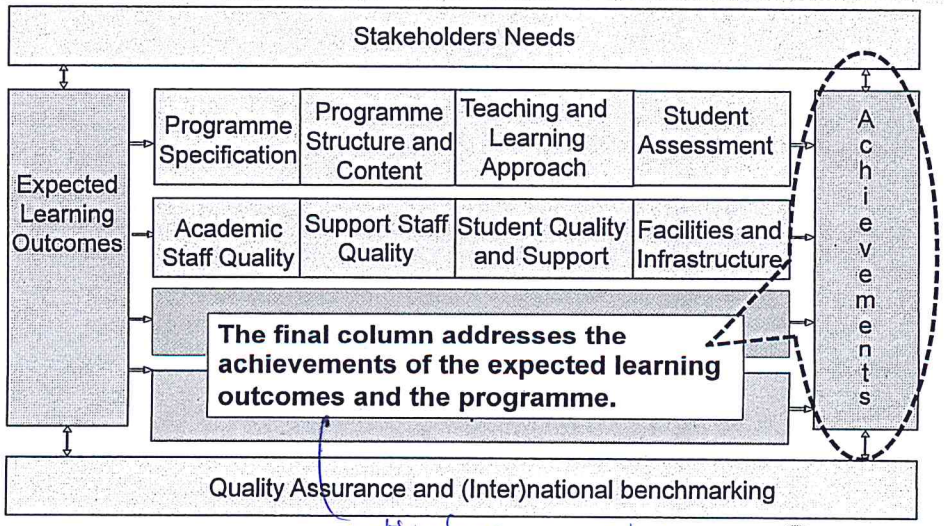

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Relationship of Criteria and Tasks

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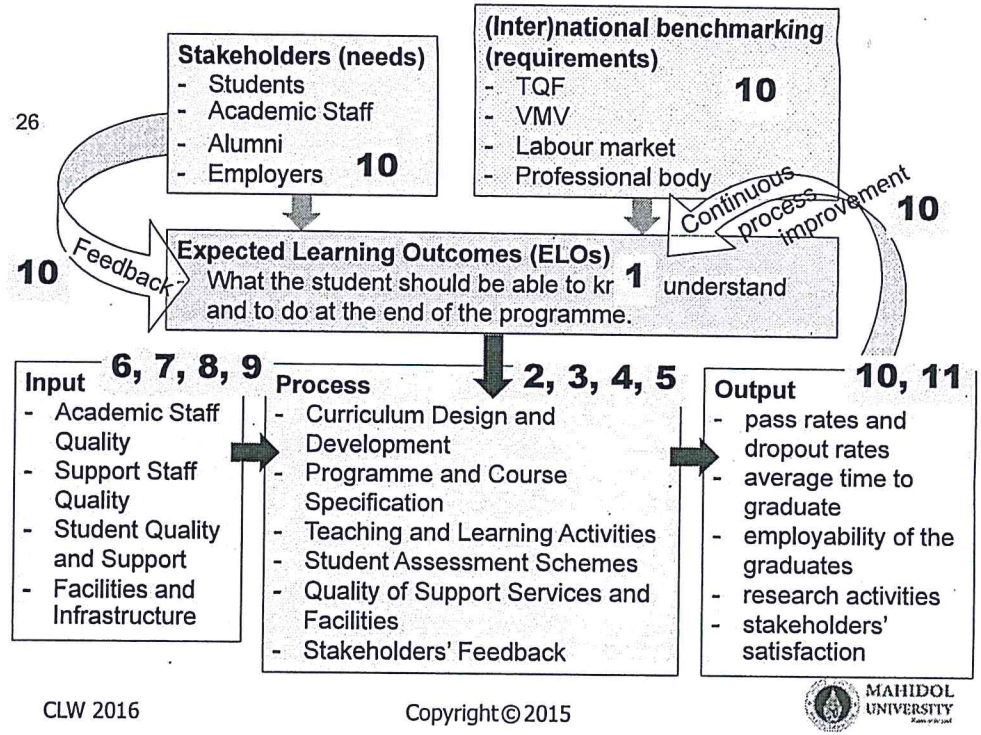
1. Expected Learning Outcomes
2. Programme Specification
3. Programme Structure and Content
4. Teaching and Learning Approach
5. Student Assessment
6. Academic Staff Quality
7. Support Staff Quality
8. Student Quality and Support
9. Facilities and Infrastructure
10. Quality Enhancement
11. Output

Curriculum - 1, 2, 3, 10

Teaching & Learning – 4, 5, 6, 9, 10

Resources – 6, 7, 8, 9, 10

Stakeholders - 8, 10, 11



กรอบมาตรฐานคุณวุฒิระดับอุดมศึกษาแห่งชาติ

(Thailand Qualifications Framework)

Stakeholders

หลักการสำคัญของ TQF

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๑. เป็นเครื่องมือในการนำแนวนโยบายการพัฒนาคุณภาพและมาตรฐาน การจัดการศึกษาตามที่กำหนดใน พ.ร.บ. การศึกษาแห่งชาติฯ ในส่วนที่เกี่ยวกับมาตรฐานการอุดมศึกษาและการประกันคุณภาพการศึกษาสู่การปฏิบัติในสถาบันอุดมศึกษาอย่างเป็นรูปธรรม

๒. มุ่งเน้นที่ผลการเรียนรู้(Learning Outcomes) 5 ด้าน ซึ่งเป็นมาตรฐานขั้นต่ำเชิงคุณภาพเพื่อประกันคุณภาพบัณฑิต

๓. มุ่งประมวลกฎเกณฑ์และประกาศต่างๆ ที่เกี่ยวกับเรื่องหลักสูตรและการจัดการเรียนการสอนเข้าไว้ด้วยกันและเชื่อมโยงให้เป็นเรื่องเดียวกัน

๔. เป็นเครื่องมือการสื่อสารที่มีประสิทธิภาพในการสร้างความเข้าใจและความมั่นใจในกลุ่มผู้ที่เกี่ยวข้อง/มีส่วนได้ส่วนเสีย เช่น นักศึกษา ผู้ปกครอง ผู้ประกอบการ ชุมชน สังคมและสถาบันอื่นๆ ทั้งในและต่างประเทศเกี่ยวกับคุณลักษณะของบัณฑิตที่คาดว่าจะพึงมี

๕. **มุ่งให้คุณวุฒิหรือปริญญาของสถาบันใดๆ ของประเทศไทย เป็นที่ยอมรับและเทียบเคียงกันได้กับสถาบันอุดมศึกษาที่ดีทั้งในและต่างประเทศ** โดยเปิดโอกาสให้สถาบันอุดมศึกษาสามารถจัดหลักสูตรตลอดจนกระบวนการเรียนการสอนได้อย่างหลากหลาย โดยมั่นใจถึงคุณภาพของบัณฑิตซึ่งจะมีมาตรฐานผลการเรียนรู้ตามที่มุ่งหวัง สามารถประกอบอาชีพได้อย่างมีความสุขและภาคภูมิใจ เป็นที่พึงพอใจของนายจ้าง

๖. **ส่งเสริมการเรียนรู้ตลอดชีวิต**

National Qualifications Frameworks-comparability-implementation expereince

30

Malaysian Qualifications Framework	
Thai National Qualifications Framework	Similar features but not identical
Indonesian Qualifications Framework	Objectives
Philippines Qualifications Framework	Scope/sectors
Brunei D National Qualifications Framework	Levels -complexity
Cambodian Qualifications Framework	Learning outcomes-domains
Vietnam National Qualifications Framework	Credits (learner centric)
Singapore (Workforce Skills Competency Framework)	Ownership/responsibility
Laos (in progress)	Generally underpinned by MOE's regulations and quality assurance systems
Myanmar (planning)	Accreditation and comparability of qualifications

National Qualifications Framework

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- NQF means an instrument for the classification of qualifications according to a set of criteria for specified levels of learning achieved, which aims to integrate and coordinate national qualifications subsystems and improve the transparency, access, progression and quality of qualifications in relation to the labour market and civil society.

Official Journal of the European Union, (2008/C 111/01)

Malaysian Qualifications Framework (MQF)

32

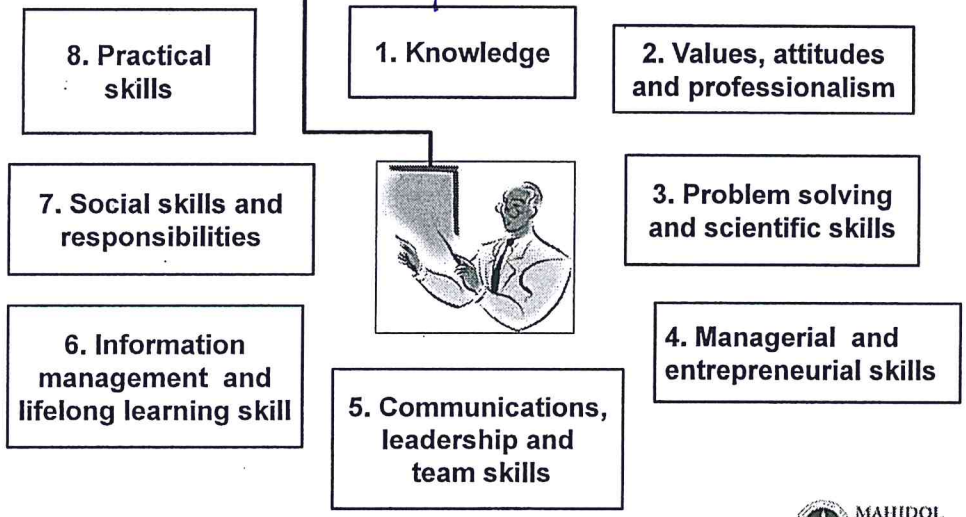
The Malaysian Qualifications Framework (MQF) classifies higher education qualifications based on a set of nationally agreed and internationally benchmarked set of criteria that clarifies the academic levels, learning outcomes and credit system based on student academic load. It integrates all national qualifications and provides pathways that link them systematically.

Supporting Outcomes-Based education.

Learner centred /LLL

Each level – generic learning outcomes descriptors

33 **8 domains**



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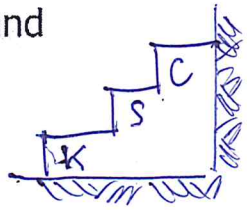
Formulating Programme Learning Outcomes

'learning outcomes'

35

- Learning outcomes means statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence.



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Programme (Expected) learning outcomes

36

- The PLO (ELO) is the starting point of the Programme design and improvement.
- ELO is what the student should be able **to know**, **understand** and **to do** at the end of the programme.
- EOLs should be formulated from the needs of the stakeholders.
- ELOs should be written in a way where learning is translated into observable and measurable results which can be demonstrated and assessed.

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Learning Outcomes (EQF 2008)

37

- Learning outcomes means statements of what a learner **knows**, **understands** and is **able to do** on completion of a learning process, which are **defined in terms of knowledge, skills and competence**.

38

- **Knowledge** means the body of facts, principles, theories and practices that is related to a field of work or study.
- **Skills** means the ability to apply knowledge and use know-how to complete tasks and solve problems. Skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

39

- **Competence** means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.

Categories of Learning Outcomes

40

- **Specific outcomes:**
  The outcomes that relate to the subject discipline and the knowledge, skills and/or competences particular to it;
- **Generic outcomes (sometimes called transferable skills)**
  The outcomes that relate to any and all disciplines e.g. written, oral, problem-solving, information technology, and team working skills, etc.

Generic learning outcomes

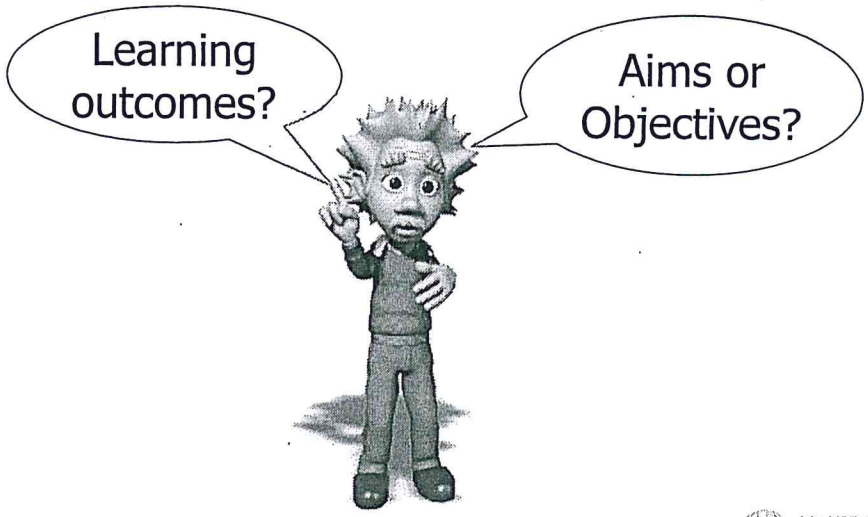
41

Generic learning outcomes are the transferrable, non discipline specific skills a graduate may achieve through learning that have application in study, work and life contexts. The four broad categories of generic learning outcomes recognised in the AQF are:

- **fundamental skills**, such as literacy and numeracy appropriate to the level and qualification type
- **people skills**, such as working with others and communication skills
- **thinking skills**, such as learning to learn, decision making and problem solving
- **personal skills**, such as self direction and acting with integrity.

Aims (Goals), Objectives and LOs

42



Aims (Goals), Objectives and LOs

43

Aims (Goals) or objectives are more concerned with teaching, the teacher's intentions and the management of learning.

Learning outcomes are concerned with the achievements or results of the learner rather than the intentions of the teacher.

Translate Aims and Objectives to PLO

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- **Aim** "To implement the undergraduate education to master the concepts of modern biology".
- **Objectives** "To empower community through the application of modern biological innovations"
- **Learning outcome** "Students should be able to **apply** the modern biological innovations underpinning the use of molecular biology to community.

Easy Syntax..... PLO Statement

45

Upon completion of this **programme**, the student will be able to:

- Action verb (Bloom's Taxonomy) + Objects + Modification (T&L / Assessment)

Example

- Apply + Modern Biology + especially related to molecular biology and nano-biology
- Relate + modern biology + concept to conserve the biodiversity

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Bloom's Taxonomy

46

BLOOM'S TAXONOMY provides verbs that are useful for articulating student learning outcomes in each of the three domains.

Benjamin Bloom
(1913 – 1999)

- **Cognitive:** Mental Skills (Knowledge)
- **Affective:** Growth in Feelings or Emotional Areas (Attitude)
- **Psychomotor:** Manual or Physical Skills (Skills)

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Bloom's Taxonomy (Cognitive)

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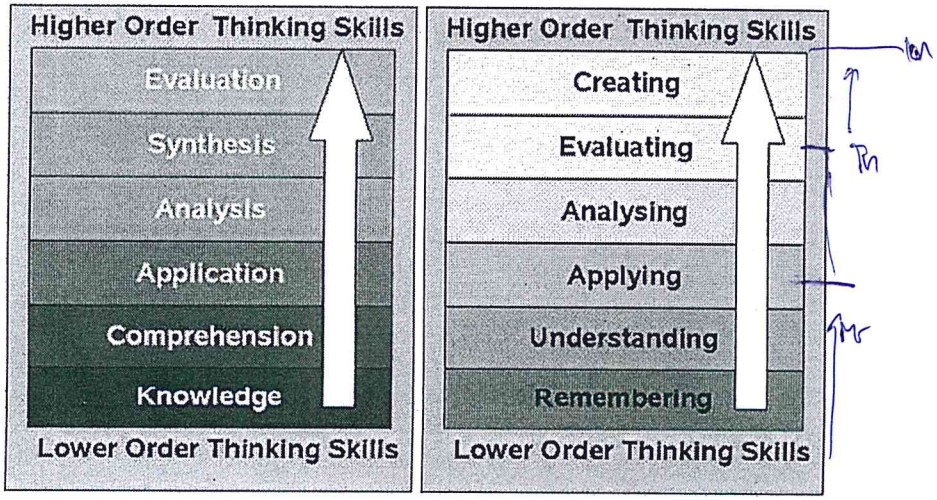

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Cognitive: Mental Skills (Knowledge)

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Remembering: Choose, Describe, Define, Identify, Label, List, Locate, Match, Memorize, Name, Recite, Select, State, Count, Draw, Outline, Point.
Understanding: Classify, Defend, Demonstrate, Distinguish, Explain, Express, Extend, Give, Examples, Illustrate, Indicate, Interrelate, Interpret, Judge, Match, Paraphrase, Represent, Restate, Rewrite, Select, Show, Summarize, Tell, Translate, Associate, Compute, Convert, Discuss, Estimate
Applying: Apply, Choose, Dramatize, Explain, Generalize, Judge, Organize, Prepare, Produce, Select, Show, Sketch, Solve, Use, Add, Calculate, Change, Classify, Complete, Compute, Discover, Divide, Examine, Graph, Interpolate, Manipulate, Modify, Operate, Subtract
Analyzing: Analyze, Categorize, Classify, Compare, Differentiate, Select, Distinguish, Identify, Point out, Subdivide, Survey, Arrange, Breakdown, Combine, Design, Detect, Diagram, Develop, Discriminate, illustrate, Utilize
Evaluating: Appraise, Judge, Criticize, Defend, Compare, Assess, Conclude, Contrast, Critique, Determine, Grade, Justify, Measure, Rate
Creating: Combine, Construct, Create, Design, Develop, Formulate, Hypothesize, Invent, Make, Originate, Organize, Plan, Produce, Generate, Group, Integrate, Reconstruct, Revise, Rewrite, Transform

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Examples of Remembering/Understanding

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- Recall genetics terminology: homozygous, heterozygous, phenotype, genotype, etc.
- Identify and consider ethical implications of scientific investigations.
- List the criteria to be taken into account when caring for a patient with tuberculosis.
- Differentiate between civil and criminal law.
- Identify participants and goals in the development of electronic commerce.
- Predict the genotype of cells that undergo meiosis and mitosis.
- Classify reactions as exothermic and endothermic.

Examples of Applying/Analyzing

50

- Apply knowledge of infection control in the maintenance of patient care facilities.
- Relate energy changes to bond breaking and formation.
- Modify guidelines in a case study of a small manufacturing firm to enable tighter quality control of production.
- Analyse why society criminalises certain behaviours.
- Compare and contrast the different electronic business models.
- Debate the economic and environmental effects of energy conversion processes.

Examples of Evaluating/Creating

51

- Recognise and formulate problems that are amenable to energy management solutions.
- Propose solutions to complex energy management problems both verbally and in writing.
- Relate the sign of enthalpy changes to exothermic and endothermic reactions.
- Organise a patient radiation protection procedure.
- Predict the effect of change of temperature on the position of equilibrium.

Affective: Feelings or Emotional Areas (Attitude)

52

Receiving phenomena: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses

Responding to phenomena: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes

Valuing: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works

Organization: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes

Internalizing values: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies

Skills

Examples of LOs relevant to the affective domain:

53

- Accept the need for professional ethical standards.
- Display a professional commitment to ethical practice.
- Appreciate the need for confidentiality in the professional client relationship.
- Value a willingness to work independently.
- Appreciate the management challenges associated with high levels of change in the public sector.
- Display a willingness to communicate well with patients.
- Resolve conflicting issues between personal beliefs and ethical considerations.
- Participate in class discussions with colleagues and with teachers.
- Relate well to pupils of all abilities in the classroom.

Psychomotor: Manual or Physical Skills (Skills)

54 **Perception:** chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects
Set: begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers
Guided response: copies, traces, follows, react, reproduce, responds
Mechanism: assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches
Complex overt response: Verbs are the same as Mechanism, but will have adverbs or adjectives that indicate that the performance is quicker, better, more accurate, etc.
Adaptation: adapts, alters, changes, rearranges, reorganizes, revises, varies
Origination: arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates

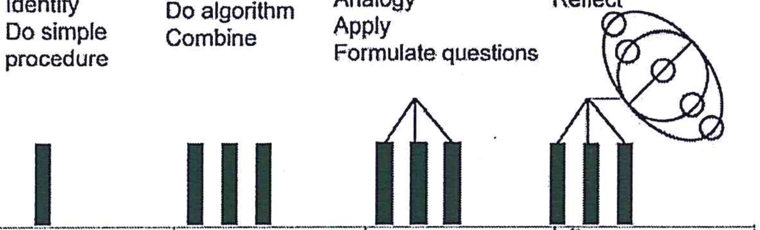
SOLO TAXONOMY
(after Biggs and Collis 1982)

55

Structure of Observed Learning Outcomes

(SOLO)

Define Identify Do simple procedure	Define Describe List Do algorithm Combine	Compare/contrast Explain causes Sequence Classify Analyse Part/whole Relate Analogy Apply Formulate questions	Evaluate Theorise Generalise Predict Create Imagine Hypothesise Reflect



Prestructural	I Unistructural	III Multistructural	Relational	Extended Abstract
Needs assistance	Definition identifies one relevant idea	Definition identifies several relevant ideas	Definition identifies several relevant ideas and links these to the whole	Definition identifies several relevant ideas and links these to the whole. Taken into another context.

Prestructural **Unistructural** **Multistructural** **Relational** **Extended abstract**

AUN 1: Expected Learning Outcomes (3)

56

1	Expected Learning Outcomes
1.1	The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
1.2	The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes. [3]
1.3	The expected learning outcomes clearly reflect the requirements of the stakeholders. [4]

stakeholder

Considerations for Developing PLOs

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- Information need to understand as input:
  1. VMV, ULOs, Accreditation & benchmarking, Professional requirements (target what),
  2. Stakeholders' requirements (feedbacks what),
  3. Understand TQF (translate What)
  4. Understand EQA-AUNQA Criteria (What works?)
  5. Issue/problem/need is identified (issue what, why do?),
- Development Team
- Do the Strategic Plan

Writing of PLOs

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When writing learning outcomes:

- use only action verbs of **the same level of taxonomy** per learning outcome and target specific aspects of expected performance include action verbs
- avoid vague verbs such as **know** and **understand**
- write in terms of what the learner will do, not what the instructor will do
- for PLOs, check that they **fit within the programme aims and/or TQF1&2**
- SMART characteristics

SMART

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SMART helps to check an LO that required characteristics:

- **Specific**: accurately states what the successful student is expected to achieve
- **Measurable**: open to assessment which accurately assesses whether or not the outcome has been achieved
- **Achievable**: should be within the range of abilities of the student
- **Relevant**: should be relatable to the key aims of the programme
- **Time scaled**: must be achievable within the duration of the study-unit/programme

Example

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- **Programme aims** to produce graduates who possess in-depth knowledge and skills for scientific decision making, and are able to construct models and analyse the problems accordingly. The possessed knowledge and skill should also be integrated in the other field areas such as economy, accounting and management.

Programme Learning Outcomes

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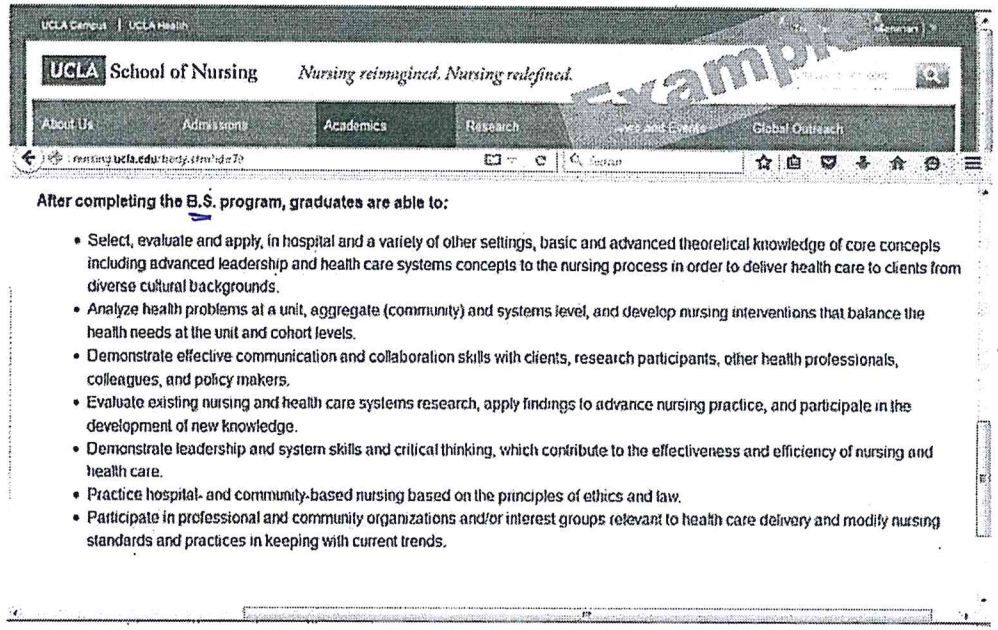
LOD 1	Apply knowledge of mathematics, probability, statistics, operational research/decision science and operation management, as well as information and communication technology (ICT).
LOD 2	Design, model and solve real world and hypothetical problems, and thus able to analyse and interpret data using contemporary computer tools.
LOD 3	Use quantitative techniques, modelling skills and contemporary decision science tools for industries, public institution and society.
LOD 4	Communicate effectively orally, graphically and in writing, and function in culturally diverse, gender-diverse and multi-disciplinary teams.
LOD 5	Integrate and synthesize organisational issues, and evaluate potential solutions in the broader context of the organisation or society.
LOD 6	Participate in lifelong learning, career advancement activities, and keep up-to-date with knowledge of emerging technologies.
LOD 7	Commercialise tangible and intangible decision making products, in the form of written, oral and electronic media.
LOD 8	Carry out professional and ethical responsibility.
LOD 9	Portray leadership and accountability, and exercising management and decision making skills.



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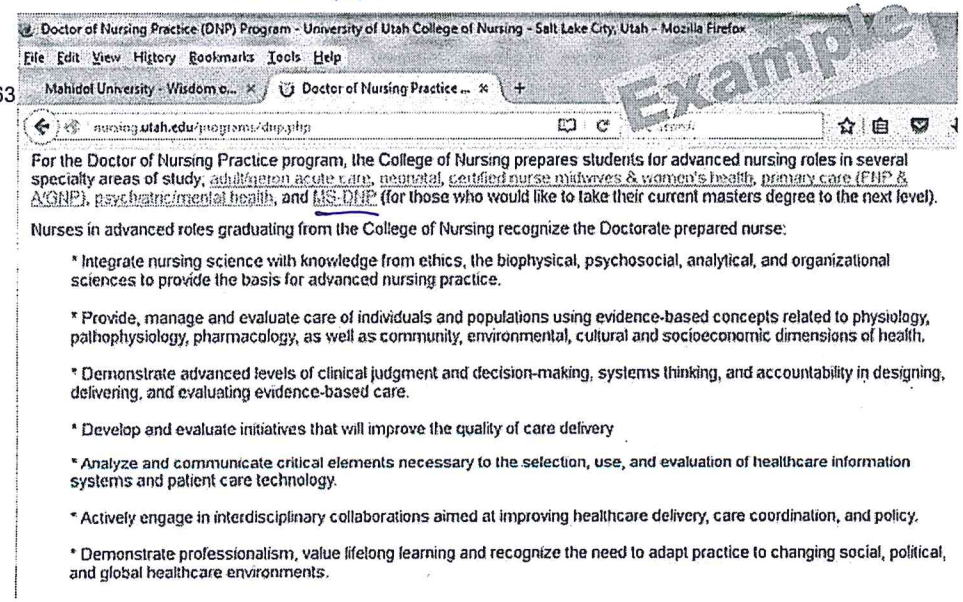

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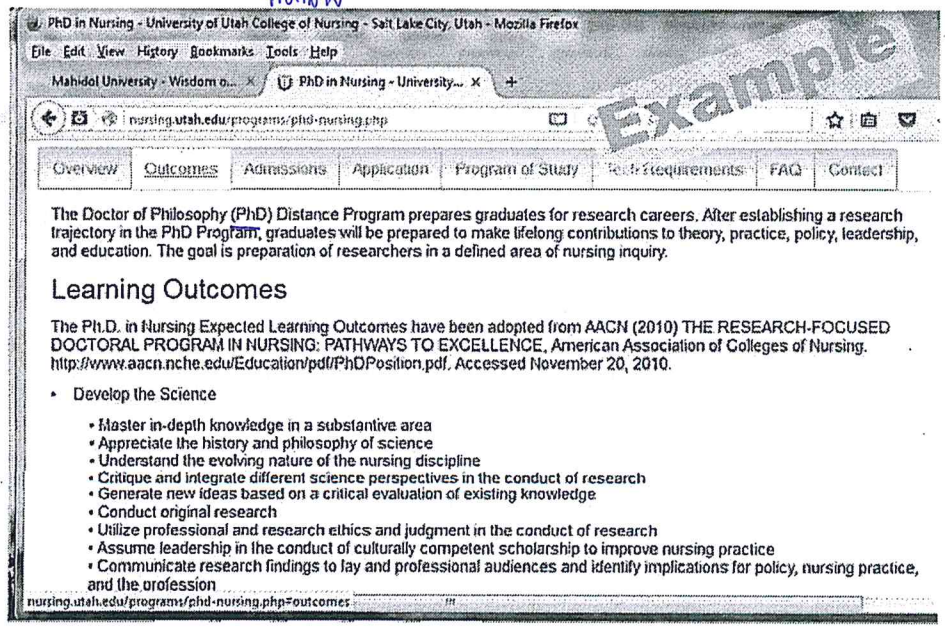

Master of Nursing Science

http://mdhs-study.unimelb.edu.au/degrees/master-of-nursing-science/overview

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- Meet the competencies identified by the Australian Nursing and Midwifery Council as necessary for practice as a registered nurse;
- Demonstrate a well developed understanding of health from global, population, community, family and individual perspectives;
- Integrate knowledge from a range of disciplines that contribute to health and disease management in the provision of nursing to people experiencing alterations in their health;
- Perform nursing assessment and intervention within legal and ethical parameters and demonstrating accountability for their own practice;
- Work effectively as a member of the multidisciplinary team;

Master of Nursing Science

http://mdhs-study.unimelb.edu.au/degrees/master-of-nursing-science/overview

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- Demonstrate the ability to critically appraise research evidence relevant to common health problems and to translate this evidence into the development of nursing interventions to improve patient outcomes;
- Dmonstrate an understanding of the Australian health care system in terms of policy and the organizational context of health service delivery;
- Practice effectively in health promotion and health education roles;
- Demonstrate the ability to identify knowledge gaps in the delivery of nursing care and to utilize research skills to address current gaps in practice in collaboration with researchers in nursing and allied disciplines

WFME: Basic (Undergraduate) Medical Education (BME)

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1.3 EDUCATIONAL OUTCOMES

http://wfme.org/standards/bme/78-new-version-2012-quality-improvement-in-basic-medical-education-english/file

Basic standards:
The medical school must

- define the intended educational outcomes that students should exhibit upon graduation in relation to
  - their achievements at a basic level regarding knowledge, skills, and attitudes. (B 1.3.1)
  - appropriate foundation for future career in any branch of medicine. (B 1.3.2)
  - their future roles in the health sector. (B 1.3.3)
  - their subsequent postgraduate training. (B 1.3.4)
  - their commitment to and skills in life-long learning. (B 1.3.5)
  - the health needs of the community, the needs of the health care delivery system and other aspects of social accountability. (B 1.3.6)
- ensure appropriate student conduct with respect to fellow students, faculty members, other health care personnel, patients and their relatives. (B 1.3.7)
- make the intended educational outcomes publicly known. (B 1.3.8)

Learning Outcomes of Masters Degree specified in AQF

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AQF level 9 criteria	
Summary	Graduates at this level will have specialised knowledge and skills for research, and/or professional practice and/or further learning
Knowledge	Graduates at this level will have advanced and integrated understanding of a complex body of knowledge in one or more disciplines or areas of practice
Skills	Graduates at this level will have expert, specialised cognitive and technical skills in a body of knowledge or practice to independently: • analyse critically, reflect on and synthesise complex information, problems, concepts and theories • research and apply established theories to a body of knowledge or practice • interpret and transmit knowledge, skills and ideas to specialist and non-specialist audiences
Application of knowledge and skills	Graduates at this level will apply knowledge and skills to demonstrate autonomy, expert judgement, adaptability and responsibility as a practitioner or learner

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Learning Outcomes of Doctoral Degree specified in AQF

AQF level 10 criteria	
Summary	Graduates at this level will have systematic and critical understanding of a complex field of learning and specialised research skills for the advancement of learning and/or for professional practice
Knowledge	Graduates at this level will have systemic and critical understanding of a substantial and complex body of knowledge at the frontier of a discipline or area of professional practice
Skills	Graduates at this level will have expert, specialised cognitive, technical and research skills in a discipline area to independently and systematically: • engage in critical reflection, synthesis and evaluation • develop, adapt and implement research methodologies to extend and redefine existing knowledge or professional practice • disseminate and promote new insights to peers and the community • generate original knowledge and understanding to make a substantial contribution to a discipline or area of professional practice
Application of knowledge and skills	Graduates at this level will apply knowledge and skills to demonstrate autonomy, authoritative judgement, adaptability and responsibility as an expert and leading practitioner or scholar

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ผลการเรียนรู้

๑. คุณธรรมจริยธรรม
- ๑) มีจิตสำนึกและตระหนักในการปฏิบัติตามจรรยาบรรณวิชาชีพ
- ๒) แสดงความซื่อสัตย์สุจริตอย่างสม่ำเสมอ
- ๓) มีวินัยและความรับผิดชอบต่อตนเองและสังคม
- ๔) เคารพกฎระเบียบและข้อบังคับขององค์กรและสังคม
- ๕) เคารพสิทธิและรับฟังความคิดเห็นของผู้อื่น

๒. ความรู้
- ๑) มีความรู้หลักการทฤษฎี
- ๒) มีความรู้ในสาขาวิชาที่เกี่ยวข้อง
- ๓) รู้กฎระเบียบ ข้อกำหนดทางวิชาการและเปลี่ยนแปลง

๓. ทักษะทางปัญญา
- ๑) สามารถค้นหาข้อเท็จจริง ทำความเข้าใจประเมินข้อมูลจากหลักฐานใหม่ แล้วนำข้อสรุปมาใช้
- ๒) สามารถศึกษาวิเคราะห์ปัญหาที่ซับซ้อนและเสนอแนวทางแก้ไขที่สร้างสรรค์
- ๓) สามารถใช้ทักษะและความเข้าใจในบริบททางวิชาการและวิชาชีพ
- ๔) มีทักษะภาคปฏิบัติ ตามที่ได้รับการฝึกฝน

๔. ทักษะความสัมพันธ์ระหว่างบุคคลและความรับผิดชอบ
- ๑) มีความรับผิดชอบในงานที่ได้รับมอบหมาย ทั้งงานรายบุคคลและงานกลุ่ม
- ๒) สามารถปรับตัวเข้าทำงานร่วมกับผู้อื่นทั้งในฐานะผู้นำและสมาชิกกลุ่ม
- ๓) วางตัวและแสดงความคิดเห็นได้เหมาะสมกับบทบาท หน้าที่และความรับผิดชอบ
- ๔) สามารถวางแผนและรับผิดชอบในการเรียนรู้และพัฒนาตนเองและวิชาชีพ

๕. ทักษะการวิเคราะห์เชิงตัวเลข การสื่อสาร และการใช้เทคโนโลยีสารสนเทศ
- ๑) สามารถระบุและใช้เทคนิคทางสถิติ และคณิตศาสตร์
- ๒) สามารถสรุปประเด็น และสื่อสาร ทั้งการพูด และการเขียน และเลือกใช้รูปแบบการนำเสนอ
- ๓) สามารถระบุเข้าถึงและคัดเลือกแหล่งข้อมูล
- ๔) มีวิจารณญาณในการใช้เทคโนโลยีสารสนเทศ และใช้อย่างสม่ำเสมอในการรวบรวมข้อมูล แปลความหมาย และสื่อสารข้อมูล และแนวความคิด
- ๕) สามารถใช้คอมพิวเตอร์จัดการเก็บข้อมูล
- ๖) สามารถใช้เทคโนโลยีสารสนเทศในการติดตามความก้าวหน้า
- ๗) สามารถใช้ภาษาไทยอย่างถูกต้องและภาษาอังกฤษใช้งานได้อย่างเหมาะสม

ที่มา : แบบ มคอ.๒ รายละเอียดหลักสูตร.......... พ.ศ.๒๕๕๓

Example of ELOs

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- **Describe** in detail the structure and function of musculoskeletal, cardio-respiratory, nervous and other associated systems, and describe how these respond and interact during exercise and training.
- **Demonstrate** advanced experiential knowledge and **handling skills**, in clinical examination of the musculoskeletal and nervous system.
- **Demonstrate** advanced experiential knowledge in laboratory and field based exercise testing in athletic and non-athletic populations.
- **Demonstrate** an advanced knowledge of the diagnosis, biological basis, treatment and rehabilitation of exercise and sports related injuries, and common illnesses impacting on sports and exercise performance.

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- **Demonstrate** practical experience as a service provider to a collegiate or other sports team in management of acute injuries and emergencies on the field of play and in injury management and rehabilitation during follow up of athletes in the sports medicine clinic.
- **Demonstrate** an advanced knowledge of pre-participation health screening, training program design and monitoring, and the nutritional and psychological strategies required to maximise performance in athletic populations.
- **Demonstrate** a detailed knowledge and critical understanding of selected areas of sports and exercise medicine gained through independent research.
- **Synthesise** and critically **evaluate** published information and present it in written or oral format to both specialist and non-specialist audiences.

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- **Pursue**, under supervision, a sports and exercise related research project.
- **Demonstrate** knowledge of key experimental methodologies used to answer research questions in sports and exercise medicine.
- **Recognise** the value of scientific enquiry and demonstrate an understanding of the ethical responsibility of scientists undertaking research projects on human subjects in sports and exercise medicine.
- **Show** proficiency in searching literature databases and analysis and presentation of data.
- **Instigate**, maintain and appraise their own self-directed learning.
- **Apply** an empirical approach to problem solving.

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ศึกษา

Exercise 1: Understand PLO from the example

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- What is the Programme Discipline?
  MSc in Sports and Exercise Medicine
- Which ELOs are Specific or Transferable Learning Outcomes?
  2 Transferable Los, 12 Specific LOs
- Would you describe the Order of Thinking Skills?
  Low to high Order of Thinking Skills
- How do the SMART?
  You can describe the alignment of Teaching Approach and Assessment Scheme?

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Exercise 2: Formulating Programme Learning Outcomes

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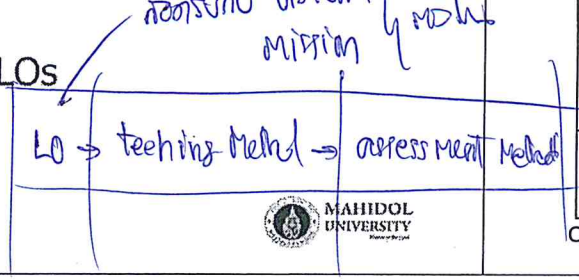
Procedures:

- Formulate your Programme Learning Outcomes (PLO) in related to:
  1. TQF/Programme Objectives (Aims)
  2. VMV-MU, VMV-PH, GA
  3. Key Stakeholders' requirements
  2. Bloom's Taxonomy
- Write the statement of PLOs

Documents: D1-D2



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TQF	AUN-QA Criteria	Documents
มคอ 1 มาตรฐานสาขาวิชา	1, 2	ELOs (+5 TQF Domains)
มคอ 2 หลักสูตร	2, 3	Curriculum mapping, Programme specification, Course specification
มคอ 3-4 ประมวลรายวิชา/ภาคสนาม + แผนการสอน	3, 4, 5	Syllabus, Study plan, T&L activities
มคอ 5-6 ประเมินรายวิชา/ภาคสนาม	5, 10	Course assessment schemes
มคอ 7 ประเมินหลักสูตร	5, 10	Programme assessments, Exit assessments

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Exercise 3: Categorise the Programme Learning Outcomes

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Procedures:

- From the Results of exercise 1 please classify each PLO as Specific or Generic learning outcomes and/or competency
- Identify the level of Bloom's taxonomy for each PLO

Documents: Results from Exercise 1

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Categories of ELOs

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PLO	Statement	Generic LO	Specific LO	Competency
1			A	
2			A	
3			E	
4		R	E	
5			E	E

Blooms' Taxonomy R = Remembering / Understanding
A = Applying / Analyzing
E = Evaluating / Creating

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Exercise 4: Align Stakeholders' Needs or Requirements to the PLOs

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Procedures:

- Aligning the stakeholders' needs or requirements to the formulated PLOs of your programme
- Use the checklist template

Documents:

1. PLOs
2. Checklist template

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Aligning Stakeholders' Needs to Learning Outcomes

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No	LO	TQF	VMV	Alumni	Employer	ect.
1		F	F	M	F	?
2			F	M	F	
3		F	F	F	F	
4		F	F	F	F	
5			F	P	F	
6			F	P		
7		F	F	F		
8		F	F	F	F	?

F – Fully fulfilled
M – Moderately fulfilled
P – Partially fulfilled

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Backward Curriculum Design

ELO → Programme structure and Content

→ Teaching and Learning Approach

→ Assessment Schemes

→ Programme Specification

Sumative LO → 2no.7

AUN 3: Programme Structure and Content (3)

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3	Programme Structure and Content
3.1	The curriculum is designed based on constructive alignment with the expected learning outcomes. [1]
3.2	The contribution made by each course to achieve the expected learning outcomes is clear. [2]
3.3	The curriculum is logically structured, sequenced, integrated and up-to-date. [3,4,5,6]

Constructive Alignment

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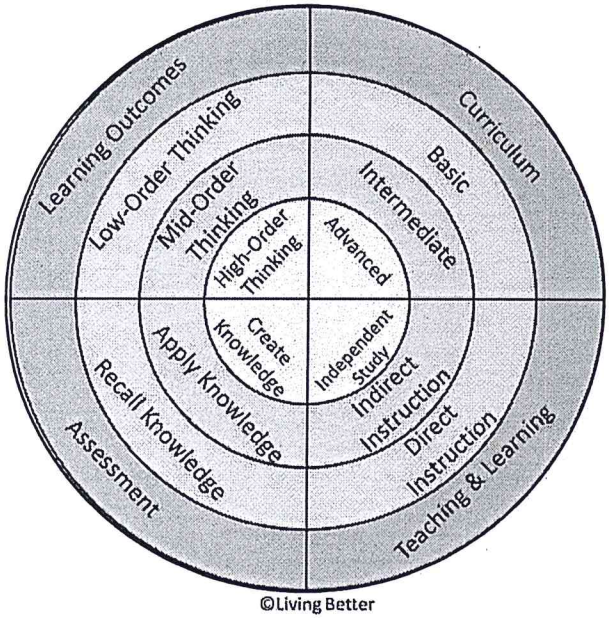
- The **curriculum should be designed** so that the teaching activities, **learning activities** and **assessment tasks** are **co-ordinated with** the **programme learning outcomes**.
- Biggs (2003) refers to this type of process as involving **constructive alignment**.
  - The *constructive* part refers to the type of learning and what the learner does.
  - The *alignment* part refers to what the teacher does).

Constructive Alignment

85



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Four basic elements involved in the constructive alignment of any programme or course

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(Biggs 2003a)

Clearly defining the learning outcomes

Curriculum is designed or pitched to align to the level of the learning outcomes

Selecting appropriate teaching and learning methods that are likely to ensure that the learning outcomes are achieved.

Using the appropriate assessment tools to assessing the student learning outcomes and checking to see how well they match with what was intended.

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Curriculum Mapping: The Process

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- Focused on curriculum and program learning outcomes
- Two-dimensional matrix representing courses on one axis and outcomes on the other
- Identify which courses address which learning outcomes

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Why do curriculum mapping?

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What we are expected to achieve through the mapping:

- Alignment (within a program, between general education and institutional goals, etc.)
- Identifying where and how particular outcomes are expected, explicitly taught for, and assessed (Ewell, 2013)
- Backwards design the curriculum
- Understand the nature and role of course pre-requisites
- **Mapping as a lens – it is a way of seeing organizational structure**

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แผนที่แสดงการกระจายความรับผิดชอบต่อผลการเรียนรู้จากหลักสูตรสู่รายวิชา

• ความรับผิดชอบหลัก　　O ความรับผิดชอบรอง

รายวิชา	1. คุณธรรม จริยธรรม					2. ความรู้				3. ทักษะทางปัญญา				4. ทักษะความสัมพันธ์ระหว่างบุคคลและความรับผิดชอบ				5. ทักษะการวิเคราะห์เชิงตัวเลข สื่อสาร และการใช้เทคโนโลยีสารสนเทศ						
	1	2	3	4	5	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	6	7
1) หมวดวิชาศึกษาทั่วไป																								
- กลุ่มวิชาวิทยาศาสตร์และคณิตศาสตร์																								
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	•	O	O	O	O	O	O
- กลุ่มวิชาสังคมศาสตร์																								
[illegible]	O	O	•	•	O	O	O	O	O	O	O	•	•	O	O	O	O	O	O	O	O	O	•	O
[illegible]	O	O	•	•	•	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
- กลุ่มวิชามนุษยศาสตร์																								
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
[illegible]	O	O	•	O	O	O	O	O	O	O	O	•	O	O	O	O	O	O	O	O	O	O	O	O
- กลุ่มวิชาภาษา																								
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[illegible]	O	O	•	O	O	•	O	O	O	O	•	•	O	O	O	O	O	O	•	O	O	O	O	•

ที่มา : แบบ มคอ.๒ รายละเอียดหลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาวิทยาศาสตร์การอาหาร หลักสูตรปรับปรุง พ.ศ.๒๕๕๓ ม.[illegible]

Curriculum Mapping of Courses and PLOs

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	CODE	NAME OF COURSE	CREDITS	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9
Specialized skills (specialized courses)												
1		Subject 1	3	X			X					
2		Subject 2	3	X			X		X			
3		Subject 3	3	X		X	X			X		
4		Subject 4	3	X			X	X			X	X
5		Subject 5	3	X			X	X			X	
6		Subject 6	3	X			X	X	X		X	
7		Subject 7	3	X							X	
8		Subject 8	3	X	X		X	X	X		X	X

Relationship Between Programme and Course Learning Outcomes

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	CODE	COURSE	CREDITS	LO1	LO2	LO3	LO4	LO5
Specialized skills (specialized courses)								
1		Subject 1	3	R			A	
2		Subject 2	3	R		A		
3		Subject 3	3		R		A	
4		Subject 4	3				E	
5		Subject 5	3	R				E
6		Subject 6	3	A		A		E
Summary				R	R	A	A	E

Bloom's Taxonomy R = Remembering / Understanding
A = Applying / Analyzing
E = Evaluating / Creating

Curriculum matrix, example 1

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Table 1.2 Relationship between Courses and Expected Learning Outcomes (Continued)

No	Code	Course	Credit	Expected Learning Outcome (ELO)						
				ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7
27	CHS220802	Analytical Chemistry Lab.	1	5	5	1	1	1	5	1
28	CHS210801	Mass and Energy Balance	3	3	1	1	1	1	3	1
29	CHS210802	Transport Phenomena	3	5	1	3	5	1	4	1
30	CHS220804	Fluid Mechanics	3	5	1	1	5	1	4	1
31	CHS220805	Material Construction and Corrosion	3	5	1	1	1	4	4	3
32	CHS220806	Thermodynamics	3	5	1	1	1	1	5	5
33	CHS220807	Heat Transfer	3	5	1	1	5	1	5	5
34	CHS220801	Chemical Engineering Mathematics	3	5	1	5	5	1	5	1
35	CHS310802	Mass Transfer	4	5	1	2	5	1	5	1
36	CHS310803	Unit Operation Lab. 1	1	5	5	1	5	1	5	1
37	CHS320803	Unit Operation Lab. 2	2	5	5	1	5	1	5	[illegible]
38	CHS310804	Chemical Reaction Engineering	4	5	1	1	1	1	5	5
39	CHS310806	Process Control	3	5	1	5	1	1	5	1
40	CHS320801	Chemical Process Simulation	3	5	1	5	5	1	5	1
41	CHS320802c	Natural Gas Processing	3	5	1	4	5	1	5	5
42	CHS120801	Communication Skill	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	5
43	CHS310805	Project Management	2	[illegible]	[illegible]	[illegible]	[illegible]	3	5	5
44	CHS320804	Research Methods	2	[illegible]	[illegible]	[illegible]	[illegible]	1	5	1
45	CHS400803	Capita Selecta	2	[illegible]	[illegible]	[illegible]	1	5	4	5
46	CHS410801	Process Equipment Design	4	5	1	5	1	1	5	5
47	CHS410802	Chemical Plant and Product Design	4	[illegible]	[illegible]	5	5	5	5	5
48	CHS300805	Seminar	1	[illegible]	[illegible]	[illegible]	5	4	5	5
49	CHS400801	On the Job Training	2	5	1	5	5	5	5	5
50	CHS400802	Final Project	4	[illegible]	[illegible]	[illegible]	5	4	5	5
51	CHF410801c	Composite Material	3	4	1	1	1	4	5	4
52	CHF410802	Applied Thermodynamics	3	5	1	3	1	3	4	4
53	CHF410803	Dynamic Systems	3	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: The figures in the ELO column relate to:
1 Not directly related to ELO
2 Quite related to ELO
3 Related to ELO
4 Closely related to ELO
5 Specifically related to ELO

Source: Chemical Engineering, Universitas Indonesia

Curriculum matrix, example 2

93

Fourth Year Courses First and Second Semesters	Relationships to Program Outcomes								
	1	2	3	4	5	6	7	8	9
Hospital Dentistry I & II		P	P	D	P		D	D	D
Community Dentistry II		P	P	D	P		D	D	D
Community Dentistry III *(Fieldwork)*		P	P	D	P		D	D	D
Current Trends in Dentistry				D	P	D	D	D	D
Oral Surgery Seminar	D	P	P	D	P	D	D	D	D
Orthodontics-Pediatric Dentistry Seminar I and II	D	P		D	P	D	D	D	D
Prosthodontics Seminars I and II	D	P		D	P	D	D	D	D
Restorative Dentistry Seminars I and II	D	P		D	P	D	D	D	D
Endodontics-Periodontics Seminar	D	P		D	P	D	D	D	D
Clinical Dentistry III & IV	D	P		D	P	D	D	D	D

I (Introduce) Concepts/principles are merely presented.
E (Emphasize) Concepts/ principles are reinforced and initially applied.
P (Practice) Concepts/principles are applied with supervision.
D (Demonstrate) Concepts/principles are applied with minimal supervision.

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Skill Matrix (PhD Research)

94

PhD Requirements	PLO 1 Methods	PLO 2 Communication	PLO 3 Research	PLO 4 Professional performance
Required courses	X			
Qualifying Exam		X	X	
Dissertation	X	X	X	
Seminar requirements		X		X
Final Exam	X	x	x	x

Learning Activities

Research

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Curriculum Mapping

95

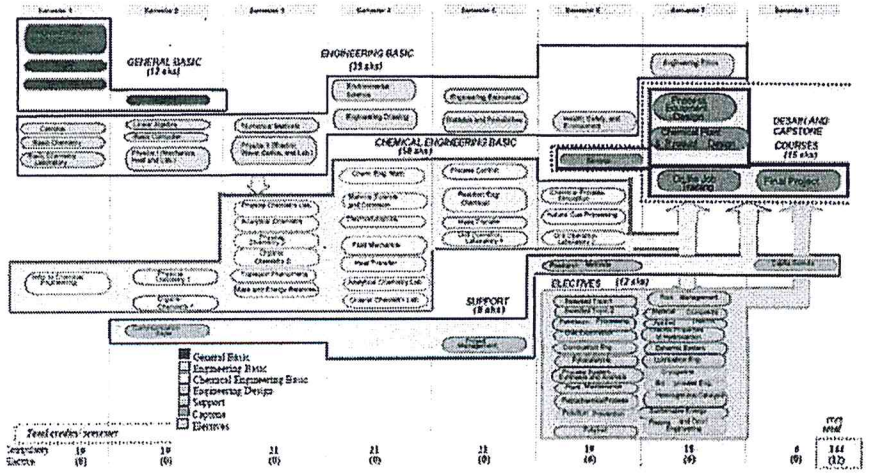

Figure 2.2 Curriculum Structure of ChESP

Source: Chemical Engineering, Universitas Indonesia

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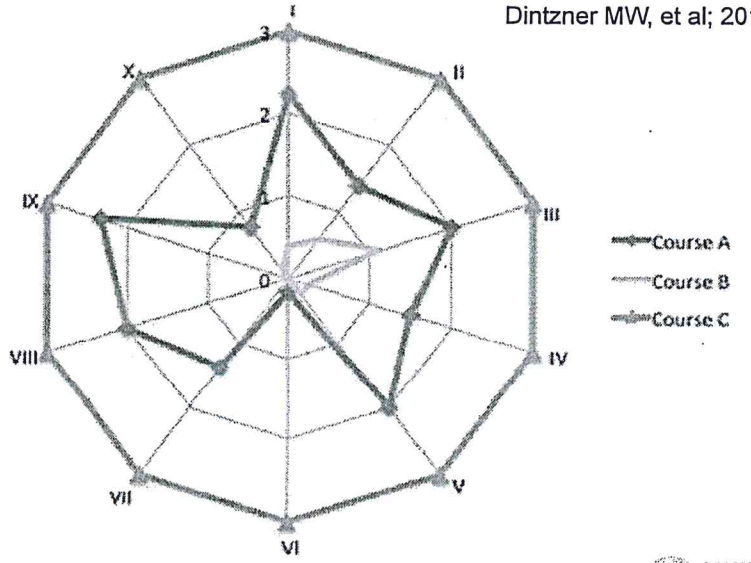
Rader plot of courses A,B, and C mapped to the 10 PLOs

96

Dintzner MW, et al; 2015



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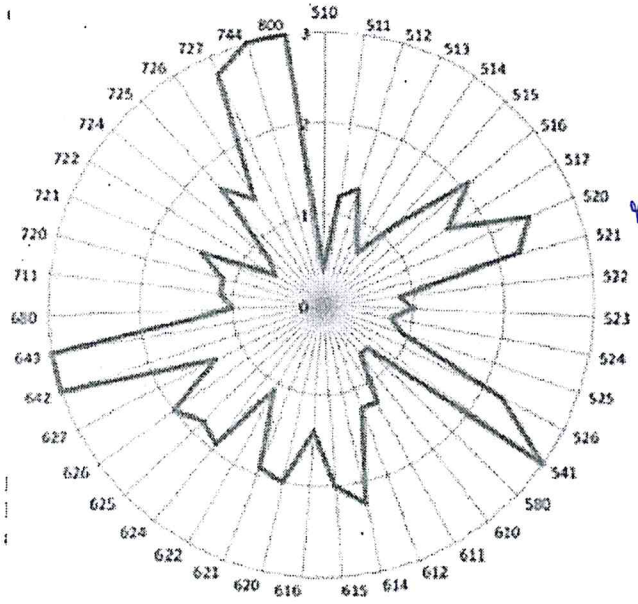
Radar plot of Core PLO 1 mapped to all courses (shown as course numbers around the perimeter of the plot)

97



ทุกภาพรวม กับ 1 PLO.

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Exercise 5: Construct a curriculum mapping

98

Procedures:

- Construct a curriculum mapping of your programme
- Apply Bloom's taxonomy to curriculum mapping for each PLO
- Using mapping template

Documents: (PLOs)

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Curriculum mapping (Template)

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	COURSE	CR	LO1	LO2	LO3	LO4	LO5
Basic courses							
1	Subject 1	3	R			A	
2	Subject 2	3	R		A		
Intermediate courses							
3	Subject 3	3	R	A		A	
4	Subject 4	3	R			A	
Specialized courses							
5	Subject 5	3		A	A	E	E
6	Thesis	18		A	A	E	E

Bloom's Taxonomy R = Remembering / Understanding
A = Applying / Analyzing
E = Evaluating / Creating

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Questions Curriculum Mapping can answer

100

- In the key courses, are all outcomes addressed, in a logical order?
- Do all the key courses address at least one outcome?
- Do multiple offerings of the same course address the same outcomes, at the same levels?
- Do some outcomes get more coverage than others?
- Are all outcomes first introduced and then reinforced?
- Are students expected to show high levels of learning too early?
- Do students get practice on all the outcomes before being assessed, e.g., in the capstone?
- What do the electives, individually and collectively, contribute to the achievement of your student learning outcomes?

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Exercise 6: Design course structure

101

Procedures:

- Using the result from Exercise 5, TQF, study plan and stakeholders requirements to design an Course structure

Documents use:

Curriculum mapping, TQF, study plan

Use Curriculum matrix to Design Course Structure

102

	COURSE	CR	LO1	LO2	LO3	LO4	LO5
Basic courses							
1	Subject 1	3	R			A	
2	Subject 2	3	R		A		
Intermediate courses							
3	Subject 3	3	R	A		A	
4	Subject 4	3	R			A	
Specialized courses							
5	Subject 5	3		A	A	E	E
6	Thesis	18		A	A	E	E

Bloom's Taxonomy R = Remembering / Understanding
A = Applying / Analyzing
E = Evaluating / Creating

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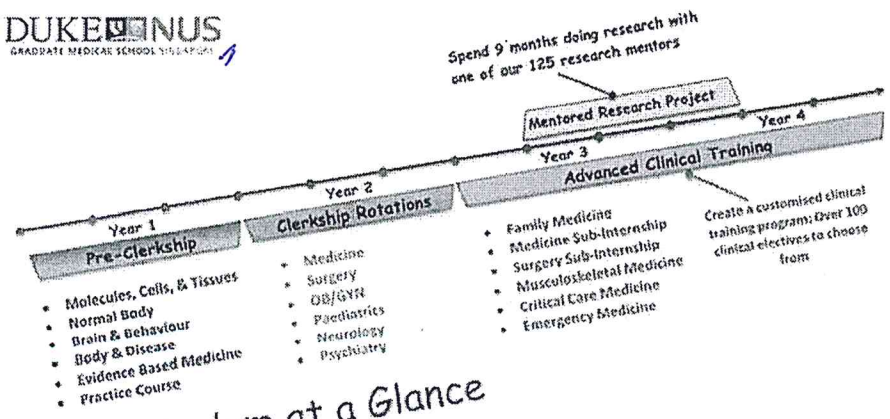
Home » Education

MD Programme

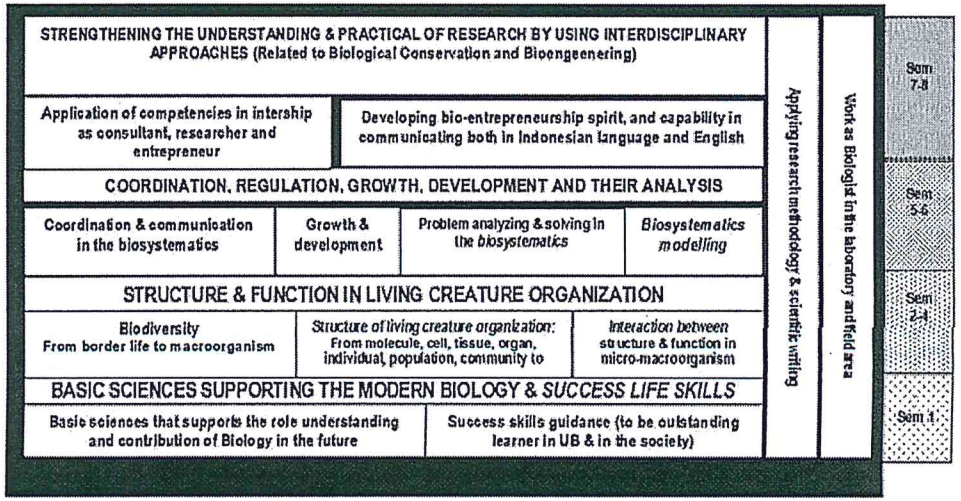
DUKE NUS GRADUATE MEDICAL SCHOOL SINGAPORE



Curriculum at a Glance

104

Curriculum Structure of BSP



Can you find out the answer

105

- How does the sequences and integration of the courses or modules structures?
- How does the possibility of students' achievement on-time?
- What and How the teaching approached are?
- What and How the Assessment methods should be?

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ELO → Programme structure and Content

→ Course Learning Outcomes

→ Teaching and Learning Approach

→ Assessment Schemes

→ Programme Specification

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AUN 4: Teaching and Learning Approach (3)

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4	Teaching and Learning Approach
4.1	The educational philosophy is well articulated and communicated to all stakeholders. [1]
4.2	Teaching and learning activities are constructively aligned to achievement of the learning outcomes. [2,3,4,5]
4.3	Teaching and learning activities enhance life-long learning. [6]

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Where can you find educational philosophy?

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- Institutional mission and disciplinary trends
- A syllabus (assignments, format, content, expectations, texts, assignments, grading and assessment)
- In-classroom environment (diversity of methods, level of interaction, quality of feedback, intercultural sensitivity)

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Student-Centered Approach to Learning

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- In this model, teachers and students play an equally active role in the learning process.
- The teacher's primary role is to coach and facilitate student learning and overall comprehension of material.
- Student learning is measured through both formal and informal forms of assessment, including group projects, student portfolios, and class participation.
- Teaching and assessment are connected; student learning is continuously measured during teacher instruction.

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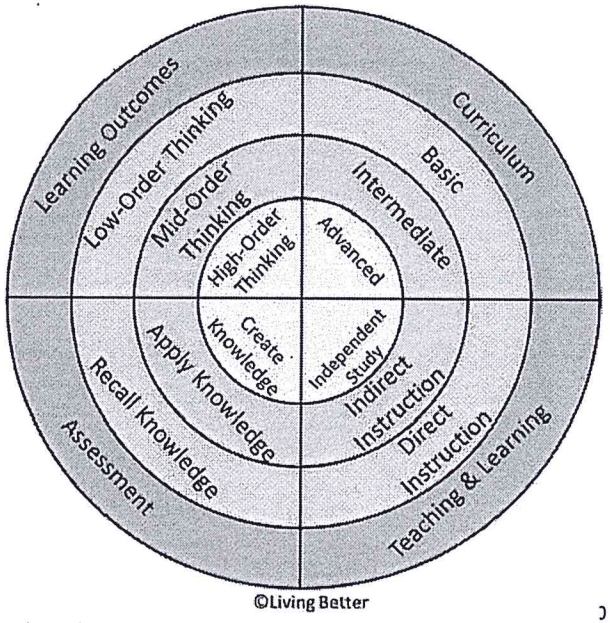
Constructive Alignment

110



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Four basic elements involved in the constructive alignment of any programme or course

111 (Biggs 2003a)

Clearly defining the learning outcomes

Curriculum is designed or pitched to align to the level of the learning outcomes

Selecting appropriate teaching and learning methods that are likely to ensure that the learning outcomes are achieved.

Using the appropriate assessment tools to assessing the student learning outcomes and checking to see how well they match with what was intended.

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Exercise 7: Formulating course learning outcomes (CLOs)

112

Procedures:

- Using the course structure, Curriculum mapping from the Previous Exercises for information
- Select the course which related to a course in TQF 3/4 and use the course objectives to formulate Course Learning Outcomes (CLO)
- Aligning the CLOs of each course to PLOs

Documents use:

Curriculum mapping, course structure, TQF 3/4

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Exercise 8 : Constructive alignment at course level

Procedures:

- From the CLOs of course selected in the previous Exercise, please find the Course content aligned with CLOs
- From the CLOs of course selected in the previous Exercise, please select the proper Teaching and Assessment methods for each course content.

Documents use:

Course outcomes, TQF 3/4

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Subject: .....

Action Verb + Object + Modification

CLO 1: .....

CLO 2: .....

CLO 3 .....

	Content	CLO No.	Teaching method	Assessment method
1				
2				
3				
4				

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Constructive alignment

Six Cognitive Process Skills			
Levels	**Verbs**	**Instructional Methods**	**Assessment Methods**
Remembering Retrieve relevant knowledge from long-term memory	- Define - Describe - Identify - Label - List - Match - Name - Outline - Recall - Recognize - Reproduce - Select - State - Locate	- Explicit Teaching - Lecture - Didactic questions - Demonstration Drill and Practice - Role play - Modeling - Simulation - Puzzles - Rub out and remember - Multi-media - Computer-based training	- MCQs - Short Answer Test - Written Test - Practical Test - Tutorials - Mix and match - Presentation (e.g. Reciting, summarizing)

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Constructive alignment

Six Cognitive Process Skills			
Levels	**Verbs**	**Instructional Methods**	**Assessment Methods**
Understanding Construct meaning from instructional messages, including oral, written, and graphic communication	- Illustrate - Compare - Calculate - Differentiate - Explain - Classify - Generalise - Interpret - Paraphrase - Rewrite - Summarise - Translate	- Lecture - Explicit teaching - Role play - Discussion - Concept formulation (e.g. mindmap, tree diagram) - Models - Multi-media	- MCQs - Short answer test - Presentation - Performance - Practical tests - Essay - Paraphrasing - Posters - Tutorials - Assignments

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Constructive alignment

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Six Cognitive Process Skills			
Levels	Verbs	Instructional Methods	Assessment Methods
Applying Carry out or use a procedure in a given situation	- Implement - Organize - Dramatise - Solve - Construct - Demonstrate - Discover - Manipulate - Modify - Operate - Predict - Prepare - Produce - Relate	- Demonstration - Problem solving - Field trip - Experiment - Show & tell - Mix & match - Role play - Case study - Projects - Work assignment - Simulations	- Projects - Presentation - Posters - Practicum/Field work - Work assignment - Case studies - Simulations

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Constructive alignment

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Six Cognitive Process Skills			
Levels	Verbs	Instructional Methods	Assessment Methods
Analysing Break material (knowledge) into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose	- Analyse - Break down - Compare - Select - Contrast - Deconstruct - Distinguish - Defend - Differentiate - Rationalise - Diagnose	- Case study - Group Project - Work Assignment - Laboratory experiment - Field Work - Problem based-learning - Debate - Research - Concept formulation	- Essay Writing - Poster - Written Report - Presentation - Portfolios - Project - Performance Test - Research - Case studies - Critique - Simulation

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Constructive alignment

119

Six Cognitive Process Skills			
Levels	Verbs	Instructional Methods	Assessment Methods
Evaluating Make judgments based on criteria and standards	- Rank - Assess - Monitor - Check - Test - Judge - Evaluate - Estimate - Examine	- Problem based learning - Debate - Experiment - Projects - Practicum - Peer teaching - Case studies	- Presentation - Written test - Debate - Mocked court - Essay - Experiment - Project - Performance Test - Case studies

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Constructive alignment

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Levels	Verbs	Instructional Methods	Assessment Methods
Creating Put elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure .	- Generate - Plan - Compose - Develop - Create - Invent - Organize - Construct - Produce - Compile - Design - Devise - Innovate - Synthesize - Modify	- Problem Solving - Case Studies - Research Project - Practicum - Experiment - Field trip - Models - Self-learning	- Presentation - Essay - Journal - Report Writing - Prototype or Model - Performance tasks - Composition (play, songs, poems, etc) - Research - Projects - Assignments - Posters

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Key factors of how to choose ...

121

What are the key factors of how to choose the Teaching methods? Please give the idea.....

- Learning outcomes
- Characteristics of students
- Educational philosophy
- Competences of academic staff
- Time
- Logistical requirements such as classroom, equipment, etc.

- Validity
- Reliability
- Flexibility
- Fairness

AUN 2: Programme Specification (3)

122

2	Programme Specification
2.1	The information in the programme specification is comprehensive and up-to-date. [1,2]
2.2	The information in the course specification is comprehensive and up-to-date. [1,2]
2.3	The programme and course specifications are communicated and made available to the stakeholders. [1,2]

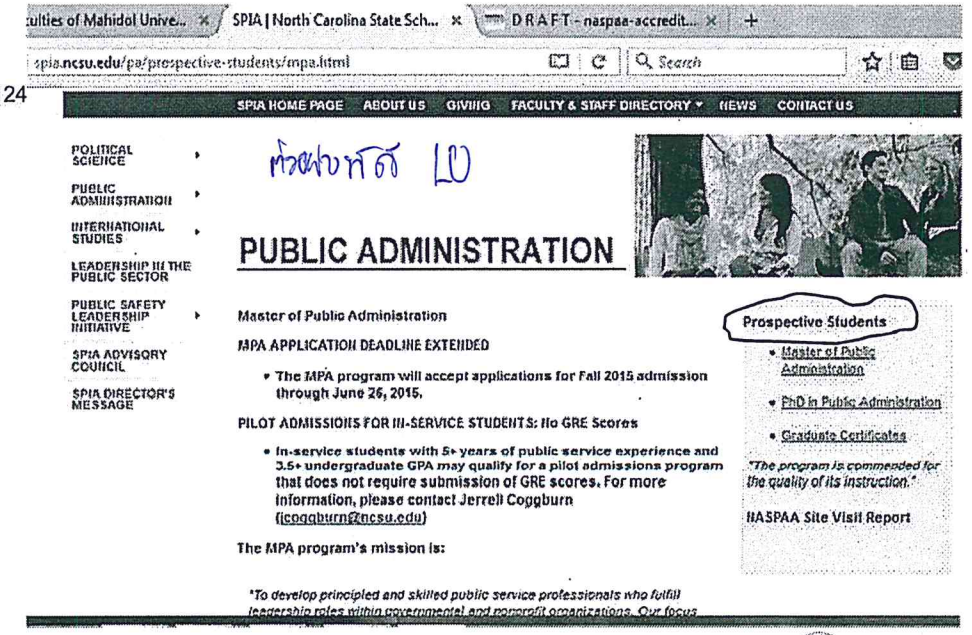
external stakeholder.

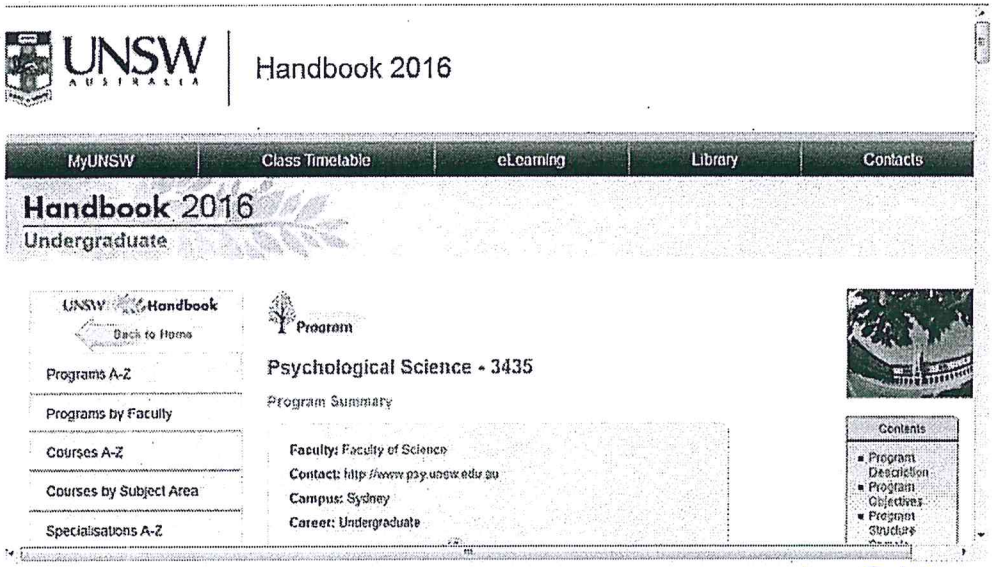
The following information should be included

123

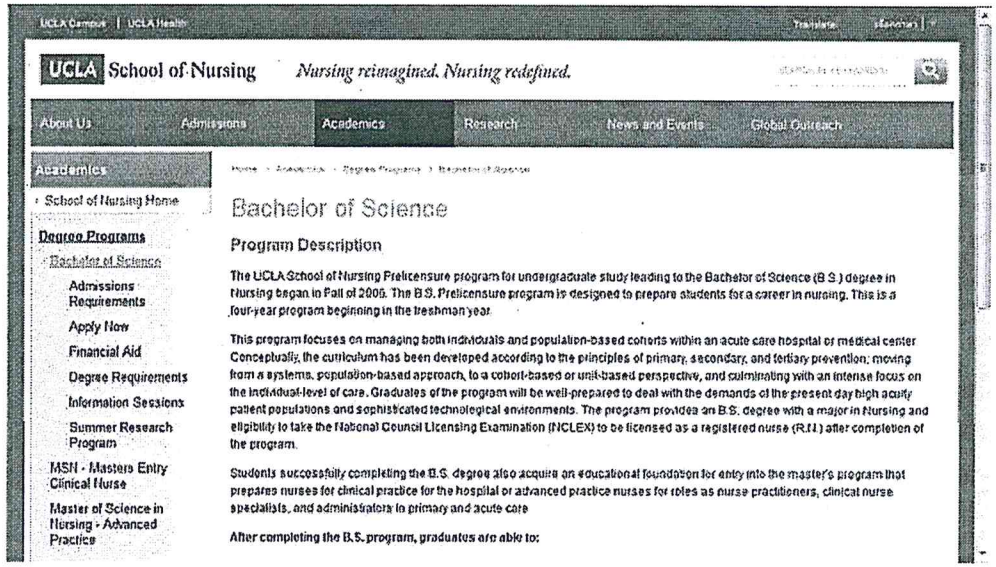
- Awarding body/institution
- Teaching institution (if different)
- Details of the accreditation by a professional or statutory body
- Name of the final award
- Programme title
- Expected Learning outcomes of the programme
- Admission criteria or requirements to the programme
- Relevant subject benchmark statements and other external and internal reference points used to provide information on programme outcomes
- Programme structure and requirements including levels, courses, credits, etc.
- Date on which the programme specification was written or revised

124





CLW 2016



CLW 2016

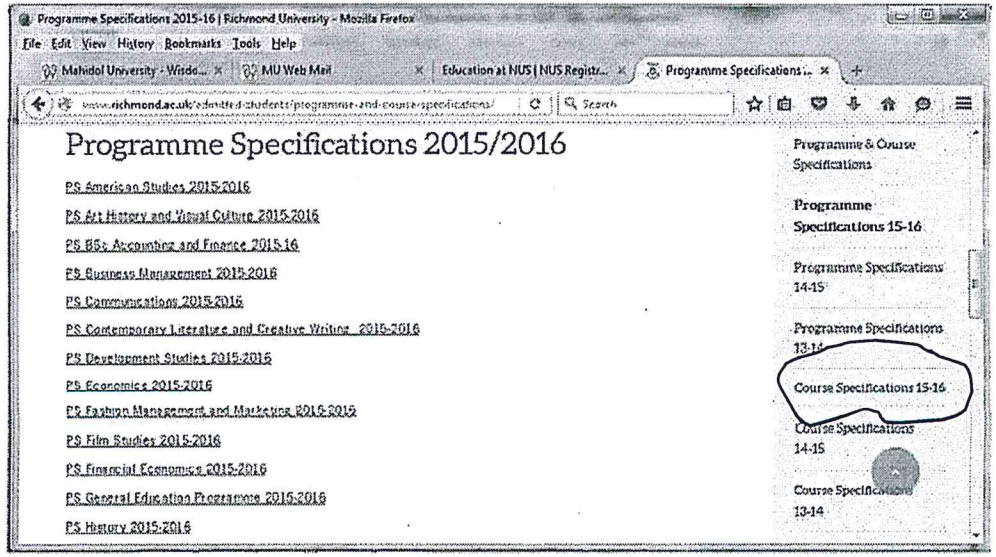
Course specification

The information to be included is listed below.

- Course title
- Course requirements such as pre-requisite to register for the course, credits, etc.
- Expected learning outcomes of the course in terms of knowledge, skills and attitudes
- Teaching, learning and assessment methods to enable outcomes to be achieved and demonstrated
- Course description and outline or syllabus
- Details of student assessment
- Date on which the course specification was written or revised.

CLW 2016

http://www.richmond.ac.uk/admitted-students/programme-and-course-specifications/programme-specifications-2015-16/



CLW 2016

129

TQF3

Course Specifications

Health Science and Physical Education

in General Education Courses

July 2011

Mahidol University International College

No.	Information on Course			
1.	Course Name : QUANTITATIVE SCIENCE TECHNIQUES I			
2.	Course Code: SQQP1014			
3.	Name(s) of Academic Staff: Dr. Zurina Hanafi			
4.	Rationale for the inclusion of the course in the programme: This is a compulsory course for Bachelor of Decision Science students.			
5.	Semester/Year Offered: 2/1			
6.	Total Student Learning Time (SLT)	Face to face	SL	TLT

School of Dentistry
COURSE SYLLABUS

ORAL PHYSIOLOGY AND OCCLUSION — BD 1215

CLW 2016

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Exercise 9: Develop Course Specification

130

Procedures:

- Select some courses from TQF 3/4 and use the Course Learning Outcomes (CLOs) from the previous exercise to design Lessons, teaching method and assessment method aligned.
- Design **summative assessment** of the subject aligned the CLOs
- Added information that should cover in AUN-QA guideline

Documents use:

Curriculum mapping, TQF 3/4

student work loads

[illegible] Techer work loads

CLW 2016

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Exercise 10:

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Do the same for Programme Specification

CLW 2016

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To be continued...

CLW 2016

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SAR Development

SAR Development

Chavalit Wongse-ek, AUN Council Member and Expert
Veeradeth Panvisavas, Mahidol University
Thasaneeya R Nopparatjamjomras, Mahidol University

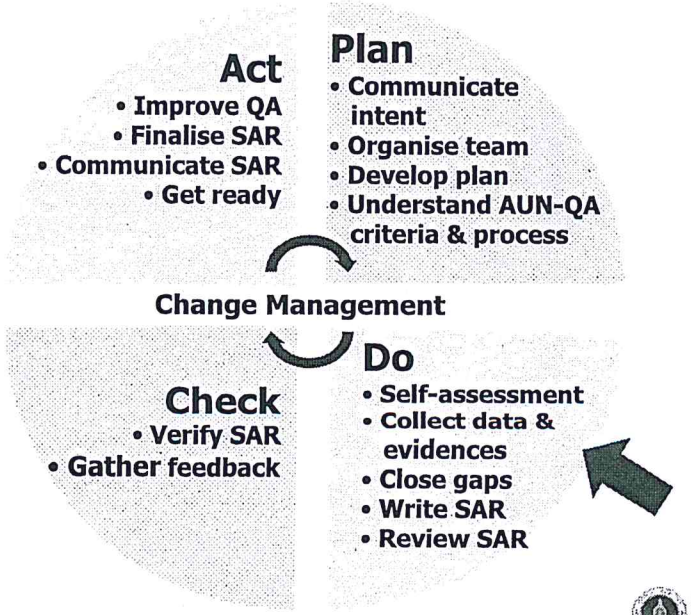
April 23, 2016

08.30	BAR share and learn
09.00	Group Presentation and Discussion (15 min each)
13.00	Workshop: SAR Development
16.00	AAR and Homework

Workshop
E1: Doing self-assessment (Appendix A)
E2: Identify Gaps
E3: Writing SAR: Criterion 3

PDCA approach to SAR development

PDCA approach to SAR development



Self-Assessment: Using Appendix A

5

Checklist for AUN-QA Assessment at Programme Level

1	Expected Learning Outcomes	1	2	3	4	5	6	7
1.1	The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]							
1.2	The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes [3]							
1.3	The expected learning outcomes clearly reflect the requirements of the stakeholders [4]							
	Overall opinion							
2	Programme Specification							
2.1	The information in the programme specification is comprehensive and up-to-date [1, 2]							

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6

Rating	Description
1	**Absolutely Inadequate** The QA practice to fulfil the criterion is not implemented. There are no plans, documents, evidences or results available. Immediate improvement must be made.
2	**Inadequate and Improvement is Necessary** The QA practice to fulfil the criterion is still at its planning stage or is inadequate where improvement is necessary. There is little document or evidence available. Performance of the QA practice shows little or poor results.
3	**Inadequate but Minor Improvement Will Make It Adequate** The QA practice to fulfil the criterion is defined and implemented but minor improvement is needed to fully meet them. Documents are available but no clear evidence to support that they have been fully used. Performance of the QA practice shows inconsistent or some results.
4	**Adequate as Expected** The QA practice to fulfil the criterion is adequate and evidences support that it has been fully implemented. Performance of the QA practice shows consistent results as expected.
5	**Better Than Adequate** The QA practice to fulfil the criterion is better than adequate. Evidences support that it has been efficiently implemented. Performance of the QA practice shows good results and positive improvement trend.
6	**Example of Best Practices** The QA practice to fulfil the criterion is considered to be example of best practices in the field. Evidences support that it has been effectively implemented. Performance of QA practice shows very good results and positive improvement trend.
7	**Excellent (Example of World-class or Leading Practices)** The QA practice to fulfil the criterion is considered to be excellent or example of world-class practices in the field. Evidences support that it has been innovatively implemented. Performance of the QA practice shows excellent results and outstanding improvement trends.

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Description

7

1	2	3	4
There are **no plans, documents, evidences or results** available.	**Process** is still at its planning stage or is inadequate	**Process** has implemented but minor improvement is needed	**Process** has been fully implemented
	There is little **document or evidence** available	No clear **evidences** to support	**Evidences** are fully supported
	ADRI shows little or poor results	**ADRI** shows inconsistent or some results	**ADRI** consistent results as expected

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Exercise 1: Doing self-assessment (Appendix A)

8

Checklist for AUN-QA Assessment at Programme Level

1	Expected Learning Outcomes	1	2	3	4	5	6	7
1.1	The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]			✓				
1.2	The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes [3]				✓			
1.3	The expected learning outcomes clearly reflect the requirements of the stakeholders [4]		✓					
	Overall opinion							
2	Programme Specification							
2.1	The information in the programme specification is comprehensive and up-to-date [1, 2]			✓				

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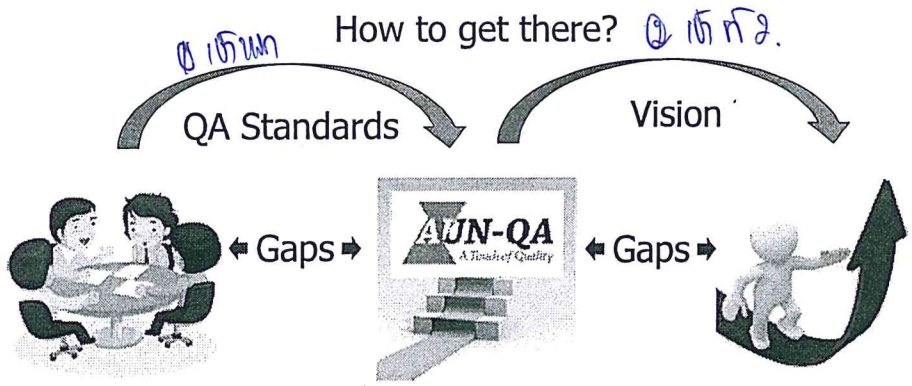
Identify Gaps (Gaps Analysis)

9



Identify Gaps

Criteria		Identify Gaps			
		Process	Data	Document	Evidence
1. Expected Learning Outcomes	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]				
	1.2 The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes [3]				

Close Gaps

11

- A gap may occurs when the current situation does not meet (AUN-QA Criteria):
  - one or more of the requirements in the criterion
  - targeted performance or results
  - one or more of evidences to support the criterion
- Identify short and long term gaps
- Analyse the cause(s) of the gaps
- Plan and implement solutions to close the short and long term gaps

Collect Data and Evidences

12

- Data and evidences should be collected on all matters related to the criterion. Checklist can be used to aid the collection of data and evidences.
- Data and evidences can be collected through:
  - Interviews
  - Examination of documents/records
  - Observation of activities and facilities
  - Comparison and benchmarking
- Use of statistical methods can be used to increase efficiency during the data collection.

Possible Data, Documents and Evidences

13 AUN-QA Criteria		Data, Documents and Evidences
1	Expected Learning Outcomes	Programme & course specifications, syllabus, course brochure & prospectus, skills matrix, stakeholders' inputs, curriculum map, university & faculty website, curriculum review minutes, accreditation & benchmarking reports
2	Programme Specification	
3	Programme Structure & Content	
4	Teaching & Learning Approach	Educational philosophy, student feedback, online learning portal, course specifications, syllabus, lesson plans
5	Student Assessment	Syllabus, assessment rubrics, samples of in-course assessment, project work, final examination, marking scheme, moderation process, appeal procedure

Possible Data, Documents and Evidences

14 AUN-QA Criteria		Data, Documents and Evidences
6	Academic Staff Quality	Manpower plan, recruitment criteria, staff qualifications, peer review & appraisal system, career plan, student feedback, award & recognition systems, staff workload, allocation of roles and duties, termination & retirement schemes, training and development policy and plan, scholarships, research & publications
7	Support Staff Quality	Manpower plan, number, type and qualification of support staff, career plan, training plan, appraisal system, award & recognition schemes, student/faculty feedback, training and development policy and plan, scholarships

Possible Data, Documents and Evidences

15

AUN-QA Criteria		Data, Documents and Evidences
8	Student Quality & Support	Student selection process, trend of student intakes, credit system, student workload, student performance reports, student monitoring, student competition and awards, CCA/ECA activities
9	Facilities and Infrastructure	Number and type of facilities, utilisation rates, downtime/uptime, maintenance plan, new facilities and upgrading plans, safety & health policy, facilities booking system

Possible Data, Documents and Evidences

16

AUN-QA Criteria		Data, Documents and Evidences
10	Quality Enhancement	Curriculum design, review & approval process and minutes, QA of assessments, stakeholders' inputs, external examiners, stakeholders' feedback report, tracer studies, service indicators
11	Output	Pass/drop-out rates, employment statistics, entry-level salary, employers feedback, average time to graduate, student research, satisfaction surveys

Exercise 2: Identify Gaps

Criteria		Identify Gaps			
		Process	Data	Document	Evidence
1. Expected Learning Outcomes	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]				
	1.2 The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes [3]				

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Writing

Self-Assessment Report (SAR)

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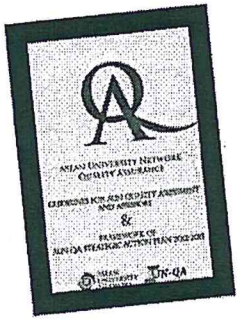
Guidelines for AUN Quality Assessment and Assessors (V.2), 2013



AUN-QA Requirements for Self-Assessment Report

SAR Format

- It is important for the SAR to **follow a specific format** based on the AUN-QA criteria and checklist.
- Focus on **information and data** (objective evidences) that directly **address the criteria**.
- The report has to be **concise and factual**. Provide trends and statistics to show achievements and performance. The quantitative data requires special attention. The manner in which data is presented is important for the right interpretation of the data.

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Content of the SAR

21

- The SAR should not be more than **50 A4 pages** and printed in a consistent typeface with **font size 12**. The content of the SAR should consist of 4 parts :
  - Part 1: Introduction
  - Part 2: AUN-QA Criteria Requirements
  - Part 3: Strengths and Weaknesses Analysis
  - Part 4: Appendices

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Part 1: Introduction

22

- Executive summary of the SAR
- Organization of the self-assessment – how is the self-assessment carried out and who are involved?
- Brief description of the university, faculty and department – outline the history of quality assurance, mission, vision, objectives and quality policy of the university followed by a brief description of the faculty and department.

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Part 2: AUN-QA Criteria Requirements

23

- This section contains the write-up on how the university, faculty or department addresses the requirements of the AUN-QA criteria. Follow the criteria **listed in the self-assessment checklist**.

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Part 3: Strengths and Weaknesses Analysis

24

- Summary of **strengths** - Summarize the points that the department considers to be its strengths and mark the points that you are proud of.
- Summary of **Weaknesses** - Indicate which points the department considers to be weak and in need of improvement.
- **Completed checklist**
- **Improvement plan** – recommendations to close the gaps identified in the self-assessment and the action plan to implement them.

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Part 4: Appendices

25

- Glossary and supporting documents and evidences

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Guidelines for writing an effective SAR (1/4)

26

- The SAR should follow a specific format based on the AUN-QA guidelines.
- The SAR is not just descriptive but
  - it is also analytical.
  - It includes an evaluation of the problems.
  - At the same time, it provides an indication of how the problems identified will be dealt with.
  - Use the diagnostic questions provided in each of the AUN-QA criteria to do this.

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Guidelines for writing an effective SAR (2/4)

27

- Illustrate clearly what, where, when, who and how the QA mechanisms or instruments are implemented and managed to fulfill the criteria. This will help you to piece all related information together.
- The content has to be concise and factual.
  - Focus on information and data (objective evidences) that directly address the criteria.
  - Provide trends and statistics to show achievements and performance.

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Guidelines for writing an effective SAR (3/4)

28

- The quantitative data requires special attention.
  - The manner in which data is presented is important for the right interpretation of the data.
  - There is a clear need for standardisation of data such as student numbers, appointment of teaching staff, staff/student ratios, pass rates, etc.

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Guidelines for writing an effective SAR (4/4)

29

- Self-assessment forms the starting point for improvement between the performance of programme and the Goals of Fac/Uni as well as a document for IQA/EQA assessment.
  - When conducting a self-assessment report, it is important to draw up an institution own standards and criteria, but it is also essential to take account of the criteria formulated by outsiders, such as OHED and an accrediting body.

How to Write SAR

30

In writing the SAR, the following factors need attention:

- Adopt a standard format and style to address the AUN-QA criteria
- **Determine whether the criterion is qualitative, quantitative or both**; and what is it asking for: a requirement, a process, a resource, a result....
- **Write the content in criterion using 5Ws** (what, where, when, who and why) **and 1H** (how) **and PDCA or ADRI approach**

How to Write SAR

31

- Content should be written in a positive tone
- Write what is being practiced
- Focus on information and data (objective evidences) that directly address each criterion
- Make reference or link related criteria in the report (e.g. Criteria 1, 3, 4 and 5)
- Provide a glossary of abbreviations and terms used in the report.
- **Review what you have written**

How to Write SAR: Qualitative Criterion

32

Criterion 1, 2, 3, 4, 5	
What	What is it? Describe the criterion or situation
How	How is it done? How is it aligned to .....? Who is involved? When is it done? Where is it done? Describe the approach (process) and deployment
Why	Why does the gap exist? Describe the gap and its improvement plan

Write SAR: Quantitative Criterion

33

Criterion 11	
What	What is the current result or performance? What are the past results or performance? What is the target? What is the trend? Describe the result or performance
How	How is it performing when compared to past years? How is it performing when compared or benchmarked with other competing universities or benchmarking partners? Describe the comparison of result or performance
Why	Why the result or performance is on a downward trend or fall below expectation? Describe the gaps and its improvement plan

Write SAR: Mixed Criterion

Criterion 6, 7, 8, 9, 10		
What	What is it? Describe the criterion or situation	What is the current result or performance? What are the past results or performance? What is the target? What is the trend? Describe the result or performance
How	How is it done? How is it aligned to .....? Who is involved? When is it done? Where is it done? Describe the approach (process) and deployment	How is it performing when compared to past years? How is it performing when compared or benchmarked with other competing universities or benchmarking partners? Describe the comparison of result or performance
Why	Why does the gap exist? Describe the gap and its improvement plan	Why the result or performance is on a downward trend or fall below expectation? Describe the gap and its improvement plan

Template to write a draft of Criterion SAR

35

Criterion	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
Process	• What is(are) the name of the process(es) or approach(es)?
Plan/ Approach	
Do/Deploy	
Check/Result	
Act/ Improvement	

Template to write a draft of Criterion SAR

36

Criterion	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
Process	Formulation of ELOs
Plan/ Approach	• What is its purpose or goal? • How is it aligned to vision, mission, objectives, learning outcomes and integrated with other approaches or processes? • What are the key steps?
Do/Deploy	
Check/Result	
Act/ Improvement	

Template to write a draft of Criterion SAR

37

Criterion	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
Process	Formulation of ELOs
Plan/Approach	
Do/Deploy	• When it was first deployed? How long has it been deployed? • Who is involved in deploying it ? What level/type of employee? • Where is it deployed? Which faculty, school, department?
Check/Result	
Act/ Improvement	

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Template to write a draft of Criterion SAR

38

Criterion	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
Process	Formulation of ELOs
Plan/Approach	
Do/Deploy	
Check/ Result	• What is the performance measure for this process or criterion? • What are the past and current results? • What is the target and trend? • What are the comparative or competitive results?
Act/ Improvement	

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Template to write a draft of Criterion SAR

39

Criterion	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university. [1,2]
Process	Formulation of ELOs
Plan/Approach	
Do/Deploy	
Check/Result	
Act/ Improvement	• Has the process ever been improved? • Is there an example of improvement that can be describe? • Was the improvement effectiveness?

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Exercise 3: Writing SAR: Criterion 3

40

Procedures:

- Read D10
- Using the information in D3 to write SAR Criterion 3,1, 3.2, 3.3
- Present your results

Tip:

- Helper! - Requirements of CR3 and Checklist
- Using Template and Diagnostic Questions to draw up a draft for writing

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Writing a draft of Criterion 3.1: Example

41

Criterion	3.1 The curriculum is designed based on constructive alignment with the expected learning outcomes [1]
Process	• What is(are) the name of the process(es) or approach(es)?
Plan/ Approach	• How is the curriculum designed ? • What is its purpose or goal? • What are the key steps?
Do/Deploy	• How is it aligned to objectives, learning outcomes and integrated with other approaches or processes?
Check/Result	• How does the curriculum mapping indicate?
Act/ Improvement	• How the curriculum has been improved?

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Review and Verify
Self-Assessment Report (SAR)

SAR Review (Exercise)

43

- Read – SAR
- Identify the gaps in the SAR (using Diagnostic Question and Source of Evidences in the Pink Guide)
- Indicate the strengths and areas for improvement using the template.
- Plan and implement corrective action to close the area of improvement

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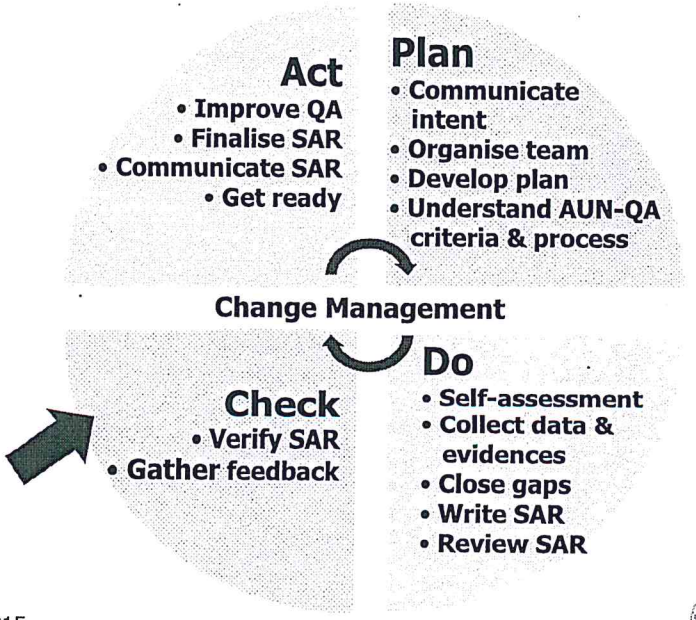
PDCA approach to SAR development

44



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Verify SAR and Gather Feedback

45

- Set an internal self-assessment
- Conducted by an independent party
- Do desktop and site assessments
- Verify SAR, evidences and documents
- Interview SAR team and relevant stakeholders
- Identify areas for improvement in SAR and QA practices
- Clarifying and verifying findings and results
- Make recommendations to SAR team and management
- Lesson learnt on assessment process, SAR and QA practices

Template for Verifing SAR (Exercise)

46

Criteria		Strengths	Areas for Improvement
1. Expected Learning Outcomes	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]		
	1.2 The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes [3]		
	1.3 The expected learning outcomes clearly reflect the requirements of the stakeholders [4]		

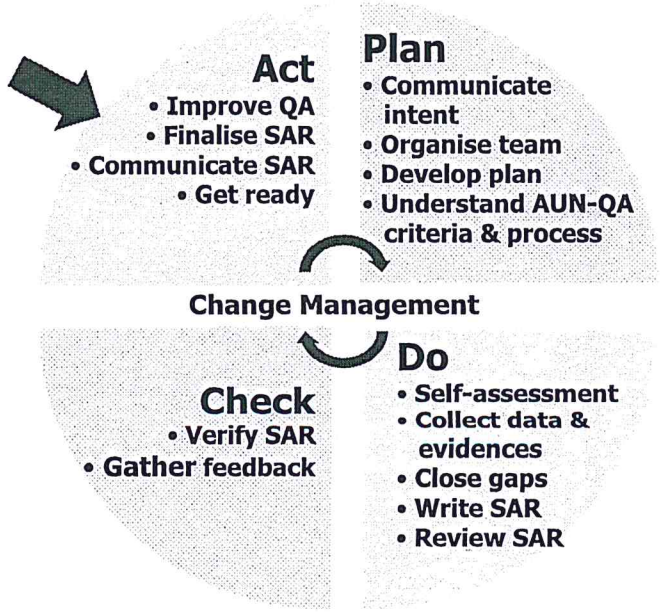
Template for Verifing SAR (Example)

47

Criteria		Strengths	Areas for Improvement
1. Expected Learning Outcomes	1.1 The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university [1,2]	The expected learning outcomes of the programme are adopted from ABET.	The process for the formulation of learning outcomes should be explained. For example, how inputs from stakeholders are gathered and translated into the learning outcomes. In the formulation of learning outcomes, what educational taxonomy is used? How the hierarchy of knowledge is established? This will have an impact on the setting of student assessment and teaching & learning approach.

PDCA approach to SAR development

48



Improve SAR

49

- Identify immediate and future improvement to the practices
- Assign responsibility to improve the practices
- Plan improvement activities
- Develop and implement the practices to close gaps
- Monitoring progress

Finalise SAR and Communicate

50

- Final review and proofread of the SAR
- Translate the SAR and key documents in English, if necessary
- Inform staff about the assessment criteria and process
- Brief staff on the content of the SAR, QA practices and supporting evidences and documents
- Make SAR and related information readily available to staff

Get Ready

51

- Approve or endorse the final SAR, documents and records for assessment
- Prepare, label and make available all documents and records (physical and electronic version) for assessment purpose
- Prepare presentation materials on the university, faculty and the programme to be assessed
- Prepare stakeholders for the assessment interviews
- Prepare the site(s) for the assessment
- Plan the assessment itinerary
- Send a copy of the SAR to the assessment team

Thank You

For Your Attention

Implementing Bologna in your institution

Writing and Using Learning Outcomes: a Practical Guide



Declan Kennedy, Áine Hyland, Norma Ryan

Abstract

Given that one of the main features of the Bologna process is the need to improve the traditional ways of describing qualifications and qualification structures, all modules and programmes in third level institutions throughout the European Higher Education Area should be (re)written in terms of learning outcomes. Learning outcomes are used to express what learners are expected to achieve and how they are expected to demonstrate that achievement. This article presents a summary of developments in curriculum design in higher education in recent decades and, drawing on recent practical experience, suggests a user-friendly methodology for writing modules, courses and programmes in terms of learning outcomes.

Content

1. Introduction

> Learning outcomes are important for recognition ... The principal question asked of the student or the graduate will therefore no longer be "what did you do to obtain your degree?" but rather "what can you do now that you have obtained your degree?" This approach is of relevance to the labour market and is certainly more flexible when taking into account issues of lifelong learning, non-traditional learning, and other forms of non-formal educational experiences. (Purser, Council of Europe, 2003)

In June 1999, representatives of the Ministers of Education of 29 European countries convened in Bologna, Italy to formulate the Bologna Declaration, aimed at establishing a common European Higher Education Area (EHEA). The overall aim is to improve the efficiency and effectiveness of higher education in Europe. The Bologna process spells out a number of "action lines" in which learning outcomes should play an important role (Adam, 2004, 2006). One of the logical consequences is that, by 2010, all programmes and significant constituent elements of programmes in third level institutions throughout the European Higher Education Area should be based on the concept of learning outcomes, and that curriculum should be redesigned to reflect this.

At the follow-up meeting in Berlin in 2003, the Ministers for Education issued a communiqué regarding the state of implementation of the Bologna process. They emphasised the creation of a common model for Higher Education in Europe, and encouraged national higher education systems to ensure – through the development of national frameworks of qualifications – that degrees (Bachelor and Masters) would also be described in terms of learning outcomes, rather than simply by number of credits and number of hours of study:

> Ministers encourage the member States to elaborate a framework of comparable and compatible qualifications for their higher education systems, which should seek to describe qualifications in terms of workload, level, learning outcomes, competences and profile. They also undertake to elaborate an overarching framework of qualifications for the European Higher Education Area. (Berlin Communiqué 2003[1])

It is worth noting that defining courses in terms of learning outcomes is not unique to Europe. Gosling and Moon (2001) have indicated that the outcomes-based approach to teaching is becoming increasingly popular at an international level:

[1] http://www.bologna-bergen2005.no

> The outcome-based approach has been increasingly adopted within credit frameworks and by national quality and qualifications authorities such as the QAA (Quality Assurance Agency for Higher Education) in the UK, the Australian, New Zealand and South African Qualification Authorities. (Gosling and Moon, 2001)

This article draws on the work of the higher education institutions involved in the European University Association (EUA) Quality Culture Network IV – Teaching and Learning[2] – during 2004/5, and of academic staff from different faculties in University College Cork, Ireland who rewrote all or part of their courses in terms of learning outcomes during 2005/6.[3]

2. What are learning outcomes?

Moving from a teacher-centred approach...

The traditional way of designing modules and programmes was to start from the content of the course. Teachers decided on the content that they intended to teach, planned how to teach this content and then assessed the content. This type of approach focussed on the teacher's input and on assessment in terms of how well the students absorbed the material taught. Course descriptions referred mainly to the content of the course that would be covered in lectures. This approach to teaching has been referred to as a teacher-centred approach. Among the criticisms of this type of approach in the literature (Gosling and Moon, 2001) is that it can be difficult to identify precisely what the student has to be able to do in order to pass the module or programme.

... to a student-centred approach

International trends in education show a shift from the traditional "teacher centred" approach to a "student centred" approach. This alternative model focuses on what the students are expected to be able to do at the end of the module or programme. Hence, this approach is commonly referred to as an outcome-based approach. Statements called intended learning outcomes, commonly shortened to learning outcomes, are used to express what it is expected that students should be able to do at the end of the learning period.

The outcome-based approach can be traced back to the work of the *behavioural objectives* movement of the 1960s and 1970s in the United States. One of the advocates of this type of teaching was Robert Mager, who proposed the idea of writing very specific statements about observable outcomes. He called these statements *instructional*

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[2] http://www.eua.be

[3] Copies of the UCC staff handbook on Learning Outcomes are available on request from Dr Norma Ryan (n.ryan@ucc.ie).

objectives (Mager, 1975). Using these instructional objectives and performance outcomes, he attempted to define the type of learning that would occur at the conclusion of instruction and how that learning would be assessed. These instructional objectives later developed into more precisely defined learning outcomes.

2.1 Defining learning outcomes

A survey of the literature on learning outcomes comes up with a number of similar definitions of the term:

- Learning outcomes are statements of what is expected that the student will be able to do as a result of learning the activity. (Jenkins and Unwin, 2001)
- Learning outcomes are statements that specify what learners will know or be able to do as a result of a learning activity. Outcomes are usually expressed as knowledge, skills or attitudes. (American Association of Law Libraries[4])
- Learning outcomes are an explicit description of what a learner should know, understand and be able to do as a result of learning. (Bingham, 1999)
- Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning. (ECTS Users' Guide, 2005)
- Learning outcomes are explicit statements of what we want our students to know, understand or be able to do as a result of completing our courses. (University of New South Wales, Australia[5])
- Learning outcome: a statement of what a learner is expected to know, understand and/or be able to demonstrate at the end of a period of learning". (Gosling and Moon, 2001)
- A learning outcome is a statement of what the learner is expected to know, understand and/or be able to do at the end of a period of learning. (Donnelly and Fitzmaurice, 2005)
- A learning outcome is a statement of what a learner is expected to know, understand and be able to do at the end of a period of learning and of how that learning is to be demonstrated". (Moon, 2002)
- Learning outcomes describe what students are able to demonstrate in terms of knowledge, skills and attitudes upon completion of a programme. (Quality Enhancement Committee, Texas University[6])
- A learning outcome is a written statement of what the successful student/learner is expected to be able to do at the end of the module/course unit or qualification. (Adam, 2004)

Handout C 3.4-1-1 Some definitions of the term "learning outcomes"

[4] http://www.aallnet.org/prodev/outcomes.asp
[5] http://www.ltu.unsw.edu.au/content/course_prog_support/outcomes.cfm?ss=0
[6] http://qep.tamu.edu/documents/writing_outcomes.pdf

Thus, we can see that the various definitions of learning outcomes do not differ significantly from each other. From these definitions, it is clear that:

- Learning outcomes focus on what the learner has achieved rather than the intentions of the teacher;
- Learning outcomes focus on what the learner can demonstrate at the end of a learning activity.

The following definition (ECTS Users' Guide, p. 47) of a learning outcome may be considered a good working definition:

A working definition

> Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning.

The process of learning could be, for example, a lecture, a module or an entire programme.

2.2 What is the difference between aims, objectives and learning outcomes?

Aims

The aim of a module or programme is a broad general statement of teaching intention, i.e. it indicates what the teacher intends to cover in a block of learning. Aims are usually written from the teacher's point of view to indicate the general content and direction of the module. For example, the aim of a module could be "to introduce students to the basic principles of atomic structure" or "to provide a general introduction to the history of Ireland in the twentieth century".

Objectives

The objective of a module or programme is usually a specific statement of teaching intention, i.e. it indicates one of the specific areas that the teacher intends to cover in a block of learning. For example, one of the objectives of a module could be that "students would understand the impacts and effects of behaviours and lifestyles on both the local and global environments". (In some contexts, objectives are also referred to as goals).

Thus, the aim of a module gives the broad purpose or general teaching intention of the module, whilst the objective gives more specific information about what the teaching of the module hopes to achieve.

Confusion

One of the problems caused by the use of objectives is that sometimes they are written in terms of teaching intention and other times they are written in terms of expected learning, i.e. there is confusion in the literature in terms of whether objectives belong to the teacher-centred approach or the outcome-based approach. The situation is nicely summarised by Moon (2002) as follows:

Basically the term 'objective' tends to complicate the situation, because objectives may be written in terms of teaching intention or expected learning... This means that some descriptions are of the teaching in the module and some are of the learning... This general lack of agreement as to the format of objectives is a complication, and justifies the abandonment of the use of the term 'objective' in the description of modules or programmes. (Moon, 2002)

Advantages of learning outcomes

Most teachers who have worked on the development of objectives for modules or programmes have encountered the above problem. One of the great advantages of learning outcomes is that they are clear statements of what the learner is expected to achieve and how he or she is expected to demonstrate that achievement. Thus, learning outcomes are more precise, easier to compose and far clearer than objectives. From one perspective, learning outcomes can be considered as a sort of "common currency" that assists modules and programmes to be more transparent at both local level and at an international level.

2.3 Learning outcomes and competences

In some papers in the literature, the term "competence" is used in association with learning outcomes. It is difficult to find a precise definition for this term. Adam (2004) comments that "some take a narrow view and associate competence just with skills acquired by training". The EC Tuning project[7] which was initiated in 2000 used the term "competence" to represent a combination of attributes in terms of knowledge and its application, skills, responsibilities and attitudes and an attempt was made to describe the extent to which a person is capable of performing them.

Lack of clear definition

The lack of clarity or agreement in terms of defining the term competence is apparent in the ECTS Users' Guide (2005), which describes competences as *"a dynamic combination of attributes, abilities and attitudes"*. The Guide goes on to state that *"Fostering these competences is the object of educational programmes. Competences are formed in various course units and assessed at different stages. They may be divided into subject-area related competences (specific to a field of study) and generic competences (common to any degree course)"*.

[7] Tuning Educational Structures in Europe, http://tuning.unideusto.org/tuningeu/

Since there does not appear to be a common understanding of the term competence in the literature, learning outcomes have become more commonly used than competences when describing what students are expected to know, understand and/or be able to demonstrate at the end of a module or programme. For that reason, the terms "competence" and "competency" are avoided in this article.

3. How can one write learning outcomes?

The learning outcome approach is, above all, a perspective and a mode of thinking in order to develop valid programmes. While being an essential part of the implementation phase, writing learning outcomes is of course only the visible surface of this perspective, or a consequence of its implementation. Having stated that, this article intends to use "writing" as the key word, but the intention is of course that the writing of these learning outcomes should be preceded by the thinking necessary for this change in approach.

Benjamin Bloom

The work of Benjamin Bloom (1913 – 1999) was found by the staff of University College Cork, Ireland, to provide a useful starting point when writing learning outcomes. Bloom studied in Pennsylvania State University, USA, and graduated with bachelor and master degrees from that institution. He then worked with Ralph Tyler at the University of Chicago and graduated with a PhD in Education in 1942.

Three domains of learning

Bloom was a gifted teacher who carried out research on the development of a classification of levels of thinking during the learning process. He believed that teachers should design lessons and tasks to help students to meet stated objectives. Bloom identified three domains of learning – cognitive, affective and psycho-motor – and within each of these domains he recognised that there was an ascending order of complexity. His work is most advanced in the cognitive domain where he drew up a classification (or taxonomy) of thinking behaviours from the simple recall of facts up to the process of analysis and evaluation. His publication *Taxonomy of Educational Objectives: Handbook 1, the Cognitive Domain* (Bloom et al., 1956) has become widely used throughout the world to assist in the preparation of curriculum and evaluation materials. The taxonomy provides a framework in which one can build upon prior learning to develop more complex levels of understanding.

In recent years, attempts have been made to revise Bloom's Taxonomy (Anderson & Krathwohl, 2001; Krathwohl, 2002) but the original works of Bloom and his co-workers are still the most widely quoted in the literature.

Bloom proposed that the cognitive or knowing domain is composed of six successive levels arranged in a hierarchy as shown in figure C 3.4-1-1.

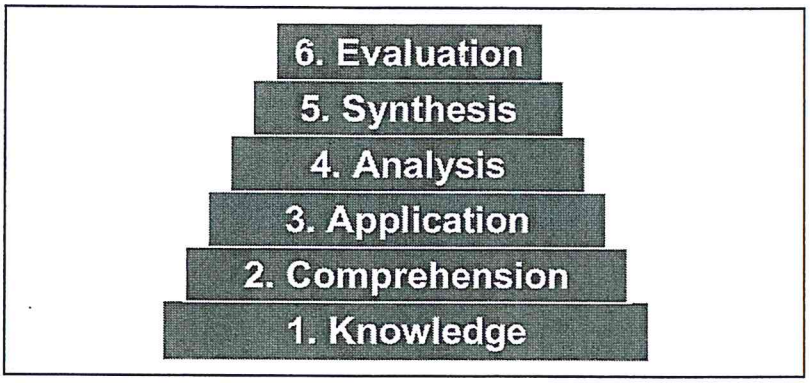


Fig. C 3.4-1-1 Hierarchy of cognitive domain

A hierarchy of thinking processes

Bloom's taxonomy was not simply a classification – it was an effort by him to arrange the various thinking processes in a hierarchy. In this hierarchy, each level depends on the student's ability to perform at the level or levels that are below it. For example, for a student to apply knowledge (stage 3) he or she would need to have both the necessary information (stage 1) and understanding of this information (stage 2).

When talking about teaching, Bloom always advocated that when teaching and assessing students one should bear in mind that learning is a process and that the teacher should try to get the thought processes of the students to move up into the higher order stages of synthesis and evaluation.

3.1 Writing learning outcomes in the cognitive domain

Using correct verbs

Bloom's taxonomy is frequently used for writing learning outcomes, since it provides a ready-made structure and list of verbs. It can be argued that the use of the correct verbs is the key to the successful writing of learning outcomes. Bloom's original list of verbs was limited and has been extended by various authors over the years. The list of verbs given in this article has been compiled from a combination of Bloom's original publication and from the more modern literature in this area. It is not claimed that the list of verbs suggested for each stage is exhaustive, but it is hoped that the reader will find the lists to be reasonably comprehensive.

Action verbs

In the following section, each stage of Bloom's taxonomy is considered and the corresponding list of verbs relating to each stage is proposed. Since learning outcomes are concerned with what the students can **do** at the end of the learning activity, all of these verbs are action (active) verbs.

3.1.1 Knowledge

Assessing knowledge

Knowledge may be defined as the ability to recall or remember facts without necessarily understanding them. Some of the action verbs used to assess knowledge are as follows:

Arrange, collect, define, describe, duplicate, enumerate, examine, find, identify, label, list, memorise, name, order, outline, present, quote, recall, recognise, recollect, record, recount, relate, repeat, reproduce, show, state, tabulate, tell.

Demonstrating evidence of knowledge

Some examples of learning outcomes for courses in various disciplines that demonstrate evidence of knowledge include the following:

- *Recall* genetics terminology: homozygous, heterozygous, phenotype, genotype, homologous chromosome pair, etc.
- *Identify* and consider ethical implications of scientific investigations.
- *Describe* how and why laws change and the consequences of such changes on society.
- *List the criteria to be taken into account when caring for a patient* with tuberculosis.
- *Define* what behaviours constitute unprofessional practice in the solicitor – client relationship.
- *Describe* the processes used in engineering when preparing a design brief for a client.

Note that each learning outcome begins with an action verb.

3.1.2 Comprehension

Assessing comprehension

Comprehension may be defined as the ability to understand and interpret learned information. Some of the action verbs used to assess comprehension are as follows:

Associate, change, clarify, classify, construct, contrast, convert, decode, defend, describe, differentiate, discriminate, discuss, distinguish, estimate, explain, express, extend, generalise, identify, illustrate, indicate, infer, interpret, locate, paraphrase, predict, recognise, report, restate, rewrite, review, select, solve, translate.

Demonstrating evidence of comprehension

Some examples of learning outcomes that demonstrate evidence of comprehension are:

- *Differentiate* between civil and criminal law
- *Identify* participants and goals in the development of electronic commerce.
- *Predict* the genotype of cells that undergo meiosis and mitosis.
- *Explain* the social, economic and political effects of World War I on the post-war world.
- *Classify* reactions as exothermic and endothermic.
- *Recognise* the forces discouraging the growth of the educational system in Ireland in the 19th century.

3.1.3 Application

Assessing application

Application may be defined as the ability to use learned material in new situations, e.g. put ideas and concepts to work in solving problems. Some of the action verbs used to assess application are shown as follows:

Apply, assess, calculate, change, choose, complete, compute, construct, demonstrate, develop, discover, dramatise, employ, examine, experiment, find, illustrate, interpret, manipulate, modify, operate, organise, practice, predict, prepare, produce, relate, schedule, select, show, sketch, solve, transfer, use.

Demonstrating evidence of application

Some examples of learning outcomes that demonstrate evidence of application are:

- *Construct* a timeline of significant events in the history of Australia in the 19th century.
- *Apply* knowledge of infection control in the maintenance of patient care facilities.
- *Select* and employ sophisticated techniques for analysing the efficiencies of energy usage in complex industrial processes.
- *Relate* energy changes to bond breaking and formation.
- *Modify* guidelines in a case study of a small manufacturing firm to enable tighter quality control of production.

- *Show* how changes in the criminal law affected levels of incarceration in Scotland in the 19th century.
- *Apply* principles of evidence-based medicine to determine clinical diagnoses.

3.1.4 Analysis

Assessing analysis

Analysis may be defined as the ability to break down information into its components, e.g. look for inter-relationships and ideas (understanding of organisational structure). Some of the action verbs used to assess analysis are as follows:

Analyse, appraise, arrange, break down, calculate, categorise, classify, compare, connect, contrast, criticise, debate, deduce, determine, differentiate, discriminate, distinguish, divide, examine, experiment, identify, illustrate, infer, inspect, investigate, order, outline, point out, question, relate, separate, sub-divide, test.

Demonstrating evidence of analysis

Some examples of learning outcomes that demonstrate evidence of analysis are:

- *Analyse* why society criminalises certain behaviours.
- *Compare* and contrast the different electronic business models.
- *Debate* the economic and environmental effects of energy conversion processes.
- *Compare* the classroom practice of a newly qualified teacher with that of a teacher of 20 years teaching experience.
- *Calculate* gradient from maps in m, km, % and ratio.

3.1.5 Synthesis

Assessing synthesis

Synthesis may be defined as the ability to put parts together. Some of the action verbs used to assess synthesis are the following:

Argue, arrange, assemble, categorise, collect, combine, compile, compose, construct, create, design, develop, devise, establish, explain, formulate, generalise, generate, integrate, invent, make, manage, modify, organise, originate, plan, prepare, propose, rearrange, reconstruct, relate, reorganise, revise, rewrite, set up, summarise.

Demonstrating evidence of synthesis

Some examples of learning outcomes that demonstrate evidence of synthesis are:

- *Recognise* and formulate problems that are amenable to energy management solutions.
- *Propose* solutions to complex energy management problems both verbally and in writing.
- *Summarise* the causes and effects of the 1917 Russian revolutions.
- *Relate* the sign of enthalpy changes to exothermic and endothermic reactions.
- *Organise* a patient education programme.

3.1.6 Evaluation

Assessing evaluation

Evaluation may be defined as the ability to judge the value of material for a given purpose. Some of the action verbs used to assess evaluation are:

Appraise, ascertain, argue, assess, attach, choose, compare, conclude, contrast, convince, criticise, decide, defend, discriminate, explain, evaluate, grade, interpret, judge, justify, measure, predict, rate, recommend, relate, resolve,

Demonstrating evidence of evaluation

The following are some examples of learning outcomes that demonstrate evidence of evaluation are:

- Assess the importance of key participants in bringing about change in Irish history Evaluate marketing strategies for different electronic business models.
- Summarise the main contributions of Michael Faraday to the field of electromagnetic induction.
- Predict the effect of change of temperature on the position of equilibrium.
- Evaluate the key areas contributing to the craft knowledge of experienced teachers.

Note that the verbs used in the above six categories are not exclusive to any one particular category. Some verbs appear in more than one category. For example, a mathematical calculation may involve merely applying a given formula (application – stage 3) or it may involve analysis (stage 4) as well as application.

3.2 Writing learning outcomes in the affective domain

Emotional component of learning

Whilst the cognitive domain is the most widely used of Bloom's Taxonomy, Bloom and his co-workers also carried out research on the **affective** ("attitudes", "feelings", "values") domain (Bloom et al., 1964). This domain is concerned with issues relating to the emotional component of learning and ranges from basic willingness to receive information to the integration of beliefs, ideas and attitudes.

Five major categories

In order to describe the way in which we deal with things emotionally, Bloom and his colleagues developed five major categories:

1. **Receiving**. This refers to a willingness to receive information, e.g. the individual accepts the need for a commitment to service, listens to others with respect, shows sensitivity to social problems, etc.

2. **Responding**. This refers to the individual actively participating in his or her own learning, e.g. shows interest in the subject, is willing to give a presentation, participates in class discussions, enjoys helping others, etc.

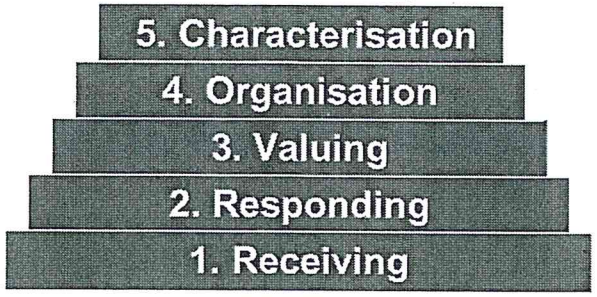
3. **Valuing.** This ranges from simple acceptance of a value to one of commitment, e.g. the individual demonstrates belief in democratic processes, appreciates the role of science in our everyday lives, shows concern for the welfare of others, shows sensitivity towards individual and cultural differences, etc.

4. **Organisation.** This refers to the process that individuals go through as they bring together different values, resolve conflicts among them and start to internalise the values, e.g. recognises the need for balance between freedom and responsibility in a democracy, accepts responsibility for his or her own behaviour, accepts professional ethical standards, adapts behaviour to a value system, etc.

5. **Characterisation**. At this level the individual has a value system in terms of their beliefs, ideas and attitudes that control their behaviour in a consistent and predictable manner, e.g. displays self reliance in working independently, displays a professional commitment to ethical practice, shows good personal, social and emotional adjustment, maintains good health habits, etc.

Major affective categories and active verbs

The major categories of the affective domain and some active verbs commonly used when writing learning outcomes for this domain are shown in Fig. C 3.4-1-2. Some examples of learning outcomes in the affective domain are:



act, adhere, appreciate, ask, accept, answer, assist, attempt, challenge, combine, complete, conform, cooperate, defend, demonstrate (a belief in), differentiate, discuss, display, dispute, embrace, follow, hold, initiate, integrate, justify, listen, order, organise, participate, practice, join, share, judge, praise, question, relate, report, resolve, share, support, synthesise, value

Fig. C 3.4-1-2 Hierarchy of affective domain and some action verbs

Bloom and his colleagues (and subsequent authors) have linked the various levels in the affective domain to specific verbs. However, this level of detail will not be explored in this article.

Examples of learning outcomes

Some examples of learning outcomes relevant to the affective domain are as follows:

- Accept the need for professional ethical standards.
- Appreciate the need for confidentiality in the professional client relationship.
- Value a willingness to work independently.
- Relate well to pupils of all abilities in the classroom.
- Appreciate the management challenges associated with high levels of change in the public sector.
- Display a willingness to communicate well with patients.
- Resolve conflicting issues between personal beliefs and ethical considerations.
- Participate in class discussions with colleagues and with teachers.
- Embrace a responsibility for the welfare of children taken into care.
- Display a professional commitment to ethical practice.

3.3 Writing learning outcomes in the psychomotor domain

Physical skills

The psychomotor domain mainly emphasises physical skills involving co-ordination of the brain and muscular activity. From a study of the literature, it would appear that this domain has been less well developed in the field of education than either the cognitive or affective domain. The psychomotor domain is commonly used in areas like laboratory science subjects, health sciences, art, music, engineering, drama and physical education. Bloom and his research team did not complete detailed work on the psychomotor domain as they claimed lack of experience in teaching these skills. However, a number of authors have suggested various versions of taxonomies to describe the development of skills and co-ordination.

Five levels

For example, Dave (1970) proposed a hierarchy consisting of five levels:

1. **Imitation**: Observing the behaviour of another person and copying this behaviour. This is the first stage in learning a complex skill.

2. **Manipulation**: Ability to perform certain actions by following instructions and practicing skills.

3. **Precision**: At this level, the student has the ability to carry out a task with few errors and become more precise without the presence of the original source. The skill has been attained and proficiency is indicated by smooth and accurate performance.

4. **Articulation**: Ability to co-ordinate a series of actions by combining two or more skills. Patterns can be modified to fit special requirements or solve a problem.

5. **Naturalisation**: Displays a high level of performance naturally ("without thinking"). Skills are combined, sequenced and performed consistently with ease.

This hierarchy and some examples of action verbs for writing learning outcomes in the psychomotor domain are shown in figure C 3.4-1-3:

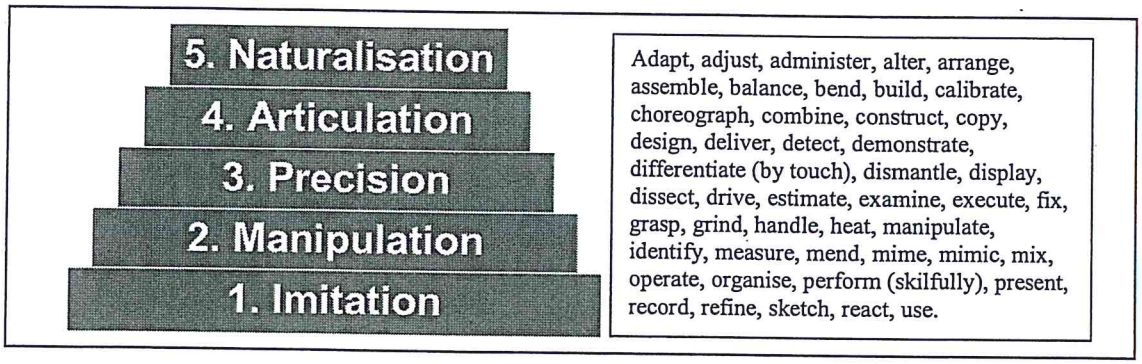


Fig. C 3.4-1-3 **Hierarchy of psychomotor domain and some action verbs**

Other taxonomies

Subsequently, Simpson (1972) developed a more detailed hierarchy consisting of seven levels:

1. **Perception**: The ability to use observed cues to guide physical activity.
2. **Set (mindset)**: The readiness to take a particular course of action. This can involve mental, physical and emotional disposition.
3. **Guided response**: The trial-an-error attempts at acquiring a physical skill. With practice, this leads to better performance.
4. **Mechanism:** The intermediate stage in learning a physical skill. Learned responses become more habitual and movements can be performed with some confidence and level of proficiency.
5. **Complex Overt Responses:** Physical activities involving complex movement patterns are possible. Responses are automatic and proficiency is indicated by accurate and highly coordinated performance with a minimum of wasted effort.
6. **Adaptation:** At this level, skills are well developed and the individual can modify movements to deal with problem situations or to fit special requirements.
7. **Origination:** The skills are so highly developed that creativity for special situations is possible.

Other taxonomies in the psychomotor domain have been developed by Harrow (1972) and Dawson (1998). Ferris and Aziz (2005) developed a taxonomy in the psychomotor domain specifically for engineering students.

In general, all of the various taxonomies in the psychomotor domain describe a progression from simple observation to mastery of physical skills.

3.4 Practical advice for writing learning outcomes

Unambiguous action verbs

Fry *et al* (2000) when giving practical advice for writing learning outcomes recommend the use of "unambiguous action verbs" and list many examples of verbs from Bloom's Taxonomy. In order to show the differences between the vocabulary used in writing aims and learning outcomes, the authors listed some examples of verbs as shown in Table C 3.4-1-1.

Table C 3.4-1-1 Examples of verbs used in writing aims and learning outcomes. (Fry et al., 2000 p. 51)

Aims	Outcomes
Know	Distinguish between
Understand	Choose
Determine	Assemble
Appreciate	Adjust
Grasp	Identify
Become familiar	Solve, apply, list

The following guidelines may be of assistance when writing learning outcomes:

- Begin each learning outcome with an action verb, followed by the object of the verb followed by a phrase that gives the context.
- Use only one verb per learning outcome.
- Avoid vague terms like know, understand, learn, be familiar with, be exposed to, be acquainted with, and be aware of. These terms are associated with teaching objectives rather than learning outcomes.
- Avoid complicated sentences. If necessary use more one than one sentence to ensure clarity.
- Ensure that the learning outcomes of the module relate to the overall outcomes of the programme.
- The learning outcomes must be observable and measurable.
- Ensure that the earning outcomes are capable of being assessed.
- When writing learning outcomes, bear in mind the timescale within which the outcomes are to be achieved. There is always the danger that one can be over-ambitious when writing learning outcomes. Ask yourself if it is realistic to achieve the learning outcomes within the time and resources available.
- As you work on writing the learning outcomes, bear the mind how these outcomes will be assessed, i.e. how will you know if the student has achieved these learning outcomes? If the learning outcomes are very broad, they may be difficult to assess effectively. If the learning outcomes are very narrow, the list of learning outcomes may be too long and detailed.
- Before finalising the learning outcomes, ask your colleagues and possibly former students if the learning outcomes make sense to them.
- When writing learning outcomes, for students at levels beyond first year, try to avoid overloading the list with learning outcomes which are drawn from the bottom of Bloom's taxonomy (e.g. *Knowledge* and *Comprehension* in the cognitive domain). Try to challenge the students to use what they have learned by including some learning outcomes drawn from the higher categories (e.g. *Application*, *Analysis*, *Synthesis* and *Evaluation)*.

Handout C 3.4-1-2 Guidelines for writing learning outcomes

4. How are learning outcomes linked to teaching and assessment?

Assessing learning outcomes

When writing learning outcomes, it is important to write them in such a way that they are capable of being assessed. Clearly, it is necessary to have some form of assessment tool or technique in order to determine the extent to which learning outcomes have been achieved. Examples of direct assessment techniques are the use of written examinations, project work, portfolios, grading system with rubrics, theses, reflective journals, performance assessment, etc. Examples of indirect assessment methods are surveys of employers, comparison with peer institutions, surveys of past graduates, retention rates, analysis of curriculum, etc.

Aligning teaching, assessment and learning outcomes

The challenge for teachers is to ensure that there is alignment between teaching methods, assessment techniques, assessment criteria and learning outcomes. This connection between teaching, assessment and learning outcomes helps to make the overall learning experience more transparent. Student course evaluations show that clear expectations are a vitally important part of effective learning. Lack of clarity in this area is almost always associated with negative evaluations, learning difficulties, and poor student performance. Toohey (1999) recommends that the best way to help students understand how they must achieve learning outcomes is by clearly setting out the assessment techniques and the assessment criteria.

In terms of teaching and learning, there is a dynamic equilibrium between teaching strategies on one side and learning outcomes and assessment on the other side.

Assessment must mirror learning outcomes

It is important that the assessment tasks mirror the learning outcomes since, as far as the students are concerned, the assessment **is** the curriculum: "From our students' point of view, assessment always defines the actual curriculum" (Ramsden, 2003). This situation is represented graphically by Biggs (2003b) as follows:

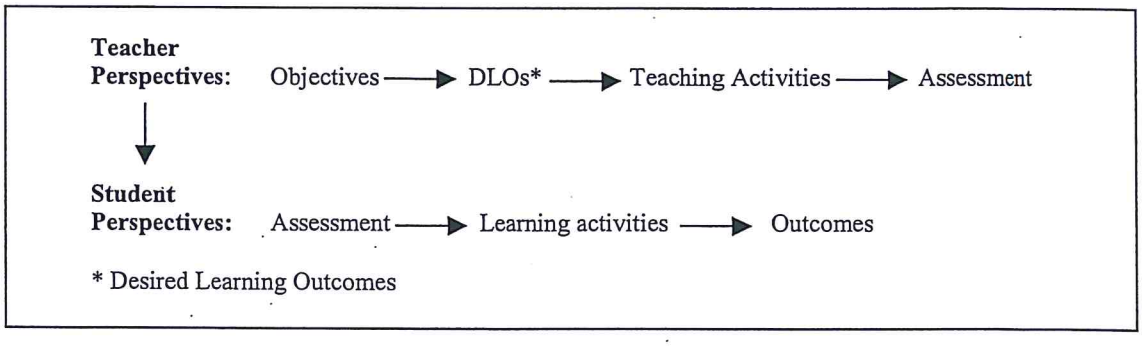


Fig. C 3.4-1-4 **Teacher and student perspectives regarding assessment**

Link between curriculum and assessment

In stressing this point, Biggs (2003) emphasises the strong link between the curriculum and assessment as follows:

To the teacher, assessment is at the end of the teaching-learning sequence of events, but to the student it is at the beginning. If the curriculum is reflected in the assessment, as indicated by the downward arrow, the teaching activities of the teacher and the learner activities of the learner are both directed towards the same goal. In preparing for the assessment, students will be learning the curriculum. (Biggs 2003)

One cannot over-emphasise the importance of assessment in the teaching and learning process. As already stated (Ramsden, 2003) as far as the students are concerned, the assessment **is** the curriculum. They will learn what they think will be assessed, not what may be on the curriculum or even what has been covered in lectures! The old adage that "assessment is the tail that wags the dog" is very true.

4.1 Linking learning outcomes, teaching and assessment

Formative assessment

Assessment is often described in terms of **formative assessment** or **summative assessment**. Formative assessment has been described as being assessment FOR learning. It has been described as assessment that "refers to all those activities undertaken by teachers, and by the students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged" (Black and Williams, 1998). In other words, formative assessment helps to inform the teacher and the students as to how the students are progressing. Formative assessment is usually carried out at the beginning of a programme or during a programme. The students' performance on the assessment tasks can help the teacher to make decisions about the direction of the teaching to help the learning process. It has been clearly shown (Black and Williams, 1998) that by giving feedback to learners, formative assessment can help improve the learning and performance of students.

Main characteristics

The main characteristics of formative assessment include:

- Identification by teachers and students of the learning outcomes and the criteria for achieving these.
- The provision of clear and rich feedback in an effective and timely fashion.
- The active involvement of students in their own learning.
- Good communication between teacher and students.
- The response by the teacher to the needs of the students.

In short, formative assessment is part of the teaching process rather than the grading process.

Summative assessment

Summative assessment is assessment that tries to summarise student learning at some point in time – usually at the end of a module or programme. Summative assessment has been described as "end-of-course assessment and essentially means that this is assessment which produces a measure which sums up someone's achievement and which has no other real use except as a description of what has been achieved" (Brown and Knight, 1994).

Thus, the use of summative assessment enables a grade to be generated that reflects the student's performance. Unfortunately, summative assessment is often restricted to just the traditional examination paper and does not involve other areas like project work, portfolios or essays. Because of the nature of summative assessment, not all learning outcomes can be assessed at any one time. Assessment of just a sample of learning outcomes is common.

Continuous assessment

In theory, continuous assessment is a combination of summative and formative assessment. In practice, continuous assessment often amounts to repeated summative assessments with marks being recorded but little or no specific feedback being given to students.

Clearly, it is important that the method of assessment that we use should attempt to test whether or not the learning outcomes have been achieved. Interestingly, it has been found that the range of assessment of students is very limited, with approximately 80 % of assessment being in the form of exams, essays and reports of some kind. (Brown,1999). For example, a study of assessment practices in University College, Dublin, Ireland found that a random sample of 83 teaching staff used a total of 256 assessments when asked to describe one of their courses, i.e. approximately 3 assessments per course. Of these assessments, the majority were summative (84 %) and a minority were formative (16 %).

Developing links between learning outcomes, teaching strategies, student activities and assessment tasks is very challenging for the teacher. The following table may be of help in developing these links.

Table C 3.4-1-2 Linking learning outcomes, teaching and learning activities and assessment

Learning outcomes	Teaching and Learning Activities	Assessment
Cognitive Demonstrate knowledge Comprehension Application Analysis Synthesis Evaluation Affective Integration of beliefs, ideas and attitudes Psychomotor Acquisition of physical skills	Lectures Tutorials Discussions Laboratory work Clinical work Group work Seminar Peer group presentation	End of module exam Multiple choice tests Essays Practical assessment. Fieldwork Clinical practice Presentation Project work

There may not be just one method of assessment to satisfy all learning outcomes and it may be necessary to choose a number of assessment methods.

Constructive alignment

The curriculum should be designed so that the teaching activities, learning activities and assessment tasks are co-ordinated with the learning outcomes. Biggs (2003) refers to this type of process as involving constructive alignment. (The *constructive* part refers to the type of learning and what the learner does. The *alignment* part refers to what the teacher does). Biggs points out that in a good teaching system, the method of teaching, learning activities and method of assessment are all co-ordinated to support student learning.

When there is alignment between what we want, how we teach and how we assess, teaching is likely to be much more effective than when it is not (aligned)... Traditional transmission theories of teaching ignore alignment. (Biggs 2003a)

Three basic tasks

It is clear from the above that there are three basic tasks involved in the constructive alignment of any module:

1. Clearly defining the learning outcomes.
2. Selecting teaching and learning methods that are likely to ensure that the learning outcomes are achieved.
3. Assessing the student learning outcomes and checking to see how well they match with what was intended.

4.2 Assessment criteria and learning outcomes

Grading criteria

Learning outcomes specify the minimum acceptable standard to enable a student to pass a module. Student performances above this basic threshold level are differentiated by applying grading criteria. Grading criteria are statements that indicate what a student must demonstrate to achieve a higher grade. These statements help to differentiate the levels of performance of a student. By making these criteria clear to students, it is hoped that students will aim for the highest levels of performance.

Giving a bare grade to a student does not provide adequate feedback on their performance since the grade simply indicates an overall level of competence. This overall grade does not identify strengths and weaknesses on specific learning outcomes. However, if the grading system is tied to some form of scoring guide, it can be a very useful way of identifying areas for improvement that need to be addressed.

Grading tool

A scoring guide that is used in assessment is often referred to as a rubric. A rubric is a grading tool used to describe the criteria used in grading the performance of students. In general, each rubric consists of a set of criteria and marks or grades associated with these criteria. Thus, rubrics help to define the criteria of the system of assessment by describing performance at different points on a rating scale.

For example, a scoring rubric used for one of the learning outcomes in module ED6001 of the Master's Degree in Science Education at University College Cork, Ireland, is as follows:

internet tip

Further information on creating and using detailed rubrics for various types of student assessment can be found on the website of the University of Monmouth, USA:

http://its.monmouth.edu/FacultyResourceCenter/rubrics.htm

Table C 3.4-1-3 Linking learning outcomes and assessment criteria

Learning outcome	Assessment criteria				
	Grade 1	Grade 2 : 1	Grade 2 : 2	Pass	Fail
On successful completion of this module, students should be able to: Summarise evidence from the science education literature to support development of a line of argument.	Outstanding use of literature showing excellent ability to synthesise evidence in analytical way to formulate clear conclusions.	Very good use of literature showing high ability to synthesise evidence in analytical way to formulate clear conclusions.	Good use of literature showing good ability to synthesise evidence in analytical way to formulate clear conclusions.	Limited use of literature showing fair ability to synthesise evidence to formulate conclusions.	Poor use of literature showing lack of ability to synthesise evidence to formulate conclusions

5. Towards the future with learning outcomes

Key characteristics

As already indicated, international trends in education show a shift from the traditional "teacher-centred" approach to a more "student-centred" approach. While traditionally the focus was on what the teacher did, in recent years the focus has been on what students have learned and can demonstrate at the end of a module or programme. Among the key characteristics of outcome-based education listed by Harden (2002) are:

- The development of clearly defined and published learning outcomes that must be achieved before the end of the programme.
- The design of a curriculum, learning strategies and learning opportunities to ensure the achievement of the learning outcome.
- An assessment process matched to the learning outcomes and the assessment of individual students to ensure that they achieve the outcomes.

5.1 Advantages of learning outcomes

Whilst there has been some criticism of outcome-based education in the literature, a learning outcomes approach to teaching and learning has received strong support at an international level. For example, Jenkins and Unwin (2001) assert that learning outcomes:

- Help teachers to tell students more precisely what is expected of them.
- Help students to learn more effectively: students know where they stand and the curriculum is made more open to them.
- Help teachers to design their materials more effectively by acting as a template for them.
- Make it clear what students can hope to gain from following a particular course or lecture.
- Help teachers select the appropriate teaching strategy matched to the intended learning outcome, e.g. lecture, seminar, group work, tutorial, discussion, peer group presentation or laboratory class.
- Help teachers to tell their colleagues more precisely what a particular activity is designed to achieve.
- Assist in setting examinations based on the materials delivered.
- Ensure that appropriate teaching and assessment strategies are employed.

Learning outcomes in medical education

When writing about the embracing of learning outcomes in medical education, Harden (2002a) comments that "where it has been implemented, outcome based education has had a significant and beneficial impact. Clarification of the learning outcomes in medical education helps teachers, wherever they are, to decide what they should teach and assess, and students what they are expected to learn". In another paper, Harden (2002b) describes how learning outcomes have been used to develop a model for use in medical training:

Learning outcomes can be specified in a way that covers the range of necessary competences and emphasises the integration of different competences in the practice of medicine. An important feature of the three-circle model of learning outcomes is that it does just that. In the inner circle are the seven learning outcomes relating to what a doctor is able to do, i.e. the technical competences expected of a doctor ('doing the right thing'); in the middle circle the learning outcomes relating to how the doctor approaches his or her task with knowledge and understanding and appropriate attitude and decision-making strategies ('doing the thing right'); and in the outer circle the ongoing development of the doctor as an individual and as a professional ('the right person doing it'). Harden, 2002b, p. 153

Adam (2004) summarises the advantages of learning outcomes under 4 main headings:

1. **Course and module design**

   Learning outcomes can:

   - Help to ensure consistency of delivery across modules and programmes.
   - Aid curriculum design by clarifying areas of overlap between modules and programmes.
   - Help course designers to determine precisely the key purposes of a course and to see how components of the syllabus fit and how learning progression is incorporated.
   - Highlight the relationship between teaching, learning and assessment and help improve course design and the student experience.
   - Promote reflection on assessment and the development of assessment criteria and more effective and varied assessment.

2. **Quality assurance**

   Learning outcomes:

   - Increase transparency and the comparability of standards between and within qualifications.
   - Possess greater credibility and utility than traditional qualifications.
   - Play a key role by acting as points of reference for establishing and assessing standards.

3. **Students**

   Learning outcomes provide:

   - Comprehensive sets of statements of exactly what the students will be able to achieve after successful study.
   - Clear information to help students with their choice of module and programme. This can lead to more effective learning.
   - Clear information to employers and higher education institutions on the achievements and characteristics associated with particular qualifications.

4. Mobility

Learning outcomes:

- Contribute to the mobility of students by facilitating the recognition of their qualifications.
- Improve the transparency of qualifications.
- Simplify credit transfer.
- Provide a common format that helps promote lifelong learning and can assist in creating multiple routes through and between different educations systems.

For further development of the advantages of using learning outcomes, particularly in an educational reform context, please see Adam, S. (2006) *An introduction to learning outcomes*, Article B.2.3-1 of this Handbook.

5.2 Potential problems with learning outcomes

One of the main concerns about the adoption of learning outcomes is the philosophical one that academic study should be open-ended and that learning outcomes do not fit in with this liberal view of learning (Adam, 2004). This need not be the case if learning outcomes are written with a focus on higher-order thinking and application skills. However, if learning outcomes are written within a very narrow framework, this could limit learning and result in a lack of intellectual challenge to learners.

Other potential problems are:

- There is a danger of an assessment-driven curriculum if learning outcomes are too confined.
- Learning outcomes could give rise to confusion among students and staff if guidelines are not adhered to when drawing up these learning outcomes.

5.3 Some concluding points

The international movement away from a "teacher-centred" approach to a more "outcome-based" approach to education has gained increased momentum from the Bologna process, with its emphasis on student-centred learning and the need to have more precision and clarity in the design and content of curricula. It is clear that learning outcomes play a key role in ensuring transparency of qualifications and of qualification frameworks. They are also central to contributing to the implementation of the various action lines of the Bologna process throughout the European Higher Education Area.

The requirement to make the teaching and learning process more transparent and more explicit presents a challenge to all involved in education. In the short term, this involves preparing for the immediate challenge of expressing modules and programmes in terms of learning outcomes. In the longer term, the adoption of the learning outcomes approach has the potential to help embrace a more systematic approach to the design of programmes and modules.

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Biographies:

Dr. **Declan Kennedy** graduated with a BSc in chemistry from University College Cork (UCC), Ireland in 1976 and subsequently studied for his Higher Diploma in Education (1977) and an MSc in x-ray crystallography (1979). He taught in Colaiste Muire, Cobh from 1976 to 1998 and as a part-time lecturer in the Education Department at UCC from 1980 to 1998. He joined the Education Department at UCC in 1998 as a full time lecturer in science education. He completed his MEd (1999) and PhD (2004) in Education at the University of York, UK.

Áine Hyland has recently retired as Professor of Education and Vice-President of University College Cork. She has represented UCC on a number of European and U.S. based teaching and learning projects, including an EUA Quality Culture Network project and an Institutional Leadership project on Teaching and Learning at the Carnegie Institute for Teaching and Learning in Higher Education in the U.S.

Dr. **Norma Ryan** is a lecturer in biochemistry at University College Cork (UCC), Ireland and since 1999 has been Director of the UCC Quality Promotion Unit. She is an Irish Bologna Promoter.

Postgraduate Programme Outcome

(Civil Engineering)

Postgraduate Programme Outcome (Civil Engineering)

The aim of the postgraduate programme is to produce graduates in master and doctor of philosophy in civil engineering in line with the inspirations of UTM which are innovative, entrepreneurial and global. In order to satisfy this aim, PEO has been formulated based on the visions and missions of UTM and FKA.

The postgraduate PEOs are as follows;

PEO 1 : Mastery of competencies and integration of knowledge required in the profession.

PEO 2 : An appreciation of the value of lifelong learning and possessing enthusiasm and strong commitment to continued acquisition of new knowledge and skills.

PEO 3 : Advanced leadership and team working skills that allow professionals to become visionary and inspirational leaders.

PEO 4 : Highly developed oral and written communications skills that fit at all level, appropriate to the field of profession.

PEO 5 : An appreciation of the ethics and integrity in management, leadership and good governance, and responsibility to their professions and community.

The Programme Learning Outcomes (LOs) are attributes that are expected to be attained by students upon completion of their postgraduate degree in Civil Engineering programme. Our programme Learning Outcomes are described as follows;

PO 1 : Advanced Knowledge

- Graduate are able to **incorporate** in-depth relevant knowledge in professional practices for the benefits of both national and international communities.
- Graduates are able to apply their knowledge and skills in the planning, analysis, design and supervision of works related to the civil engineering discipline.

PO 2 : Critical Thinking and Research

- Graduate are able to **manage** conducive working environment qualities problem solving and higher order thinking skills.
- Graduates are technically competent in solving problems logically, analytically and creatively based on sound facts and ideas.

PO 3 : Communication

- Graduate are able to **apply** a wide range of relevant knowledge through effective oral and written communications.
- Graduates are able to **communicate** effectively across a range of contexts and audiences.

PO 4 : Professional Ethics and Integrity

- Graduate are able to **balance** professional and ethical responsibilities including contemporary issues and environmental awareness.

PO 5 : Life-long learning

- Graduate are able to **adopt** the latest relevant knowledge and cutting-edge technologies through life-long learning process.

PO 6 : Management and Entrepreneurship

- Graduates are able to **explain** managerial concepts and identify business opportunities and initiate action to achieve it.

PO 7 : Teamwork and Leadership

- Graduate are able to **manage** conducive working environment qualities through effective leadership and team working skills that allow professionals to become visionary and inspirational leaders

MSc in Sports and Exercise Medicine

Course Objectives

1. The course will give participants a thorough grounding in the basic sciences required for sports medicine. Workshops aim to provide the practical skills in history taking and musculoskeletal examination; in the laboratory you will learn the basics of physiological assessment of athletes. The completion of the MSc project write up represents an introduction to the scientific process of high quality experimental design, methodology, data analysis and scientific report writing.
2. No course can claim to cover every aspect of sports medicine and participants are asked to read widely around material presented in lectures and workshops. In our experience Doctors are skilled in clinical history taking and medical examination, but often have insufficient handling skills and knowledge of musculoskeletal examination. Physiotherapists may have more experience in musculoskeletal examination, especially handling skills, but frequently have knowledge deficits in medical differential diagnosis. All groups do not usually appreciate the relevance of their basic undergraduate clinical anatomy and physiology and are usually inexperienced in basic experimental design, quality data collection and analysis of results.

The deliberate mix of physiotherapists and doctors aims to allow knowledge and expertise to cross over and enrich both disciplines and it is the fundamental philosophy of the course that each of the disciplines learns from each other's skills and knowledge.

Learning Outcomes

On successful completion of the program students will be able to:

- Describe in detail the structure and function of musculoskeletal, cardio-respiratory, nervous and other associated systems, and describe how these respond and interact during exercise and training.
- Demonstrate advanced experiential knowledge and handling skills, in clinical examination of the musculoskeletal and nervous system.
- Demonstrate advanced experiential knowledge in laboratory and field based exercise testing in athletic and non-athletic populations.
- Demonstrate an advanced knowledge of the diagnosis, biological basis, treatment and rehabilitation of exercise and sports related injuries, and common illnesses impacting on sports and exercise performance.
- Demonstrate practical experience as a service provider to a collegiate or other sports team in management of acute injuries and emergencies on the field of play and in injury management and rehabilitation during follow up of athletes in the sports medicine clinic.
- Demonstrate an advanced knowledge of pre-participation health screening, training program design and monitoring, and the nutritional and psychological strategies required to maximise performance in athletic populations.
- Demonstrate a detailed knowledge and critical understanding of selected areas of sports and exercise medicine gained through independent research.
- Synthesise and critically evaluate published information and present it in written or oral format to both specialist and non-specialist audiences.
- Pursue, under supervision, a sports and exercise related research project.
- Demonstrate knowledge of key experimental methodologies used to answer research questions in sports and exercise medicine.
- Recognise the value of scientific enquiry and demonstrate an understanding of the ethical responsibility of scientists undertaking research projects on human subjects in sports and exercise medicine.
- Show proficiency in searching literature databases and analysis and presentation of data.
- Instigate, maintain and appraise their own self-directed learning.
- Apply an empirical approach to problem solving.

Sample Learning Outcomes

Languages and Literature:

Students will be able to apply critical terms and methodology in completing a literary analysis following the conventions of standard written English.

Students will be able to locate, apply and cite effective secondary materials in their own texts.

Students will be able to analyze and interpret texts within the contexts they are written.

French students will be able to demonstrate oral competence with suitable accuracy in pronunciation, vocabulary, and language fluency.

French students will be able to produce written work that is substantive, organized, and grammatically accurate.

French students will be able to accurately read and translate French texts.

Humanities and Fine Arts:

Students will be able to demonstrate fluency with formal vocabulary, artistic techniques and procedures of two-dimensional and three-dimensional art practice.

Students will demonstrate in-depth knowledge of artistic periods used to interpret works of art including the historical, social and philosophical contexts .

Students will be able to critique and analyze works of art and visual objects .

Students will be able to identify musical elements, take them down at dictation, and perform them at sight.

Students will be able to communicate both orally and verbally about music of all genres and styles in a clear and articulate manner.

Students will be able to perform a variety of memorized songs from a standard of at least two foreign languages.

Students will be able to apply performance theory in the analysis and evaluation of performances and texts.

Students will be able to analyze and interpret scripts.

Students will demonstrate in-dept knowledge and understanding of contemporary theatre forms and artists.

Students will be able to demonstrate proficiency in a variety of dance styles, including ballet, modern dance, jazz, and tap.

Sample Learning Outcomes

Physical and Biological Sciences:

Students will be able to demonstrate an understanding of core knowledge in biochemistry and molecular biology.

Students will be able to apply critical thinking and analytical skills to solve scientific data sets.

Students will be able to apply the scientific method to solve problems.

Students will be able to demonstrate written, visual, and/or oral presentation skills to communicate scientific knowledge.

Students will be able to acquire and synthesize scientific information from a variety of sources.

Students will be able to apply techniques and instrumentation to solve problems.

Mathematics:

Students will be able to translate problems for treatment within a symbolic system.

Students will be able to articulate the rules that govern a symbolic system.

Students will be able apply algorithmic techniques to solve problems and obtain valid solutions.

Students will be able to judge the reasonableness of obtained solutions.

Social Sciences:

Students will be able to write clearly and persuasively to communicate their scientific ideas clearly.

Students will be able to test hypotheses and draw correct inferences using quantitative analysis.

Students will be able to evaluate theory and critique research within the discipline.

Business:

Students will be able to work in groups and be part of an effective team.

Students will be able to communicate business knowledge both orally and written.

Students will be able to recognize and respond appropriately to an ethical and regulatory dilemma.

Students will be able to recognize and diagnose accounting problems.

Students will demonstrate disciplinary competence in a field of business.

(NOTE: These samples were gathered from a variety of sources including UR assessment plans, program assessment statements at other institutions, etc.)

PROGRAM STRUCTURE AND CONTENT

PROGRAM STRUCTURE AND CONTENT

Curriculum of BSP is an educational study program with eight semesters in maximum or four-year study. Curriculum has been organized mainly by referring to Expected Learning Outcome (ELO), staff resources and infrastructure capacities. Evaluation and reconstruction of the curriculum has regularly been held every four years to assure that the curriculum develops based on updated science and technology, social-culture and stakeholder needs.

The Components of ELO were elaborated into four main competencies of graduate (Figure 3.0) and transfer to a structure of the curriculum arranged gradually semester to semester during student study period (Figure 3.1). There are (1) Biological science and success life skill; (2) Structure, function, and organization of life; (3) Coordination of life, regulation of growth and development and its analysis, and also; (4) Bio-scientific research and writing.

In each semester, student competency (reflecting reached learning outcome) is supported by some study topics that are classified to particular subjects (Figure 3.2).The whole ELOs are covered indeed in complete subjects represented in a matrix as shown in Table 3.1 for some subjects.

Based on the ELOs, the contents of each subject are described including mechanism how to transfer knowledge, skill and spirit to students, and also a method of evaluation (Table 3.2). A manual/handbook of each defined subject is stated as Semester Teaching-Learning Program (STLP). The STLP should be developed every semester before the lecture is done to assure the subject content is up to date. Then it is delivered to students.

The curriculum has been designed to provide eight semesters (four years) study period for a student to accomplish 144 credits, which is approximately covered with 40-45 subjects. Distribution of the subject in each semester is arranged proportionately based on competency increment of students gained during their study. Detailed structure of the curriculum is provided in the Faculty Academic Handbook published every year.

The events of social-culture are also actively accommodated in the curriculum. The developments of these aspects should consider natural resource conservation and local wisdom in area around Salaya Campus. Aspiration of citizen living in surrounding areas of the campus gives influence on community demand, graduate competency (ELO) and uniqueness of BSP curriculum. The result of stakeholder need analysis reveals an image of work labor demands.

The competency is described in a matrix divided into main competency and supporting competency. Main competencies are organized to students having literacy in modern concept of Biology in four aspects of knowledge, workability, attitude or ethic that graduates must possess.

The curriculum consists of compulsory courses (78 %), optional courses (22 %) that supporting main competencies and additional abilities for the enrichment of graduates that are derived from vision-missions of University as a community-based research university.

Compulsory courses are organized from basic topics to those which are complex. Every compulsory course relates to each other and becomes prerequisite for courses in the following semester. In the first semester, teaching-learning is focused on basic sciences supporting Biology comprehension (Chemistry, Physics, Mathematics, Statistics, and Computer) and basic general courses (Languages and Scientific Writing) which can help students as a new biologist generation and a part of scientific society. In the 2nd, 3rd, 4th, and 5th semester, topics on basic biological concepts of structure and function of life organization, coordination, regulation, and their analysis are arranged gradually, then students have ability to practice some field works both in institutions and social community in 6th-7th semester, and finally students can accomplish their research project and publish it in 8th semester.

As can be seen, the curriculum is logically structured, sequenced and integrated. Furthermore, the curriculum is evaluated every four years to make certain of it is up to date.

ELO	Knowledge Literacy	Work Skills	Attitude	Leaderchip and Managerial
Main	CU.1 Having Biology literacy and success skill	PU.1 Good at selecting appropriate method for solving biological problems.	AU.1 Having Scientific attitudes (curiosity, objective, rational, critical, openminded, creative, innovative, etc.)	LU.1 Having Bio-entrepreneurship spirit (leadership, managerial, inner motivated, responsive, team-work etc.)
	CU.2 Understanding the structure, function & organization of life	PU.2 Good at communicating in Indonesian and English language.	AU.2 Having Social behavior (polite, honor people, responsible, etc.)	
	CU.3 Understanding the coordination of life, regulation of growth and development and its analysis	PU.3 Good at operating basic computer, software application, basic instrument, standard method for application, and synthesis in Biology		
	CU.4 Understanding the bio-scientific research and writing	PU.4 Good in using the Bioinformatics and Computational Biology (analysis of biostatistic, Clustering/ Coordination, Phenetic-Phylogenetic, GIS)		
Supporting	CP.1 Understanding the management related to Research & Development, procedure standard and work quality	PP.1 Good in practicing the internship as consultant, researcher, entrepreneur, environmental assessment	AP.1 Having Personal approach (act based on the role, lobbying etc.)	
	CP.2 Understanding the market need analysis to start entrepreneurship	PP.2 Good at conducting the Bioassay		
		PP.3 Having ability to analyze the market need, to start entrepreneurship, marketing, promotion and entrepreneurship practice		

CU : Knowledge Literacy (Main)
PU : Work Skills (Main)
AU : Attitude (Main)
LU : Leadership and Managerial (Main)

CP : Knowledge Literacy (Supporting)
PP : Work Skills (Supporting)
AP : Attitude (Supporting)
LP : Leadership and Managerial (Supporting)

Fig 3.0 Programme learning outcomes elaborated into four main competencies

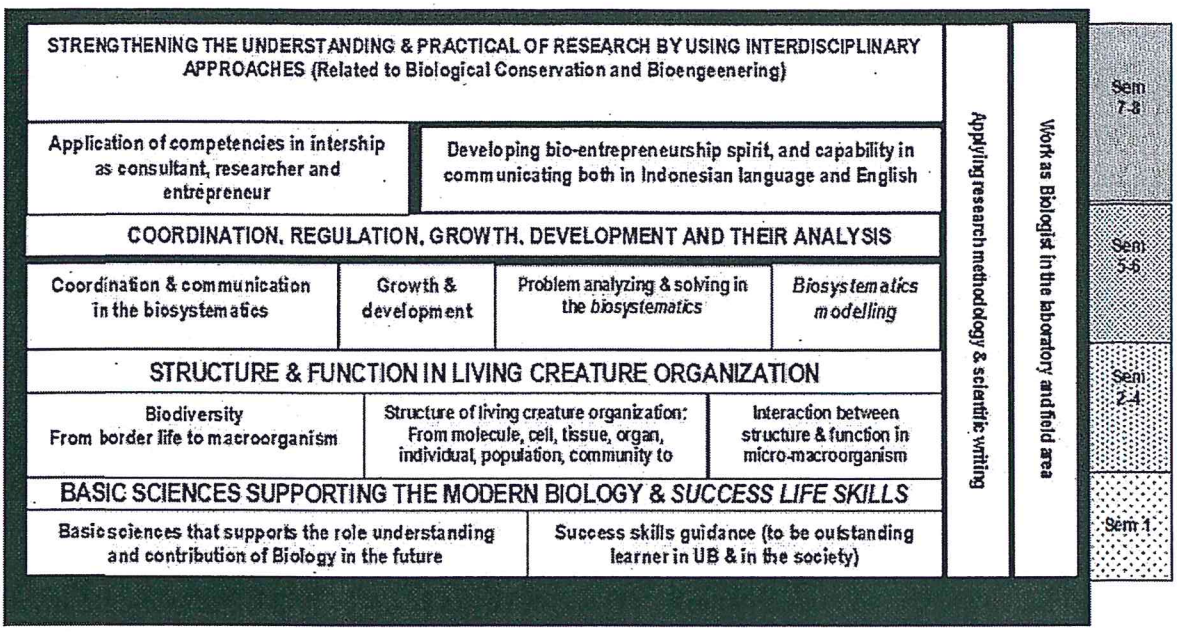

Fig 3.1 Curriculum Structure of BSP

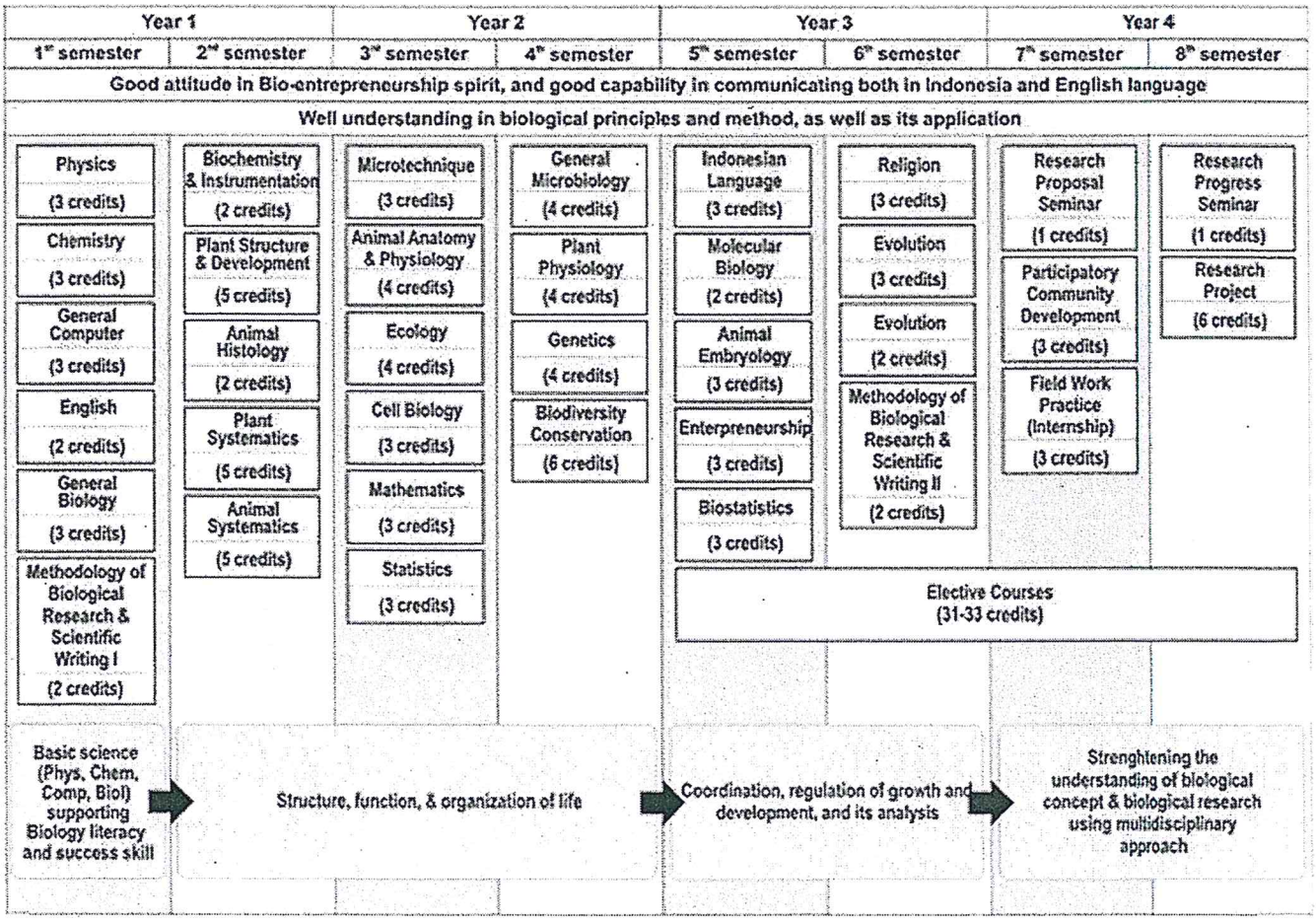

Fig 3.2 Curriculum Map of Undergraduate Course of BSP

Study plan

Table 3.1 Matrix of ELO and Subjects (Example for some subject)

No	Strategy	*Expected Learning Outcome*																		
		Knowledge Literacy							Intellectual Skill								Attitude		Leadership & Managerial	
		Main				Supporting		Others	Main				Supporting			Others			Main	Supporting
		P.U.1	P.U.2	P.U.3	P.U.4	P.P.1	P.P.2		K.U.1	K.U.2	K.U.3	K.U.4	K.P.1	K.P.2	K.P.3		T.U.1	T.U.2	M.U.1	M.P.1
1	Lecturing	•	•	•	•	•	•	•												
2	Student Presentation	•	•	•	•	•	•	•		•						•	•	•	•	
3	Class discussion	•	•	•	•	•	•	•		•										•
4	Group discussion	•	•	•	•	•	•	•												•
5	Homework	•	•	•	•	•	•	•								•				
6	Teamwork task							•	•					•	•	•				
7	Laboratory Practice							•	•		•	•		•		•	•	•	•	
8	Field work							•	•		•	•	•	•	•	•	•	•	•	•
9	Small project							•	•		•	•	•	•	•	•	•	•	•	•
10	Review							•	•		•	•	•	•	•	•	•	•	•	•

Table 3.2 Strategy of Teaching Learning Activities

No	Strategy	*Expected Learning Outcome*																		
		Knowledge Literacy							Intellectual Skill								Attitude		Leadership & Managerial	
		Main				Supporting		Others	Main				Supporting			Others			Main	Supporting
		P.U.1	P.U.2	P.U.3	P.U.4	P.P.1	P.P.2		K.U.1	K.U.2	K.U.3	K.U.4	K.P.1	K.P.2	K.P.3		T.U.1	T.U.2	M.U.1	M.P.1
1	Lecturing	•	•	•	•	•	•	•												
2	Student Presentation	•	•	•	•	•	•	•		•						•	•	•	•	
3	Class discussion	•	•	•	•	•	•	•		•										•
4	Group discussion	•	•	•	•	•	•	•												•
5	Homework	•	•	•	•	•	•	•								•				
6	Teamwork task							•	•					•	•	•				
7	Laboratory Practice							•	•		•	•		•		•	•	•	•	
8	Field work							•	•		•	•	•	•	•	•	•	•	•	•
9	Small project							•	•		•	•	•	•	•	•	•	•	•	•
10	Review							•	•		•	•	•	•	•	•	•	•	•	•