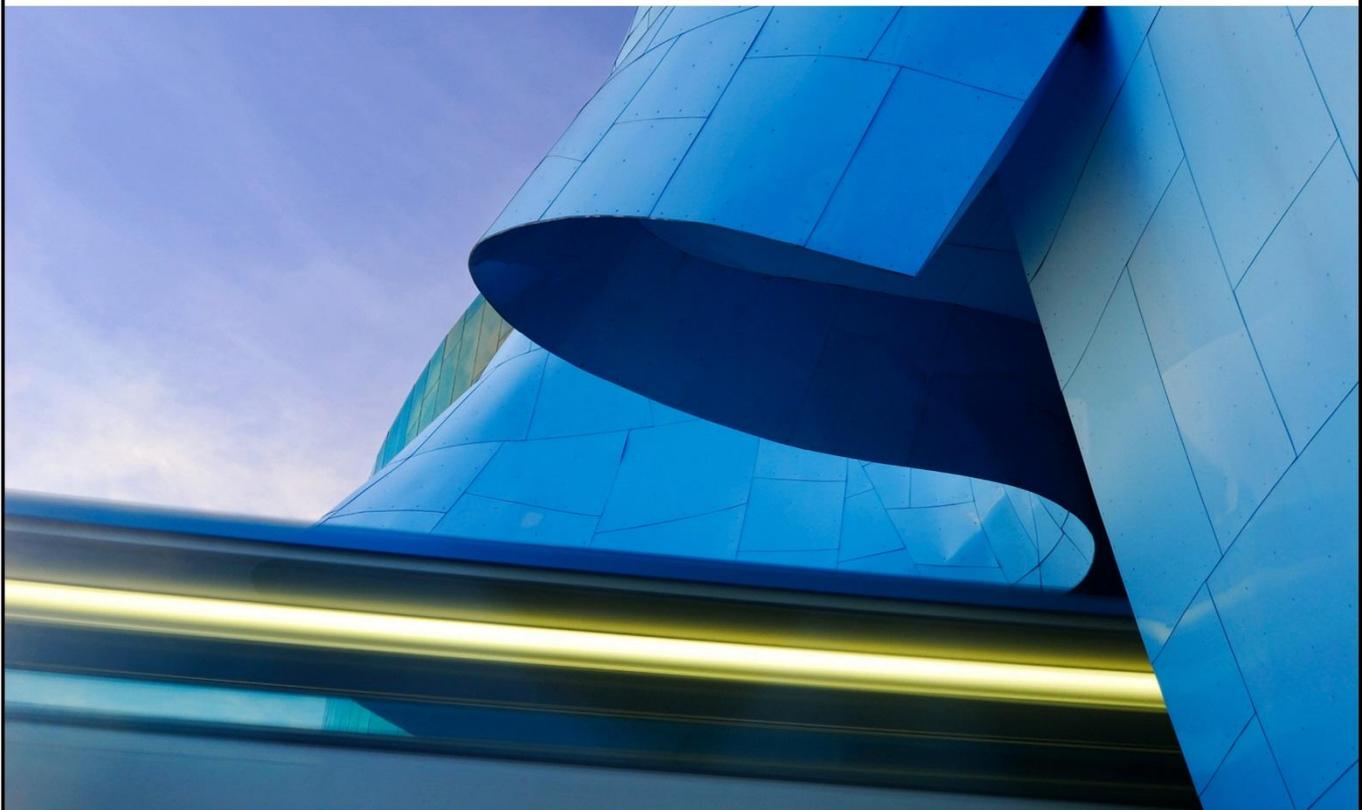


G U I D E T O
B L O O M ' S
T A X O N O M Y
C O G N I T I V E



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Guide to Bloom's Taxonomy

(COGNITIVE DOMAIN)

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PREFACE

The overall structure of Guide to Bloom's Taxonomy specifically focused on Cognitive domain serves to consolidate the knowledge we have acquired from being TVET educators and lecturers. This handbook aims to guide the readers on how to suit the different levels of knowledge and various levels of complexity in Bloom's Taxonomy to Learning Outcome for respective program. Educators are expected to use this guideline to enhance their preparation on delivery of the curriculum and develop the item for assessment effectively.

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This guideline contains six level of knowledge in cognitive domain. (Refer to Figure 1.1) The first part focuses on a cognitive level 1, knowledge (C1), the second part discusses on Comprehension (C2) and the third part signifies Application (C3). The forth part discusses on Analysis (C4), the fifth part is regarding Synthesis (C5) and the final part of the guideline focuses on the evaluation in Bloom’s Taxonomy. Based on Figure 1.2. We can see that the first two levels are in the lower order while the rest are categorized in the higher order.

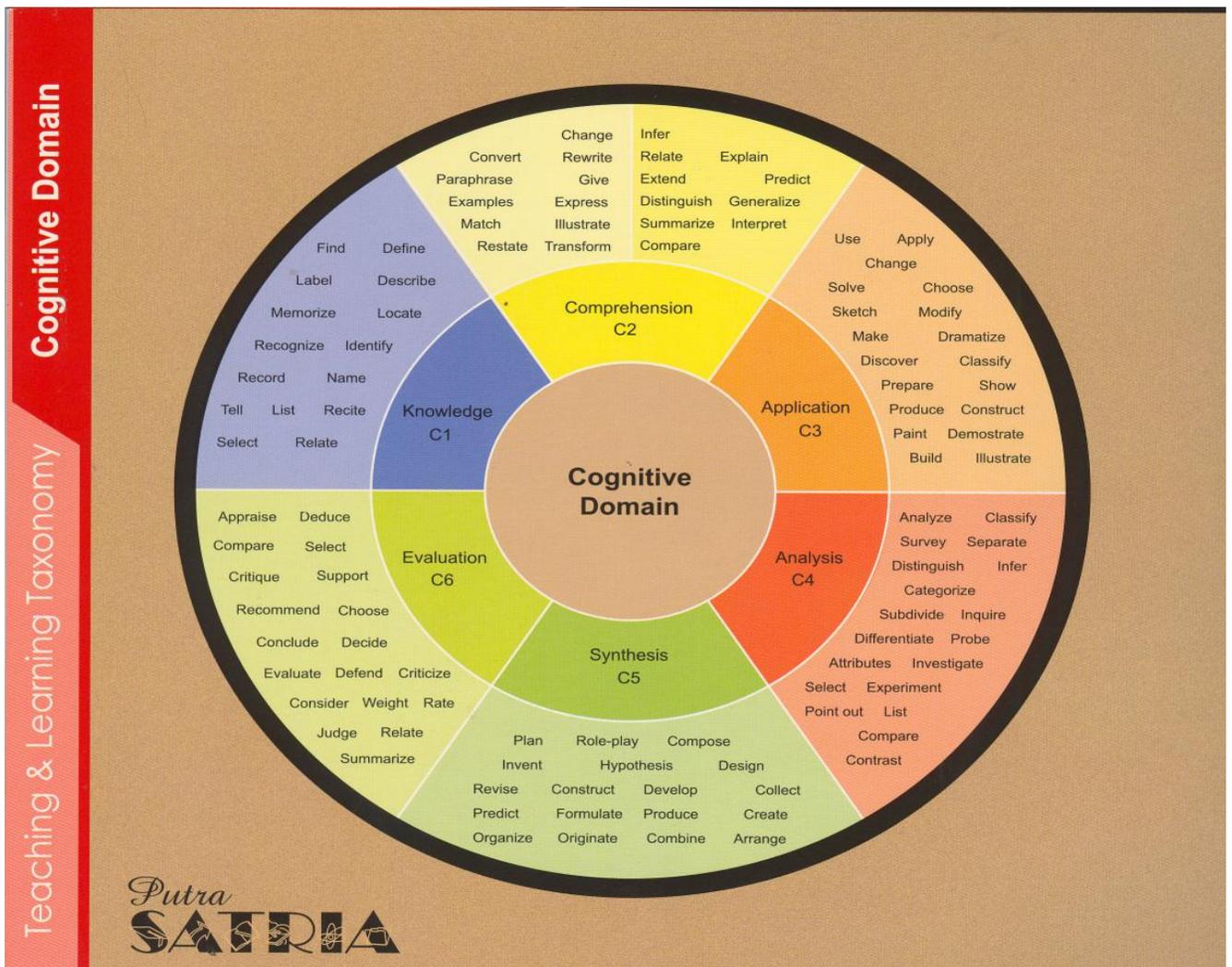


Figure 1.1

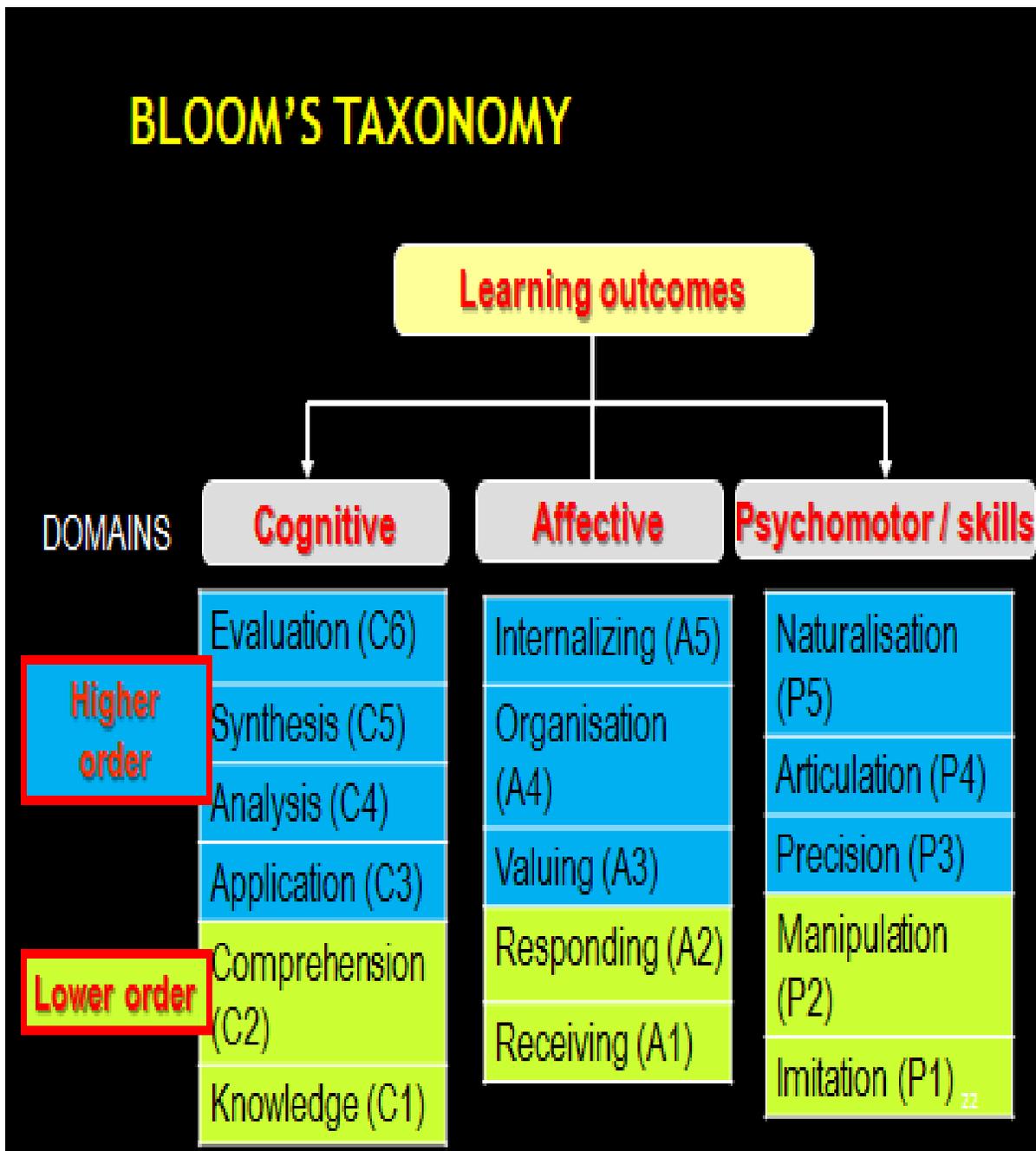


Figure 1.2

C1: Knowledge

Definition:

Knowledge entails the ability to recall or state information.

Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is the bringing to mind of the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain.

Keywords:

define; describe; identify; label; list; tell; recognize; name; read; record; locate; reproduce; select; state; recite; relate.

- remembering;
- memorizing;
- recognizing;
- recalling identification and
- recall of information
- o Who, what, when, where, how ...?

Examples of Knowledge Objectives:

State the definition of an isosceles triangle.

Define utmost good faith.

Describe what is meant by thermal stresses in composite bar.

State the correct definition of a disk operating system.

Name SIX basic principles of insurance.

State the definition of codependence.

Give the definition of punishment.

State the definition of application in Bloom's Taxonomy.

*State the difference between the knowledge and comprehension levels of Bloom's Taxonomy.

{This would be a knowledge-level response only if the difference is clearly stated in a textbook or lecture and all the learner has to do is remember that response. If the learner read the distinction in the book and had to paraphrase it in order to give the answer, this would be an example of comprehension. If the learner had to make up this distinction on his own, it might be an example of synthesis. }

*Give an example of punishment.

This would be a knowledge-level response if the learner answered by giving the example that the textbook or lecturer had given. If the learner had to make up his own example, this would be an example of application.

How to Test for Knowledge Objectives:

Ask the person to recall the information.

It is usually possible to accomplish this with direct questions, with short-answer items, and with multiple-choice questions.

Special Notes about Knowledge Objectives:

It is often difficult to tell from a person's response whether the person is performing at the knowledge or application level. That is, a person who can state a definition correctly, might be performing at either the knowledge or comprehension level. The best way to tell the difference is to have the person paraphrase the definition or answer questions that explain the definition.

Remembering—recall of specific information from long-term memory. Can the student recall information?

Requires recall of information previously learned.

Question requires no understanding or judgment.

Good for testing factual information.

Limited value to test for competency.

C2: Comprehension

Definition:

Comprehension entails the ability to give meaning to information.

Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another (words to numbers), by interpreting material (explaining or summarizing), and by estimating future trends (predicting consequences or effects). These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.

Keywords:

classify; cite; convert; discuss; estimate; explain; generalize; give examples; make sense out of; paraphrase; change; restate (in own words); summarize; trace; rewrite; illustrate; express; understand.

- interpreting;
- translating from one medium to another;
- describing in one's own words;
- organization and selection of facts and ideas
- retell...

Examples of Comprehension Objectives:

Explain the meaning of mitosis.

Describe when it is proper to use a semicolon in a sentence.

Explain what an income statement is.

With the help of a diagram, describe risk management process.

Explain in your own words what is meant by Outcomes Based Education (OBE).

Describe in your own words what is meant by a sprained ankle.

Explain the meaning of codependence.

Describe the definition of application in Bloom's Taxonomy.

*State the difference between the knowledge and comprehension levels of Bloom's Taxonomy.

This would be a knowledge-level response if the difference is clearly stated in a textbook or lecture and all the learner has to do is remember that response. If the learner read the distinction in the book and had to paraphrase it in order to give the answer, this would be an example of comprehension. If the learner had to make up this distinction on his own, it might be an example of synthesis.

How to Test for Comprehension Objectives:

Have the person do something to demonstrate an understanding of facts and ideas, such as organizing, comparing, translating, interpreting, giving descriptions, paraphrasing, or stating main ideas.

It is usually possible to accomplish this with direct questions, with short-answer items, and with multiple-choice questions.

Special Notes about Comprehension Objectives:

It is essential that learners be able to comprehend information (not just remember it) before they move on to higher levels of knowledge (such as application).

It is often difficult to tell from a person's response whether the person is performing at the knowledge or application level. That is, a person who can state a definition correctly, might be performing at either the knowledge or comprehension level. The best way to tell the difference is to have the person paraphrase the definition or answer questions that explain the definition.

Understanding—ability to paraphrase information or construct meaning from content.

Can the student explain ideas or concepts?

Requires student to understand the information and utilize it in a specified situation.

C3: Application

Definition:

Application entails the ability to use knowledge or principles in new or real-life situations. Application refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws, and theories. Learning outcomes in this area require a higher level of understanding than those under comprehension.

Keywords:

apply; use; acts; administer; articulate; assess; chart; collect; compute; construct; sketch; make; demonstrate; classify; change; contribute; control; determine; develop; discover; establish; extend; implement; include; inform; instruct; operationalize; participate; predict; prepare; preserve; produce; project; provide; relate; report; show; solve; teach; transfer; utilize.

- problem solving;
- applying information to produce some result;
- use of facts, rules and principles
 - o How is...an example of...?
 - o How is...related to...?
 - o Why is...significant?

Examples of Application Objectives:

Compute the area of actual circles.

Use principles about recessive genes to predict the results of matings one and two

generations later.

Given examples of several characteristics and the results of matings, *designate* which matings involved recessive genes.

Correctly *transfer* files from a Macintosh system to a Windows system that runs the same programs.

Calculate the number of sacrificial anodes that would be required to form a calcareous deposit on a steel pile immersed in seawater.

Apply the Rule 1 of the 12-step program that will help overcome addiction.

Given a description of four situations, *identify* correctly the one that contains an example of codependence.

Given four statements of instructional objectives, *identify* the one that is an example of application in Bloom's Taxonomy.

Give an example of punishment.

This would be a knowledge-level response if the learner answered by giving the example that the textbook or lecturer had given. If the learner had to make up his own example, this would be an example of application.

How to Test for Application Objectives:

Have the person solve a problem that requires the application of acquired knowledge, facts, techniques and rules. It is important that this be a problem to which the person does not already know the solution. If the person already knew the solution, this would be a knowledge or comprehension task.

Special Notes about Application Objectives:

A student who "uses" his memorization of the multiplication tables to write down "15" next to "5 times 3 equals" is working at the knowledge level, not the application level.

A student who studies Spanish and then converses with a native Mexican is almost certainly at the synthesis level, not at the application level. If the student made a deliberate attempt to get his past tense right, this would be an example of application. However, in conversing he would almost certainly be creating something new that did not exist before by integrating information that had been learned at lower levels of the hierarchy.

Applying—ability to carry out or use knowledge. Students must learn to assimilate large amounts of information and use it to plan and implement a process or procedure. Can the student use the information in another familiar situation?

Requires students to understand the information and apply their knowledge in a new situation.

C4: Analysis

Definition:

Analysis entails the ability to break down complex information into simpler parts and understand the relationships among the parts.

Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of parts, analysis of the relationship between parts, and recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.

Keywords:

separate; categorize; investigate; break down; correlate; diagram; differentiate; discriminate; distinguish; focus; illustrate; infer; limit; outline; point out; prioritize; recognize; separate; subdivide; classify; contrast; compare.

- subdividing something to show how it is put together;
- finding the underlying structure of a communication;
- identifying motives;
- separation of a whole into component parts
 - o What are the parts or features of...?
 - o Classify...according to...
 - o Outline/diagram...
 - o How does...compare/contrast with...?
 - o What evidence can you list for...?

Examples of Analysis Objectives:

Given the results of a mating that involves several principles and concepts, *explain* the results of the mating in terms of these principles and concepts.

Explain the causes of World War II.

Given a videotape of a situation in which the client encountered a person who made her anxious, the client will *identify* the choices that she made, the effects of each choice, and the reason each of those effects occurred.

What could be the *consequences* to use a green light emitting screen cassette with orthochromatic film for conventional radiography ?

How to Test for Analysis Objectives:

Have the student examine a product or problem and break information into parts by identifying component concepts, looking for motives or causes, making inferences, and finding evidence to support generalizations.

Note that it is not always possible to tell just by looking at a learner's output what level of cognitive skills he is employing. If the learner is applying an algorithm that he has already learned, then he is demonstrating application skills. If the learner has to invent an algorithm that he has not already specifically learned, then this would be either analysis or synthesis.

To state this comparison in a different way:

If the learner can solve a problem by directly applying something he has previously learned, this would be testing application skills.

If the learner has to identify component concepts on his own (without having been shown specifically how to do so) then this item would be testing analysis skills.

If the learner has to identify component concepts on his own (without having been shown specifically how to do so) and actually uses the component skills to solve the problem, then this item would be testing synthesis skills.

Special Notes about Analysis Objectives:

It is often extremely difficult to tell whether a person is engaging in analysis or synthesis or to write items that measure analysis without synthesis. This is because the learner often engages in both almost simultaneously. In addition, it's often not worth the effort to make this distinction.

Analysing—ability to break a concept into component parts and determine how the parts relate to each other and overall structure. Can students break the information into parts to explore understandings and relationships?

Requires student to break down information to obtain the meaning of the material or demonstrate how it is organized or structured.

Requires the student to analyze the situation, interpret data, set goals, establish diagnoses, set priorities, and determine actions.

C5: Synthesis

Definition:

Synthesis entails the act of creating something that did not exist before by integrating information that had been learned at lower levels of the hierarchy.

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

Keywords:

develop; predict; produce; formulate; categorize; collaborate; combine; communicate; compare; compile; compose; contrast; create; design; devise; express; facilitate; formulate; generate; incorporate; individualize; initiate; integrate; intervene; model; modify; negotiate; plan; progress; rearrange; reconstruct; reinforce; reorganize; revise; structure; substitute; validate

creating a unique, original product that may be in verbal form or may be a physical object;

combination of ideas to form a new whole

o What would you predict/infer from...?

o What ideas can you add to...?

o How would you create/design a new...?

o What might happen if you combined...?

o What solutions would you suggest for...?

Examples of Synthesis Objectives:

Design a quality assurance program for a radiology department.

Determine the appropriate strategies for implementing a health education program for dengue fever.

Following the identification of the etiology and pathophysiology of hepatoma, *recommend* an MRI scanning protocol to evaluate patient with hepatocellular carcinoma (HCC)

Design a testing scenario to assess the susceptibility of “inverse image” to be used in localising foreign bodies utilising digital radiography.

Apply the strategies learned in health psychology to help a client with depression due to terminal illness.

How to Test for Synthesis Objectives:

Give the student a problem that requires a new solution and have him create that solution by integrating component concepts and principles in an effective manner.

Note that it is not always possible to tell just by looking at a learner's output what level of cognitive skills he is employing. If the learner is applying an algorithm that he has already learned, then he is demonstrating application skills. If the learner has to invent an algorithm that he has not already specifically learned, then this would be either analysis or synthesis.

For example,

If a person had learned the necessary skills to compute his batting average but had never done so, then computing his batting average would be an example of synthesis. He would have to combine several intellectual skills (realizing that the batting average is a ratio, determining what items go into the ratio, and then performing long division) to accomplish this.

If he watched somebody else compute the batting average and realized what each of the components were and why that person was putting these together in the way he was, then this would be analysis.

Once he had learned this algorithm (or once someone else had shown him how to compute a batting average), then he could compute subsequent batting averages by simply applying this algorithm. In this case, computing his batting average would be an example of application.

To state this comparison in a different way:

If the learner can solve a problem by directly applying something he has previously learned, this would be testing application skills.

If the learner has to identify component concepts on his own (without having been shown specifically how to so) then this item would be testing analysis skills.

If the learner has to identify component concepts on his own (without having been shown specifically how to so) and actually uses the component skills to solve the problem, then this item would be testing synthesis skills.

Special Notes about Synthesis Objectives:

Synthesis is very similar to analysis. In many situations, a person analyzes while synthesizing.

It is reasonable to think of synthesis as "complex application." That is, the person is applying (and integrating) several principles or skills simultaneously.

Creating—ability to take previously learned information and put the elements together to create something new. Can students generate new products, ideas, or ways of viewing things?

C6: Evaluation

Definition:

Evaluation entails the ability to make judgments based on previous levels of learning to compare a product of some kind against a designated standard.

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

Keywords:

appraise; compare & contrast; deduce; select; support; evaluate; consider; choose; conclude; criticize; critique; decide; defend; interpret; judge; justify; reframe; support .

- making value decisions about issues;
- resolving controversies or differences of opinion;
- development of opinions, judgements or decisions
- o Do you agree...?
- o What do you think about...?
- o What is the most important...?
- o Place the following in order of priority...
- o How would you decide about...?
- o What criteria would you use to assess...?

Examples of Evaluation Objectives:

Evaluate the level of galvanic coupling between two metals using basic kinetic Information.

Using straight value depreciation, decide between two copper-nickel alloys for the design of a heat exchanger.

Critique a given radiograph, based on European Guidelines on Quality Criteria for Diagnostic Radiographic Images (EUR16260)

Examine radiographic image quality with regard to optimisation and measurement After examining your own radiographs (or one by another), state ways in which it could be improved based on principles discussed in class.

Given a videotape of a situation in which the client encountered a person who made her anxious, the client will use the principles discussed with the counselor to determine the degree to which she handled the situation effectively and will suggest specific strategies for handling the situation more effectively in the future.

The student will examine a report in which a classmate used at least ten of the fifteen designated resources to complete a research project, will determine the degree to which that student used those resources effectively, and will make suggestions for doing that project more effectively.

Observe another student (or yourself) and determine the quality of the student's performance.

How to Test for Evaluation Objectives:

Have the learner examine a product that he or someone else has created and evaluate that product by comparing it to specific standards that require the application of cognitive concepts and principles.

Special Notes about Evaluation Objectives:

An extremely common error is to classify an evaluation objective as either analysis or synthesis. The difference is that the evaluation effort (or task) includes a comparison to a standard.

Evaluating—ability to make a judgment based on standards and specific criteria. Can the student justify a course of action or decision?

Know – Can students RECALL information?

Literal questions Recall

Who, What, Where, When, How

Which one

How much

Name

Describe

Label

Define

List

Memorise

Reproduce

Comprehend – Can students EXPLAIN ideas?

Explain

What are they saying

Describe in your own words

Explain what is happening

Inferential questions

Give an example

Summarise

State in 5 words

What would go better

Explain what is meant

Select the definition

What restriction would you add

Read the graph table

Translate

This represents

Outline

Condense this paragraph

Locate

What part doesn't fit

Match

Apply – Can students USE ideas?

What is this used for?

How would you use

Make a model

Tell what would happen

If...how

Demonstrate how

Construct how

Show how

How much would there be if...

Design a lesson

Choose the statements that don't apply

Analyse– Can students DETERMINE relationships?

Whole into parts

Analyse, Research, Survey

Group, Categorise, Compare and Contrast

What inconsistencies, fallacies

Arrange

What is the relationship

Chart

What is the function of

Diagram

What conclusions

Reason for...

What does the author believe

Investigate

Make a distinction

Cause for

What motive is there

Conclude

State the point of view

Separate

What relationship

Graph

Differentiate

Dissect

Categorize

Distinguish fact from opinion

What persuasive technique

Synthesize – Can students combine ideas and CREATE a new entity?

New ways of doing

Consider the unexpected

Pose an alternative

Hypothesize

Create

Compose

Solve

Design

Construct

How else would you

Build

Combine

Solve the following

Imagine

Plan

Predict

Link concepts in an unusual and flexible way

Make

What if

Invent

Propose an alternative

Evaluate – Can students make JUDGEMENTS and support them?

Evaluate quality, relevance, reliability, truth

Argue critically

Determine the accuracy and effectiveness

Rate

Grade

Verify

Dispute

Criticise

Find the errors

Appraise

Judge

Editorialise

Defend

Rank by order of importance

Defend

Which is best

Choose and explain why

What fallacies, consistencies, inconsistencies appear

Which is more important, better, moral, appropriate, inappropriate, useful, clearer, suits the purpose, achieves the goal, logical, valid

Assessment methods vs Learning Outcomes and course content:

(from Developing Learning Outcomes: Linking Outcomes to Assessment, Faculty of Medicine, Dentistry and Health Sciences, Uni. of Western Australia)

• Assessing knowledge and comprehension

Essays

Report

Short answer questions

Reflective case summary

Videotaped consultation

Reflective journals/portfolios

Critical incident analysis

Concept mapping

Case based article

Critical appraisal

• **Assessing critical thinking skills**

Essay

Report

Critical incident analysis

Assessing Peer feedback

Critical evaluation of the literature

Critique on an issue

Reflective journal writing

Seminar presentation

• **Assessing problem solving skills**

Simulation

Report

Clinical assessment

Essay Question

Observed long case

Problem Based Learning (PBL)

Poster

Simulated patient interviews

Viva voce

- **Assessing performance of procedures and demonstrating techniques**

Mastery performance tests

Video skill assessment

Assessment of competence in simulation

Case History exercises

Clinical tutor evaluation

Observed long case

Clinical tutor assessment

OSCE

Web-based skills Ward rating assessment

Special clinical skills exam

Laboratory reports

Case presentation

Case assessment

- **Assessing ability to reflect upon learning and integrate into professional practice**

Reflective journals

Simulations

Case Study

PBL

Clinical tutor evaluation

Videotaped consultation

Case presentation

Portfolio

Critical incidents

Project

Log diary

Clinical experience record

Reflective case summary

Clinical tutor rating

• **Assessing independent learning skills**

Learning contracts

Peer assessment

Critical appraisal

Clinical experience record

Portfolios

Project

Reflective case summary

Case based article

• **Assessing collaborative learning skills**

Group projects where the group process and group outcomes are assessed (using criteria against which the group can assess itself and determine future, more effective ways of functioning)

Peer tutoring

• **Assessing research skills**

Research assignment that is professionally relevant (and where students are assisted to develop the requisite skills)

Develop a database on a particular area

Writing an annotated bibliography

Case based article

Research Paper

Literature review

Conclusion

It is hoped that this handbook will assist the lecturers in their endless endeavors in serving the best education to the students and a good basis for their self-improvement as educators.