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PART A – INSTITUTIONAL PILLARS:STRENGTHENING THE INSTITUTIONS

Academia: Teaching and Learning

Imperatives

We must produce confident students with a sense of balance and proportion. While an individual may specialise in a certain area, his or her perspective should be enriched by other experiences as well. The MOHE will thus introduce a holistic programme that will cut across all disciplines and focus on communication and entrepreneurial skills. The programme, which is intended to build a balanced perspective in all students, will expose them to subjects beyond their area of specialisation. For example, students reading for degrees in the sciences such as medicine, engineering and chemistry will be exposed to courses covering literature and philosophy. Likewise, students in the humanities will be exposed to the rudiments of science and technology, and certainly, ICT.

Dynamic and relevant curriculum and pedagogy are needed to ensure the health and strength of an institution. Inter-disciplinary approaches to the design of higher education curricula will build and stimulate creativity, innovation, leadership and entrepreneurship. Curricula must also equip undergraduates with appropriate skills to enable them to compete in an ever-changing market. Curricula must be reviewed, and courses that are no longer relevant must be removed. Peer review and industry collaboration must be enhanced in curricula development and evaluation.

Desired Outcomes

- Critical thinking, communication skills, excellent English proficiency and enhanced IT skills must form the common foundation of all graduates regardless of their chosen disciplines. These new focuses will be incorporated into a compulsory curriculum, which runs concurrently with degree programmes at all HEIs.

- All lecturers are expected to demonstrate scholarship in their fields of specialisation, and to demonstrate professionalism and competence in their ability to teach.

ACTION PLAN

- Design holistic programmes: students in the pure sciences will be exposed to humanities subjects, and vice versa.
- Embed career skills development into teaching and learning of core curriculum. Career skills to include soft skills, IT awareness, and entrepreneurship.
- Provide compulsory in-service training in pedagogy for all HEI teaching staff. Teaching KPIs used in their evaluation.
- Establish multi-purpose centres serving the triple objectives of pedagogical development, curriculum development and evaluation.
- Implement measures to make research into teaching methods a priority.
- Promote innovative teacher-training methods, training and research through AKePT.

While the curriculum is important, its delivery is equally critical. HEI academic staff are today expected to be leaders in the field of teaching. While reformed administrative procedures and excellent curricula will aid HEIs in achieving their true potential, teaching staff form the frontline of this transformation and

must focus on innovative delivery of curricula. Adoption of innovative modes such as active learning or problem-based learning will be encouraged where appropriate to promote the development of communication, problem-solving, and self-directed learning skills.

Evaluation is an important aspect of pedagogy, the skills of which must be acquired by all academic staff. Good teaching must be followed by good evaluation. The aim of evaluation is to obtain information regarding the level of mastery of a subject that the student has learned and grasped.

A policy will be formulated to encourage the acquisition and demonstration of teaching skills for all HEI academic staff. As a first step, the MOHE will draw up in-service programmes for university lecturers and professors to undergo enrichment programmes in the science and methodology of pedagogy.

Understanding by Design by Grant Wiggins and Jay McTighe

Backward Design

Why "backward" is best

Deliberate and focused instructional design requires us as teachers and curriculum writers to make an important shift in our thinking about the nature of our job. The shift involves thinking a great deal, first, about the specific learnings sought, and the evidence of such learnings, before thinking about what we, as the teacher, will do or provide in teaching and learning activities. Though considerations about what to teach and how to teach it may dominate our thinking as a matter of habit, the challenge is to focus first on the desired learnings from which appropriate teaching will logically follow.

Our lessons, units, and courses should be logically inferred from the results sought, not derived from the methods, books, and activities with which we are most comfortable. Curriculum should lay out the most effective ways of achieving specific results. It is analogous to travel planning. Our frameworks should provide a set of itineraries deliberately designed to meet cultural goals rather than a purposeless tour of all the major sites in a foreign country. In short, the best designs derive backward from the learnings sought.

The appropriateness of this approach becomes clearer when we consider the educational purpose that is the focus of this book: understanding. We cannot say *how* to teach for understanding or *which* material and activities to use until we are quite clear about which specific understandings we are after and what such understandings look like in practice. We can best decide, as guides, what "sites" to have our student "tourists" visit and what specific "culture" they should experience in their brief time there only if we are clear about the particular understandings about the culture we want them to take home. Only by having specified the desired results can we focus on the content, methods, and activities most likely to achieve those results.

But many teachers begin with and remain focused on textbooks, favored lessons, and time-honored activities—the inputs—rather than deriving those means from what is implied in the desired results—the output. To put it in an odd way, too many teachers focus on the *teaching* and not the *learning*. They spend most of their time thinking, first, about what they will do, what materials they will use, and what they will ask students to do rather than first considering what the learner will need in order to accomplish the learning goals.

Consider a typical episode of what might be called *content*-focused design instead of *results*-focused design. The teacher might base a lesson on a particular topic (e.g., racial prejudice), select a resource (e.g., *To Kill a Mockingbird*), choose specific instructional methods based on the resource and topic (e.g., Socratic seminar to discuss the book and cooperative groups to analyze stereotypical images in films and on television), and hope thereby to cause learning (and meet a few English/language arts standards). Finally, the teacher might think up a few essay questions and quizzes for assessing student understanding of the book.

This approach is so common that we may well be tempted to reply, What could be wrong with such an approach? The short answer lies in the basic questions of purpose: Why are we asking students to read this particular novel—in other words, what *learnings* will we seek from their having read it? Do the students grasp why and how the purpose should influence their studying? What should students be expected to understand and do upon reading the book, related to our goals beyond the book? Unless

we begin our design work with a clear insight into larger purposes—whereby the book is properly thought of as a means to an educational end, not an end unto itself—it is unlikely that all students will *understand* the book (and their performance obligations). Without being self-conscious of the specific understandings about prejudice we seek, and how reading and discussing the book will help develop such insights, the goal is far too vague: The approach is more "by hope" than "by design." Such an approach ends up unwittingly being one that could be described like this: Throw some content and activities against the wall and hope some of it sticks.

Answering the "why?" and "so what?" questions that older students always ask (or want to), and doing so in concrete terms as the focus of curriculum planning, is thus the essence of understanding by design. What is difficult for many teachers to see (but easier for students to feel!) is that, without such explicit and transparent priorities, many students find day-to-day work confusing and frustrating.

The twin sins of traditional design

More generally, weak educational design involves two kinds of purposelessness, visible throughout the educational world from kindergarten through graduate school. We call these the "twin sins" of traditional design. The error of activity-oriented design might be called "hands-on without being minds-on"—engaging experiences that lead only accidentally, if at all, to insight or achievement. The activities, though fun and interesting, do not lead anywhere intellectually. Such activity-oriented curricula lack an explicit focus on important ideas and appropriate evidence of learning, especially in the minds of the learners.

A second form of aimlessness goes by the name of "coverage," an approach in which students march through a textbook, page by page (or teachers through lecture notes) in a valiant attempt to traverse all the factual material within a prescribed time. Coverage is thus like a whirlwind tour of Europe, perfectly summarized by the old movie title *If It's Tuesday, This Must Be Belgium*, which properly suggests that no overarching goals inform the tour.

As a broad generalization, the activity focus is more typical at the elementary and lower middle school levels, whereas coverage is a prevalent secondary school and college problem. No guiding intellectual purpose or clear priorities frame the learning experience. In neither case can students see and answer such questions as these: What's the point? What's the big idea here? What does this help us understand or be able to do? To what does this relate? Why should we learn this? Hence, the students try to engage and follow as best they can, hoping that meaning will emerge.

The three stages of backward design

Stage 1: Identify desired results

What should students know, understand, and be able to do? What content is worthy of understanding? What *enduring* understandings are desired? In Stage 1 we consider our goals, examine established content standards (national, state, district), and review curriculum expectations. Because typically we have more content than we can reasonably address within the available time, we must make choices. This first stage in the design process calls for clarity about priorities.

Stage 2: Determine acceptable evidence

How will we know if students have achieved the desired results? What will we accept as evidence of student understanding and proficiency? The backward design orientation suggests that we think about a unit or course in terms of the collected assessment evidence needed to document and validate that the desired learning has been achieved, not simply as content to be covered or as a series of learning activities. This approach encourages teachers and curriculum planners to first "think like an assessor" before designing specific units and lessons, and thus to consider up front how they will determine if students have attained the desired understandings.

Stage 3: Plan learning experiences and instruction

With clearly identified results and appropriate evidence of understanding in mind, it is now the time to fully think through the most appropriate instructional activities. Several key questions must be considered at this stage of backward design: What enabling knowledge (facts, concepts, principles) and skills (processes, procedures, strategies) will students need in order to perform effectively and achieve desired results? What activities will equip students with the needed knowledge and skills? What will need to be taught and coached, and how should it best be taught, in light of performance goals? What materials and resources are best suited to accomplish these goals?

Note that the specifics of instructional planning—choices about teaching methods, sequence of lessons, and resource materials—can be successfully completed only after we identify desired results and assessments and consider what they imply. Teaching is a means to an end. Having a clear goal helps to focus our planning and guide purposeful action toward the intended results.

Conclusion

Backward design may be thought of, in other words, as purposeful task analysis: Given a worthy task to be accomplished, how do we best get everyone equipped? Or we might think of it as building a wise itinerary, using a map: Given a destination, what's the most effective and efficient route? Or we might think of it as planning for coaching: What must learners master if they are to effectively perform? What will count as evidence *on the field*, not merely in drills, that they really get it and are ready to *perform with understanding, knowledge, and skill* on their own? How will the learning be designed so that learners' capacities are developed through use and feedback?

This is all quite logical when you come to understand it, but "backward" from the perspective of much habit and tradition in our field. A major change from common practice occurs as designers must begin to think about assessment *before* deciding what and how they will teach. Rather than creating assessments near the conclusion of a unit of study (or relying on the tests provided by textbook publishers, which may not completely or appropriately assess our standards and goals), backward design calls for us to make our goals or standards specific and concrete, in terms of assessment evidence, as we begin to plan a unit or course.

The rubber meets the road with assessment. Three different teachers may all be working toward the same content standards, but if their assessments vary considerably, how are we to know which students have achieved what? Agreement on needed evidence of learning leads to greater curricular coherence and more reliable evaluation by teachers. Equally important is the long-term gain in teacher, student, and parent insight about what does and does not count as evidence of meeting complex standards.

Home http://www.fctel.uncc.edu/index.html

Writing Objectives Using Bloom's Taxonomy

Various researchers have summarized how to use Bloom's Taxonomy. Following are four interpretations that you can use as guides in helping to write objectives using Bloom's Taxonomy.

From: http://www.kcmetro.cc.mo.us/longview/ctac/blooms.htm

Bloom's Taxonomy divides the way people learn into three domains. One of these is the cognitive domain, which emphasizes intellectual outcomes. This domain is further divided into categories or levels. The key words used and the type of questions asked may aid in the establishment and encouragement of critical thinking, especially in the higher levels.

Level	Level Attributes	Keywords	Questions
1: Knowledge	Exhibits previously learned material by recalling facts, terms, basic concepts and answers.	who, what, why, when, omit, where, which, choose, find, how, define, label, show, spell, list, match, name, relate, tell, recall, select	What is ...? How is ...? Where is ...? When did _____ happen? How did _____ happen? How would you explain ...? Why did ...? How would you describe ...? When did ...? Can you recall ...? How would you show ...? Can you select ...? Who were the main ...? Can you list three ...? Which one ...? Who was ...?
2: Comprehension	Demonstrating understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas.	compare, contrast, demonstrate, interpret, explain, extend, illustrate, infer, outline, relate, rephrase, translate, summarize, show, classify	How would you classify the type of ...? How would you compare ...? contrast ...? Will you state or interpret in your own words ...? How would you rephrase the meaning ...? What facts or ideas show ...? What is the main idea of ...? Which statements support ...? Can you explain what is happening . . . what is meant . . .?

Level	Level Attributes	Keywords	Questions
			What can you say about ...? Which is the best answer ...? How would you summarize ...?
3: Application	Solving problems by applying acquired knowledge, facts, techniques and rules in a different way.	apply, build, choose, construct, develop, interview, make use of, organize, experiment with, plan, select, solve, utilize, model, identify	How would you use ...? What examples can you find to ...? How would you solve _____ using what you have learned ...? How would you organize _____ to show ...? How would you show your understanding of ...? What approach would you use to ...? How would you apply what you learned to develop ...? What other way would you plan to ...? What would result if ...? Can you make use of the facts to ...? What elements would you choose to change ...? What facts would you select to show ...? What questions would you ask in an interview with ...?
4: Analysis	Examining and breaking information into parts by identifying motives or causes; making inferences and finding evidence to support generalizations.	analyze, categorize, classify, compare, contrast, discover, dissect, divide, examine, inspect, simplify, survey, take part in, test for, distinguish, list, distinction, theme, relationships, function, motive, inference, assumption, conclusion	What are the parts or features of ...? How is _____ related to ...? Why do you think ...? What is the theme ...? What motive is there ...? Can you list the parts ...? What inference can you make ...? What conclusions can you draw ...? How would you classify ...? How would you categorize ...? Can you identify the difference parts ...? What evidence can you find ...? What is the relationship between ...? Can you make a distinction between ...? What is the function of ...?

Level	Level Attributes	Keywords	Questions
			What ideas justify ...?
5: Synthesis	Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions.	build, choose, combine, compile, compose, construct, create, design, develop, estimate, formulate, imagine, invent, make up, originate, plan, predict, propose, solve, solution, suppose, discuss, modify, change, original, improve, adapt, minimize, maximize, delete, theorize, elaborate, test, improve, happen, change	What changes would you make to solve ...? How would you improve ...? What would happen if ...? Can you elaborate on the reason ...? Can you propose an alternative ...? Can you invent ...? How would you adapt _____ to create a different ...? How could you change (modify) the plot (plan) ...? What could be done to minimize (maximize) ...? What way would you design ...? What could be combined to improve (change) ...? Suppose you could _____ what would you do ...? How would you test ...? Can you formulate a theory for ...? Can you predict the outcome if ...? How would you estimate the results for ...? What facts can you compile ...? Can you construct a model that would change ...? Can you think of an original way for the ...?
6: Evaluation	Presenting and defending opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.	award, choose, conclude, criticize, decide, defend, determine, dispute, evaluate, judge, justify, measure, compare, mark, rate, recommend, rule on, select, agree, interpret, explain, appraise, prioritize, opinion, ,support, importance, criteria, prove, disprove, assess, influence, perceive,	Do you agree with the actions ...? with the outcomes ...? What is your opinion of ...? How would you prove ...? disprove ...? Can you assess the value or importance of ...? Would it be better if ...? Why did they (the character) choose ...? What would you recommend ...? How would you rate the ...? What would you cite to

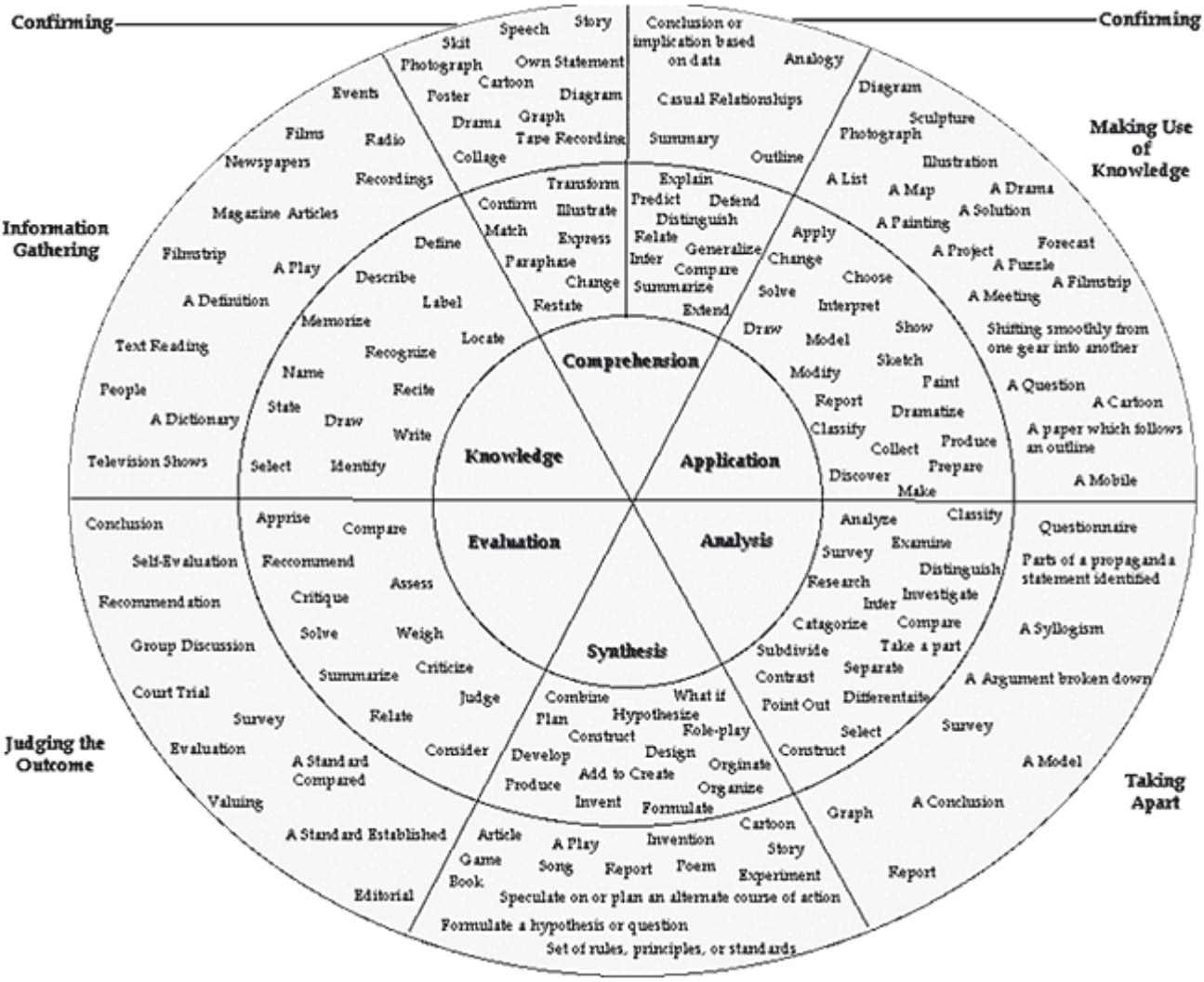
Level	Level Attributes	Keywords	Questions
		value, estimate, influence, deduct	defend the actions ...? How would you evaluate ...? How could you determine ...? What choice would you have made ...? What would you select ...? How would you prioritize ...? What judgment would you make about ...? Based on what you know, how would you explain ...? What information would you use to support the view ...? How would you justify ...? What data was used to make the conclusion ...? Why was it better that ...? How would you prioritize the facts ...? How would you compare the ideas ...? people ...?

From: http://www.umuc.edu/ugp/ewp/bloomtax.html

Bloom's Ranking of Thinking Skills					
Knowledge	**Comprehension**	**Application**	**Analysis**	**Synthesis**	**Evaluation**
List, Name, Identify, Show, Define, Recognize, Recall, State, Visualize	Summarize, Explain, Interpret, Describe, Compare, Paraphrase, Differentiate, Demonstrate, Classify	Solve, Illustrate, Calculate, Use, Interpret, Relate, Manipulate, Apply, Modify	Analyze, Organize, Deduce, Contrast, Compare, Distinguish, Discuss, Plan, Devise	Design, Hypothesize, Support, Schematize, Write, Report, Justify	Evaluate, Choose, Estimate, Judge, Defend, Criticize

From: http://www.stedwards.edu/cte/bwheel.htm

Task Oriented Question Construction Wheel Based on Bloom's Taxonomy



Task Oriented Question Construction Wheel Based on Bloom's Taxonomy.
©2001 St. Edward's University Center for Teaching Excellence.
http://www.stedwards.edu/cte/bwheel.htm

From: http://epitome.ce.gatech.edu/iowa/how.html

According to Benjamin Bloom, and his colleagues, there are six levels of cognition:

1. Knowledge: rote memorization, recognition, or recall of facts
2. Comprehension: understanding what the facts mean
3. Application: correct use of the facts, rules, or ideas
4. Analysis: breaking down information into component parts
5. Synthesis: combination of facts, ideas, or information to make a new whole
6. Evaluation: judging or forming an opinion about the information or situation

Ideally, each of these levels should be covered in each course and, thus, at least one objective should be written for each level. Depending on the nature of the course, a few of these levels may need to be given more emphasis than the others.

Below are examples of objectives written for each level of Bloom's Taxonomy and activities and assessment tools based on those objectives. Common key verbs used in drafting objectives are also listed for each level.

Level	Level Attributes	Keywords	Example Objective	Example Activity	Example Assessment
1: Knowledge	Rote memorization, recognition, or recall of facts.	list, recite, define, name, match, quote, recall, identify, label, recognize	"By the end of this course, the student will be able to recite Newton's three laws of motion."	Have students group up and perform simple experiments to the class showing how one of the laws of motion works.	Use the following question on an exam or homework. "Recite Newton's three laws of motion."
2: Comprehension	Understanding what the facts mean.	describe, explain, paraphrase, restate, give original examples of, summarize, interpret, discuss	"By the end of this course, the student will be able to explain Newton's three laws of motion in his/her own words."	Group students into pairs and have each pair think of words that describe motion. After a few minutes, ask pairs to volunteer some of their descriptions and write these descriptions on the board.	Assign the students to write a simple essay that explains what Newton's laws of motion mean in his/her own words.
3: Application	Correct use of the facts, rules, or ideas.	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model	"By the end of this course, the student will be able to calculate the kinetic energy of a projectile."	After presenting the kinetic energy equation in class, have the students pair off for just a few minutes and practice using it so that they feel comfortable with it before being	On a test, define a projectile and ask the students to "Calculate the kinetic energy of the projectile."

Level	Level Attributes	Keywords	Example Objective	Example Activity	Example Assessment
				assessed.	
4: Analysis	Breaking down information into component parts.	classify, outline, break down, categorize, analyze, diagram, illustrate	"By the end of this course, the student will be able to differentiate between potential and kinetic energy."	Present the students with different situations involving energy and ask the students to categorize the energy as either kinetic or potential then have them explain in detail why they categorized it the way they did, thus breaking down what exactly makes up kinetic and potential energy.	Give the students an assignment that asks them outline the basic principles of kinetic and potential energy. Ask them to point out the differences between the two as well as how they are related.
5: Synthesis	Combining parts to make a new whole.	design, formulate, build, invent, create, compose, generate, derive, modify, develop	By the end of this section of the course, the student will be able to design an original homework problem dealing with the principle of conservation of energy."	Tie each lecture or discussion to the previous lectures or discussions before it, thus helping the students assemble all the discreet classroom sessions into a unified topic or theory.	Give the students a project in which they must design an original homework problem dealing with the principle of conservation of energy.
6: Evaluation	Judging the value or worth of information	choose, support, relate,	"By the end of the course, the student	Have different groups of students solve	On a test, describe a dynamic

Level	Level Attributes	Keywords	Example Objective	Example Activity	Example Assessment
	or ideas.	determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate	will be able to determine whether using conservation of energy or conservation of momentum would be more appropriate forsolving a dynamics problem."	the same problem using different methods, then have each group present the pros and cons of the method they chose.	system and ask the students which method they would use to solve the problem and why.

ACTIVITIES AT VARIOUS COGNITIVE LEVELS OF LEARNING (LOL)

Bloom's taxonomy of learning objectives is used to define how well a skill or competency is learned or mastered. A fuller description of Bloom's taxonomy is given in the following pages but a brief summary of the activities associated with each level is given below.

1. At Knowledge Level of Learning a student can define terms
2. At Comprehension Level of Learning a student can work assigned problems and can show examples of what they did
3. At Application Level of Learning a student recognizes what methods to use and then use the methods to solve problems
4. At Analysis Level of Learning a student can explain why the solution process works
5. At Synthesis Level of Learning a student can combine the part of a process in new and useful ways
6. At Evaluation Level of Learning a student can create a variety of ways to solve the problem and then, based on established criteria, select the solution method best suited for the problem.

KNOWLEDGE (INFORMATION)

1. How do **I know** I have reached this level?

   I can recall information about the *subject, topic, competency,* or *competency area*; I can *recall* the appropriate material at the appropriate time. I have been *exposed* to and have *received* the information about the subject; thus, I can respond to questions, perform relevant tasks, etc.

2. What do **I do** at this level?

   I read material, listen to lectures, watch videos, take notes; I pass 'True/False', 'Yes/No', 'multiple choice', or 'fill in the blank' tests which demonstrate my *general knowledge* of the *subject*. I learn the vocabulary or terminology as well as the conventions or rules associated with the *subject*.

3. How will the **teacher know** I am at this level?

   The teacher will provide *verbal* or *written* tests on the *subject* that can be answered by simply *recalling* the material I have learned about this subject.

4. What does the **teacher do** at this level?

   The teacher directs, tells, shows, identifies, examines the subject or competency area *at this level*.

5. What are typical ways **I** can demonstrate my knowledge?
   a. Answer 'True/False', 'Yes/No', 'fill in the blank', or 'multiple choice' questions correctly.

b. Define technical terms associated with the subject by stating their attributes, properties, or relations.
c. Recall the major facts about the subject.
d. Name the classes, sets, divisions, or arrangements that are fundamental to the subject.
e. List the criteria used to evaluate facts, data, principles, or ideas associated with the subject.
f. List the relevant principles and generalizations associated with the subject.
g. List the characteristic methods of approaching and presenting ideas associated with the subject (e.g., list the conventions or rules associated with the subject).
h. Describe the general problem solving method (i.e., the techniques and procedures) or the method(s) of inquiry commonly used in the subject area.

6. What are typical ***work products***?
   a. Answers to Knowledge level quizzes ('True/False', 'Yes/No', 'fill in the blank', or 'multiple choice').
   b. Lists of definitions or relevant principles and generalizations associated with the subject.
   c. Modifications of example problems presented in the textbook; for example, modest changes in numerical values or units; i.e., solutions to problems which were solved using 'pattern recognition'.

7. What are descriptive **'process' verbs**?

define	label	listen	list	memorize	name
read	recall	record	relate	repeat	view

COMPREHENSION (UNDERSTANDING)

1. How do **I know** I have reached this level?

   I comprehend or understand the *subject, topic, competency,* or *competency area;* I use ideas associated with the subject without relating them to other ideas or subjects. I may not yet completely understand the subject. When others are discussing this subject, I can follow and understand the discussion. This level requires **Knowledge**.

2. What do **I do** at this level?

   I successfully solve textbook problems using appropriate techniques and procedures based on (**1**) where the problem is located in the book or (**2**) the problem statement. I translate ideas into my own words (translation from one level of abstraction to another). I translate graphical or symbolic information (e.g., tables, diagrams, graphs, mathematical formulas, etc.) into verbal forms, and vice versa. I interpret or

summarize communications (oral/written/graphical). I can use the problem solution to determine effects, trends, implications, corollaries, etc.

3. How will the **teacher know** I am at this level?

   The teacher will ask questions that can be answered by restating or reorganizing material in a literal manner; i.e., by clearly stating facts or the principle meaning of the material in your own words. The teacher will also give tests based on the textbook problems that were (**1**) assigned as homework **or** (**2**) used as examples in the textbook or in class.

4. What does the **teacher do** at this level?

   The teacher demonstrates, solves problems, listens, questions, compares, contrasts, and examines the information and your knowledge of the subject.

5. What are typical ways **I** can demonstrate, on my own, my comprehension and understanding?
   a. Read textbook problems, understand what is required, and successfully solve the problems.
   b. Clearly document the process used to solve the problem.
   c. Clearly describe the solution to the problem.
   d. Draw conclusions based on the solution to the problem.
   e. Compare/contrast two different textbook problems (i.e., what elements are the same? what elements are different?).
   f. Restate an idea, theory, or principle in your own words.

6. What are typical **work products**?
   a. Answers to Comprehension level quizzes and exams ('multiple choice' or textbook problems).
   b. Solutions to textbook problems which include (a) a summary of the learning objectives associated with the problem, (b) the problem statement in the form of a clearly labeled sketch, specifications, and what is required, (c) a description of the general solution method (techniques and procedures) used to solve the problem, and (d) a discussion of the solution.

7. What are descriptive '**process**' **verbs**?

describe	discuss	explain	express	identify	locate
recognize	report	restate	review	solve	tell

APPLICATION (INDEPENDENT PROBLEM SOLVING)

1. How do I know I have reached this level?

I can recognize the need to use an idea, concept, principle, theory, or general solution methods (techniques and procedures) **without being told** and **without any specific or immediate context or cues.** For example, I do not need to locate a similar example in a textbook, nor do I need to know that an assignment is for a particular course in order to recognize the need to use a particular idea, etc. I know and comprehend these ideas, concepts, principles, theories, or general solution methods (techniques and procedures and I can apply them to new situations. I also have the ability to recognize when a certain task or project is beyond my current competency. This level requires **Knowledge** and **Comprehension**.

2. What do I do at this level?

   I apply ideas, concepts, principles, theories, or general solution methods (techniques and procedures) that I learned at the Knowledge and Comprehension level to new situations. I solve problems in which the solution method is not immediately evident or obvious. I solve these problems independently and make use of other techniques and procedures as well. This requires not only knowing and comprehending these ideas, concepts, principles, theories, and general solution methods (techniques and procedures) but deep thinking about their usefulness and how they can be used to solve new problems that I identify or define.

3. How will the teacher know I am at this level?

   The teacher will review my work products and confirm that I am solving problems independently, in new situations, and without prompting by the teacher. The teacher will be able to pose general questions such as *"How much protection from the sun is enough?"* and I will know how to answer the question by defining and solving a problem.

4. What does the **teacher do** at this level?

   The teacher assigns problems that do not explicitly (or as best possible implicitly) imply the use of an expected solution methodology. The teacher may develop problems and assignments in conjunction with teachers in another related subject areas. The teacher will probe for use of course material outside of the course.

5. What are the typical ways **I** can demonstrate, on my own, my Application of Knowledge and Comprehension?
   a. Solve problems which require that I recognize and apply the appropriate ideas, concepts, principles, theories, general solution methods (techniques and procedures), etc. without being told and without any specific or immediate context or cues.
   b. Apply the laws of mathematics, chemistry, and physics, as well as engineering, business or design concepts, etc. to practical problems or situations.
   c. Solve problems associated with design/build projects.

6. What are typical ***work products***?

Application level work products are very similar to Comprehension level work products; however, documentation will be included which demonstrates that you recognized the need to use ideas, concepts, principles, theories, general solution methods (techniques and procedures), etc. in a new situation.

7. What are descriptive **'process' verbs**?

apply	demonstrate	employ	illustrate	interpret
operate	practice	recognize	solve	use

ANALYSIS (LOGICAL ORDER, COMPONENTS)

1. How do I know I have reached this level?

   I can explain why. I can methodically examine ideas, concepts, principles, theories, general solution methods (techniques and procedures), reports, etc. and separate these into their component parts or basic elements. I can use the results of this examination to clarify the organization of the whole or to gain a global view. This level requires Knowledge and Comprehension Levels of Learning; Application is not required.

2. What do I do at this level?

   I demonstrate that I can analyze results by breaking ideas, concepts, principles, theories, general solution methods (techniques and procedures), reports, etc. into their component parts. I explain the logical interconnections of the parts. I can also develop detailed cause and effect sequences.

3. How will the teacher know I am at this level?

   When asked, I am able to explain why I did what I did. I include a discussion with my work that explains why my solution method worked.

4. What does the teacher do at this level?

   The teacher probes, guides, observes, and acts as a resource or facilitator.

5. What are typical questions I can ask myself that will demonstrate my Analysis Level of Learning?
   a. What are the causal relationships between the parts and how the whole functions?
   b. Can I explain, from the parts, why the whole does or does not work?
   c. Are the conclusions supported by sound reasoning?
   d. Does the evidence provided support the hypothesis or the conclusion?
   e. Are the conclusions supported by facts, opinions, or an analysis of the results?
   f. What are the unstated assumptions, if any?

6. What are typical work products?

a. Answers to Analysis level exams (problems, multiple choice, and essays).
b. Analysis level work products are very similar to Comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation is what distinguishes Analysis level work products from Comprehension level work products; e.g., see items a. through f. above.

7. What are descriptive 'process' verbs?

analyze	appraise	break apart	break down	calculate
compare	contrast	debate	diagram	differentiate
examine	experiment	explain	inspect	inventory
question	relate	solve		

SYNTHESIS (CREATE)

1. How do I know I have reached this level?

   I have the ability to assemble parts and elements into a unified organization or whole that requires original or creative thinking. I recognize new problems and develop new tools to solve them. I create my own plans, models, hypotheses, etc. for constructing solutions to problems. This Level of Learning requires Knowledge, Comprehension, Application and Analysis Levels of Learning.

2. What do I do at this level?

   I generate ideas and use them to create a physical object, a process, a design method, a written or oral communication, or even a set of abstract relations (e.g., mathematical models). I produce written or oral reports that have the desired effect (e.g., information acquisition, acceptance of a point of view, continued support, etc.) on the reader or listener. I generate project plans. I propose designs. I formulate hypotheses based on the analysis of relevant or pertinent factors. I am able to generalize from a set of axioms or principles.

3. How will the teacher know I am at this level?

   I demonstrate that I can combine ideas into a statement, a plan, a product, etc. that was previously unknown to me; e.g., I develop a program that includes the best parts of each of these ideas.

4. What does the teacher do as this level?

   The teacher reflects, extends, analyzes, and evaluates.

5. What are the typical questions I can ask myself that will demonstrate my Synthesis Level of Learning?
    a. Can I create a project plan?
    b. Can I develop a model?
    c. Can I propose a design?

6. What are typical work products?
    a. Answers to Synthesis level exams (problems, multiple choice, and essays).
    b. Synthesis level work products are very similar to Comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation is what distinguishes Synthesis level work products from Comprehension level work products; e.g., see items a. through c. above.

7. What are descriptive 'process' verbs?

Arrange	assemble	collect	compose	construct
create	design	formulate	manage	organize
plan	prepare	propose	set up	write

EVALUATION (APPRECIATION)

1. How do I know I have reached this level?

    I have the ability to judge and appreciate the value of ideas, concepts, principles, theories, or general solution methods (techniques and procedures) using appropriate criteria. This level requires Knowledge, Comprehension, Application, Analysis, and Synthesis Levels of Learning.

2. What do I do at this level?

    I make value judgments based on certain criteria such as usefulness and effectiveness. Based on information gained through application, analysis, and synthesis, I can rationally select a process, a method, a model, a design, etc. from among a set of possible processes, methods, models, designs, etc. I evaluate competing plans of action before actually starting the work. I evaluate work products based on internal standards of consistency, logical accuracy, and the absence of internal flaws; e.g., I can certify that the feasibility of a design has been demonstrated in a report. I evaluate work products based on external standards of efficiency, cost, or utility to meet particular goals or objectives; e.g., I can certify that the quality of the design has been demonstrated in a report.

3. How will the teacher know I am at this level?

I demonstrate that I can select, judge, or appreciate a process, a method, a model, a design, etc. using appropriate criteria or standards.

4. What does the teacher do at this level?

   The teacher clarifies, accepts, harmonizes, aligns, and guides.

5. What are typical statements and questions I can answer to that will demonstrate or show my appreciation/evaluation?

   a. I can evaluate an idea in terms of ...
   b. For what reasons do I favor...?
   c. Which policy do I think would result in the greatest good for the greatest number?
   d. Which of these models or modeling approaches is best for my current needs?
   e. How does this report demonstrate that the design is feasible?
   f. How does this report demonstrate the quality of the design?

6. What are typical work products?
   a. Answers to Evaluation level exams (problems, multiple choice, and essays).
   b. Evaluation level work products are very similar to Comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation is what distinguishes Evaluation level work products from Comprehension level work products; e.g., see items a through f above.

7. What are descriptive 'process' verbs?

appraise	assess	choose	compare	estimate (quality)
evaluate	judge	predict (quality)	rate value	select

LEARNING OUTCOMES

LEARNING ACHIEVED BY THE

END OF A COURSE OR

PROGRAM

KNOWLEDGE

SKILLS

ATTITUDES

http://liad.gbrownc.on.ca/programs/InsAdult/currlo.htm

Learning Outcomes

Definition	Guidelines for Writing LO	Practice
Characteristics	Components of LO	Critique
Background	LO Checklist	

What is meant by Learning Outcomes?

Think for a moment about a course or training session with which you are currently involved. Identify one skill that you think would be essential to know or do by the end of this learning period. If you were able to do this, then you are beginning to construct a learning outcome.

Definition of Learning Outcomes

Learning outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program. In other words, learning outcomes identify what the learner will know and be able to do by the end of a course or program.

Spady, (1994) , an educational researcher who spearheaded the development of outcomes based education, suggests that the ability *demonstrate* learning is the key point. This demonstration of learning involves a performance of some kind in order to show ***significant*** learning, or learning that matters. He claims that significant content is essential, but that content alone is insufficient as an outcome. Rather, knowledge of content must be manifested through a demonstration process of some kind.

An outcome statement that incorporates this knowledge within a performance demonstration might include:

- The learner will have demonstrated the ability to make engine repairs on a variety of automobiles.

  In the above statement, the ability to make engine repairs implies that the person has the requisite knowledge to do so.

Performance statements include higher level thinking skills as well as psychomotor skills.

Consider the following learning outcome statement:

- The learner will have demonstrated the ability to analyze engines and make decisions regarding required repairs for a variety of automobiles.

Spady, also addresses the context or performance setting in which the performance demonstration occurs. He suggests a range of performance contexts from that of demonstrations of classroom learning to those which involve living successfully in the larger society. Thus, his highest level outcomes refer to generic skills such as the preparation of learners to be problem solvers, planners, creators, learners and thinkers, communicators etc., regardless of subject areas studied.

Learning outcomes refer to observable and measurable

- *knowledge*
- *skills*
- *attitudes*

EXAMPLES OF LEARNING OUTCOMES STATEMENTS

The successful student has reliably demonstrated the ability to:

1. Administer medications according to legal guidelines
2. Make pricing decisions using relevant cost and profitability factor

Characteristics of Learning Outcomes Statements

Learning outcomes should:

- reflect broad conceptual knowledge and adaptive vocational and generic skills
- reflect essential knowledge, skills or attitudes;
- focus on *results* of the learning experiences;
- reflect the desired end of the learning experience, not the means or the process;
- represent the *minimum* performances that must be achieved to successfully complete a course or program;
- answer the question, "Why should a student take this course anyway?"

Learning outcomes statements may be considered to be exit behaviors.

Background and Context for Development of Learning Outcomes

You may have seen learning outcomes statements on various college course outlines, including this course. Or, you may have seen learning outcomes statements which reflect your children's expected level of learning at a certain grade level.

Learning outcomes reflect a movement toward *outcomes based learning (OBL)* in elementary, secondary, and post secondary educational systems throughout North America, and beyond. This movement is, in turn, influenced by public pressure to ensure a greater accountability and consistency within educational systems. Through the creation of outcomes statements, and the evaluation of learner performance in relation to those statements, it is believed by some that a more accountable educational system will result.

Because learning outcomes focus on the end result of learning, regardless of how or where that learning occurred, their development serves to offer the potential for increased access to learning opportunities through prior learning assessment.

Outcomes-based education is thought to provide greater:

- consistency - in course offerings across the educational system
- accountability - expectations for learning are clearly stated, and frequent assessment processes help both teacher and student identify progress toward meeting the outcomes
- accessibility - clearly defined outcomes enable learners to demonstrate achievement of those outcomes through prior learning assessment processes

Global Influences

In the 1990's, global economies and work place requirements shifted toward broad based, transferable skills. For example, the Conference Board of Canada lists the following skills as essential for the workplace:

- ability to work in teams
- effective communication
- ability to solve problems

Local Influences

A comprehensive review of the mandate of the Ontario college system in the early 1990's recommended that program standards be developed as a means of ensuring better quality programming. The creation of program standards was also seen as a way of enabling learners to receive recognition for previous learning when transferring from one college program to another. (Vision 2000, 1992)

As a consequence of this decision, a body called the College Standards and Accreditation Committee (CSAC) was established to ensure standards and consistency across colleges throughout the province. This body was given the authority to approve program standards which are the program learning outcomes for all diploma vocational community college programs. (Diploma college programs are three years in length.)

It further developed a set of generic skill standards or outcomes which all community college graduates of diploma programs are expected to demonstrate upon graduation.

Individual colleges were given the responsibility for establishing Learning Outcomes for General Educational courses, and for individual courses within college programs.

College Context

In the college system, learning outcomes are written at the:

- PROGRAM level
- COURSE level

LEARNING OUTCOMES in the college system may express

- Vocational Skills
- Generic Skills
- General Education

Overview of Learning Outcomes Structure in Community Colleges

GLOBAL INFLUENCES
WORKPLACE REQUIREMENTS

DEVELOPMENT OF PROGRAM LEARNING OUTCOMES
Essential knowledge, skills and attitudes required by program graduates

OVERALL CURRICULUM DESIGN
Mapping of content and course sequence to provide required vocational, general education and generic skill outcomes

COURSE LEARNING OUTCOMES
Faculty developed learning outcomes for individual courses within a program

UNIT OR LESSON LEARNING OUTCOMES
Essential knowledge, skills and attitudes required for each unit of instruction within a course

Guidelines for Writing Course Learning Outcomes

Learning Outcomes written at the *course* level should:

- state clear expectations - learners know what they have to do to demonstrate that they have achieved the learning outcomes;
- represent culminating performances of learning and achievement; (meaning the highest stage of development, or exit, end performance)

- describe performances that are *significant*, *essential*, and *verifiable;* (meaning that performances can be verified or observed in some way and that they represent more than one small aspect of behaviour; this also means that the performance is considered to be essential for success in the course)
- preferably state only ONE performance per outcome;
- refer to learning that is *transferable;*(meaning that the learning can readily be transferred from a class to a work place environment, or from one workplace environment to another, etc.)
- not dictate curriculum content; (meaning that there could be a number of different ways to achieve the outcome.)
- reflect the overriding principles of equity and fairness and accommodate the needs of diverse learners.
- represent the minimal acceptable level of performance that a student needs to demonstrate in order to be considered successful.

(Source: Guidelines to the Development of Standards of Achievement through Learning Outcomes, 1994. Gollege Standards and Accreditation Committee)

Self Assessment Would you like to test your knowledge related to Learning Outcomes?

Anatomy of Learning Outcomes

Learning Outcome statements may be broken down into three main components:

- an *action word* that identifies the performance to be demonstrated;
- a *learning statement* that specifies what learning will be demonstrated in the performance;
- a broad statement of the *criterion* or standard for acceptable performance.

For example:

ACTION WORD (performance)	LEARNING STATEMENT (the learning)	CRITERION (the conditions of the performance demonstration)
Applies	principles of asepsis	when executing psychomotor skills
Produces	documents	using word processing equipment
Analyzes	global and environmental factors	in terms of their effects on people

(Source for categories: Developing Learning Outcomes Self-Study Guide, Humbler College of Applied Arts and Technology, March, 1996)

Performance Elements

Learning outcomes statements can be supported by the inclusion of *performance elements.* Performance elements or indicators as they are sometimes called, provide a more specific picture of an ability. They define and clarify the level and quality of performance necessary to meet the requirements of the learning outcome. In effect, the elements are indicators of the means by which the learner will proceed to satisfactory performance of the learning outcome.That is, they help to address the question, "What would you accept as evidence that a student has achieved a certain level, or is in the process of achieving the outcome?

(Source: Generic Skills Learning Outcomes for Two and Three Year Programs in Ontario's Colleges of Applied Arts and Technology. The College Standards and Accreditation Council, May, 1995)

For example:

Suppose you have the learning outcome:

Applies analytical skills when addressing contemporary social issues.

Some performance elements might include:

- identifies assumptions underlying various points of view
- presents a cogent argument with supporting evidence.

Verbs to avoid when writing learning outcomes include:

Appreciate	Enjoy
Know	Realize
Be aware of	Perceive

What do these verbs have in common, and why do you think it is recommended that you avoid using them when writing learning outcomes?

Some common verbs that I have seen included in learning outcomes include the following:

Use	Develop	Analyze	Express	Evaluate
Organize	Create	Write	Plan	Apply
Produce	Implement	Compile	Incorporate	Construct

Would you like to know more about the difference between learning outcomes and learning objectives?

CHECKLIST FOR INTEGRATION OF LEARNING OUTCOMES

- I know what the learning outcomes are for my course and program.
- I have designed learning activities and resources which reflect the learning outcomes.
- I have designed assessment/evaluation strategies with feedback opportunities for students.
- The evaluation strategies reflect the learning outcomes.
- I have negotiated with students to provide some choice in the means of reaching the outcomes.
  (Adapted from the York Region Board of Education OBL Planning Model)
- Course learning outcomes have been developed in consultation with program advisory committees, and groups of other faculty; not by individuals working in isolation. Since learning outcomes reflect the present and anticipated future needs of society, their development requires discussion and input from a variety of sources
- Course learning outcomes dovetail with program learning outcomes for the program in which I am working
- Some learning outcome statements may receive more weighting or importance within a course than others. This differential course weighting would be reflected in the percentage of a course grade attached to each outcome.

SUMMARY OF DEFINITIONS AND DISTINCTIONS

Program Learning Outcomes

- describe the essential knowledge, skills and attitudes required by graduates of the program

Course Learning Outcomes

- reflect what the faculty and the community collectively identify as the essential knowledge, skills and attitudes required by practitioners in the subject area

Unit or Lesson Learning Outcomes

- describe in detail the behaviours that students will be able to perform at the conclusion of a unit of instruction such as a class, and the conditions and criteria which determine the acceptable level of performance.

Practice

Would you like to put some of these ideas into practice?

Reflection:

Reflect for a moment on the implications of learning outcomes development for teaching and learning. What does such a movement suggest in relation to teachers and learners? Do you find yourself basically in agreement with some of the underlying assumptions? What questions or concerns do you have related to the introduction of learning outcomes? Compare your thoughts with some of the the literature related to learning outcomes.

Self Assessment

1. Define the term "Learning Outcomes."
2. Give 3 reasons for the movement toward Outcomes Based Learning.
3. List 3 components of learning which are addressed by learning outcomes statements.
4. Learning outcomes statements would be appropriate for a one hour session on flower arranging.

   A. True B. False

Generic Skills Learning Outcomes

http://liad.gbrownc.on.ca/programs/InsAdult/curgensk.htm

We hear much talk these days about the need for learners both in colleges and the workplace to acquire generic skills.

Generic skills are defined as:

"*particular life skills essential for both personal and career success*."

In the college system in Ontario, these generic skills learning outcomes were developed by the College Standards and Accreditation Council (CSAC) , in recognition of the requirement that people require broad sets of skills to function effectively in today's social and economic climate. For example, the Conference Board of Canada's employability skills profile requires that Canadian workers can:

Communicate Think Learn
Assume responsibility Demonstrate Adaptability Display positive attitudes and behaviours
Work with others

Guiding Principles underlying the development of generic skills include the following:

- generic skills are expressed as learning outcomes;
- all graduates of two and three year programs must have achieved all generic skill learning outcomes;
- generic skills requirements in postsecondary programs are to be at a postsecondary level;
  This means that the skills must reflect a quality of performance that is appropriate to the college context.
- generic skill learning outcomes represent the *minimum* acceptable level of achievement;
  In some programs, such as computer programs, the level of achievement may be much higher in order to achieve the vocational learning outcomes.
- generic skills learning outcomes may be incorporated into a program's curriculum in a variety of ways. That is, there might be specific courses related to their development, or they might be incorporated into vocational or general education courses.
- graduates will be evaluated by faculty for their ability to reliably demonstrate each generic skills learning outcome; This statement suggests that students will require the opportunity to practice the skills over time, and in a variety of situations. It might also mean that students work should be collected over a period of time to illustrate progression toward achieving those skills.

A total of thirteen generic skills outcomes were developed, which relate to the areas of communications, mathematics, computer literacy, interpersonal skills, and analytical skills. Each skill was identified with a description of elements of the performance. The elements were included to define and clarify the level and quality of performance necessary to meet the requirements of the learning outcome.

The following is a list of the generic skills outcomes. For a more comprehensive discussion related to their meaning, performance elements, and sample learning activities, read the document:

Generic Skills Learning Outcomes for Two and Three Year Programs in Ontario's Colleges of Applied Arts and Technology. The College Standards and Accreditation Council, May, 1995.

List of Generic Skills

The graduate has reliably demonstrated the ability to:

- communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of audiences;
- reframe information, ideas and concepts using the narrative, visual, numerical and symbolic representations which demonstrate understanding;
- apply a wide variety of mathematical techniques with the degree of accuracy required to solve problems and make decisions;
- use a variety of computer hardware and software and other technological tools appropriate and necessary to the performance of tasks;
- interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals;
- evaluate her or his own thinking throughout the steps and processes used in problem solving and decision making;
- collect, analyze and organize relevant and necessary information from a variety of sources;
- evaluate the validity of arguments based on qualitative and quantitative information in order to accept or challenge the findings of others;
- create innovative strategies and/or products that meet identified needs;
- manage the use of time and other resources to attain personal and/or project-related goals;
- take responsibility for her or his own actions and decisions
- adapt to new situations and demands by applying and/or updating her or his knowledge and skills
- represent her or his skills, knowledge and experience realistically for personal and employment purposes.

Exercise:

Within your teaching and learning context, propose two learning activities that would address two of the generic skills learning outcomes.

SOLO taxonomy

I am pleased to say that John Biggs himself has endorsed this representation of his ideas; "I've just found your website on SOLO et al via google. I'm delighted! Your diagrams of prestructural-extended abstract are very elegant..." (Unsolicited email, 29 May 2005)

The SOLO taxonomy stands for:

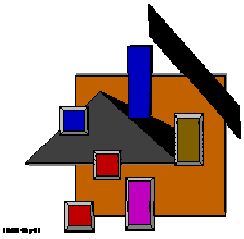
Structure of
Observed
Learning
Outcomes

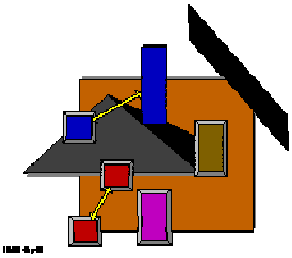
It was developed by Biggs and Collis (1982), and is well described inBiggs and Tang (2007)

It describes level of increasing complexity in a student's understanding of a subject, through five stages, and it is claimed to be applicable to any subject area. Not all students get through all five stages, of course, and indeed not all teaching (and even less "training" is designed to take them all the way).

There are fairly clear links not only with Säljö on conceptions of learning, but also, in the emphasis on making connections and contextualising, with Bateson's levels of learning, and even with Bloom's taxonomy in the cognitive domain. Like my pyramidal representation of Bloom, the assumption is that each level embraces previous levels, but adds something more:

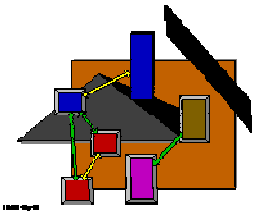
1 Pre-structural: here students are simply acquiring bits of unconnected information, which have no organisation and make no sense.





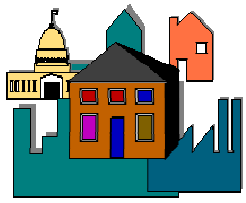
2 Unistructural: simple and obvious connections are made, but their significance is not grasped.

3 Multistructural: a number of connections may be made, but the meta-connections between them are missed, as is their significance for the whole.



4 Relational level: the student is now able to appreciate the significance of the parts in relation to the whole.

5 At the **extended abstract** level, the student is making connections not only within the given subject area, but also beyond it, able to generalise and transfer the principles and ideas underlying the specific instance.



I confess to a slight distrust of this kind of "progressive" model, which aspires inexorably to a final state. I am not convinced that every subject area fits the model, but nevertheless it is quite a good guide, and gives some idea of the place of the Gestalt insight (at the fourth, relational level). What it does not deal with is the student who establishes a relational construct which is nevertheless wrong, and those who pursue wild geese at the extended abstract level because they are insufficiently informed at more modest levels. See Umberto Eco's "*Foucault's Pendulum*".

However, the emerging field of work on Threshold Concepts and Troublesome Knowledge links in very effectively with the SOLO yaxonomy and offers some points about how the above issues might be addressed. Go here to follow up.

To reference this page copy and paste the text below:

ATHERTON J S (2009) *Learning and Teaching; SOLO taxonomySOLO taxonomy* [On-line] UK: Available: file:///D:/drjj/Documents%20and%20Settings/DRJJ/MQA-JPA-OBEFSG%20Jan09/CURRICULUM/SOLO%20taxonomy.htmhttp://www.learningandteaching.info/learning/solo.htmAccessed: 15 March 20108 March 2010