TEACHING, LEARNING & ASSESSING

Copyright Statement

Introduction

There are 10 Mandatory Units for the Level 4 BTEC Diploma for Healthcare Science Associates, listed in the table below:

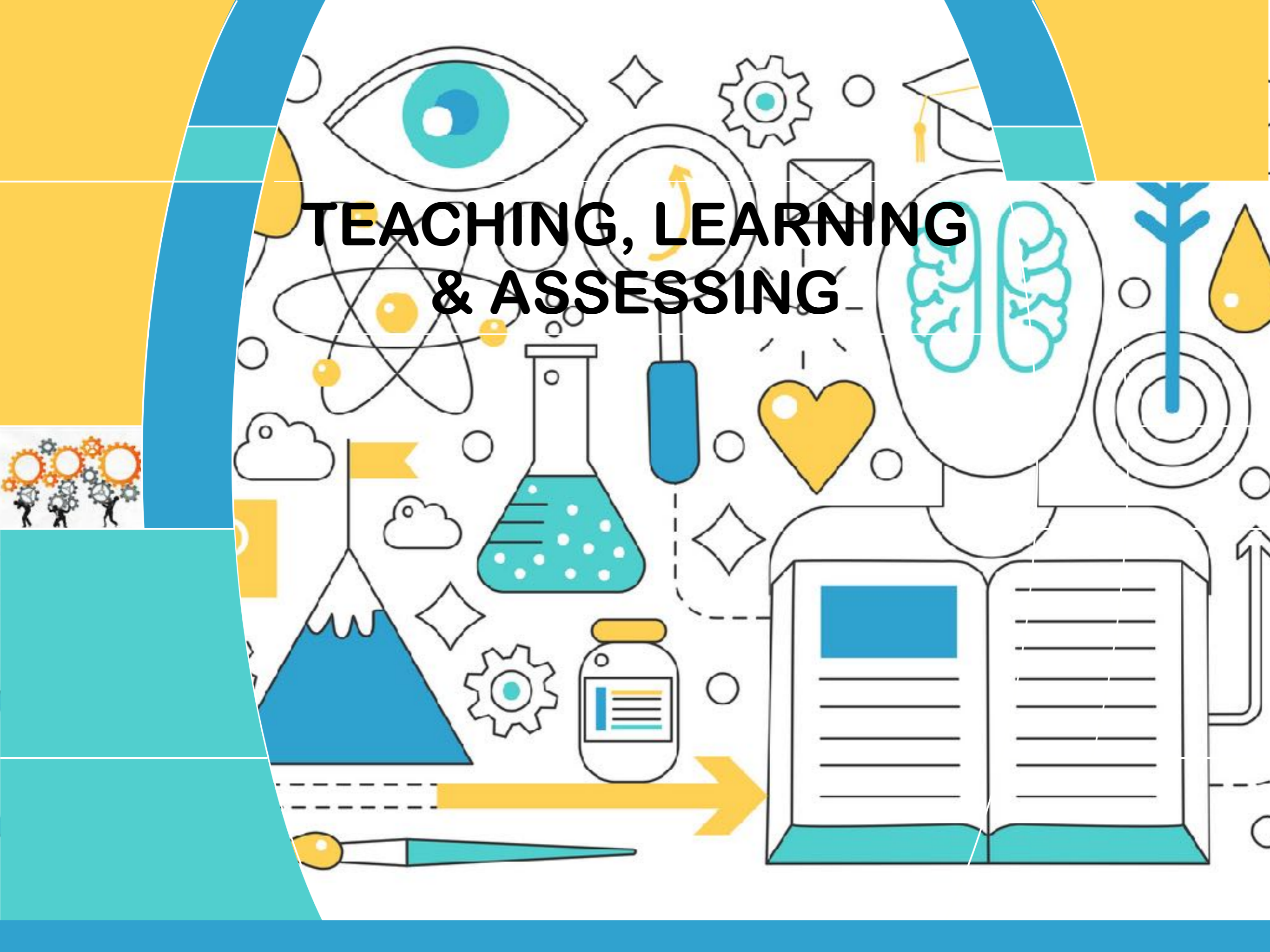| Unit 1	Skills for Lifelong Learning
Unit 2	Professional Practice and Person-centred Care
Unit 3	Legal and Ethical Context of Practice
Unit 4	Health, Safety and Security in the Healthcare Science Environment
Unit 5	Technical Scientific Services
Unit 6	Effective Communication in Healthcare
Unit 7	Audit, Research, Development and Innovation
Unit 8	Leadership and Teamwork
Unit 9	Teaching, Learning and Assessing Practical Skills
Unit 10	Continuing Personal and Professional Development

This is one of six eBooks that have been produced to give you the necessary information you need to complete the work for the mandatory units. You don't have to learn everything that is written here. Instead think of the books as a jigsaw puzzle. You have been given some pieces that describe the work you need to do to complete the units, and the eBooks are the the big picture of the puzzle that helps you know where the pieces fit and gives you the resources to do the work.

This eBook is a guide for Mandatory Units 9. ADD

As you read through the book you will find the work you need to do in dark blue boxes headed "ASSIGNMENT", with a reference to the assessment criteria for the relevant module. You will also find this information with some additional details in your Mandatory Units Learning and Assessment Guides and in your e-portfolio. At all times try to relate what you read here and write in your assignments to your own work context and practice.

TEACHING, LEARNING & ASSESSING

Chapter 1: Learning Theory and Process

Learning objectives

- Definitions of teaching and learning

- Bloom's taxonomy and the three domains of learning

- Theories of learning

- Principles of adult learning

1.1 Overview

Learning and teaching

There are many definitions of learning and teaching. These are two:

> We define learning as the transformative process of taking in information that - when internalized and mixed with what we have experienced - changes what we know and builds on what we do. It is based on input, process, and reflection. It is what changes us. (Malamed, 2016)

> Teaching is the process of attending to people's needs, experiences and feelings, and making specific interventions to help them learn particular things. Interventions commonly take the form of questioning, listening, giving information, explaining some phenomenon, demonstrating a skill or process, testing understanding and capacity, and facilitating learning activities (such as note taking, discussion, assignment writing, simulations and practice). (Smith, 2016)

The following is an extract from *Effective teaching and learning for eye health workers* published in the Community Eye Health Journal. (Prozesky, Stevens and Hubley, 2006) It outlines a number of themes that will be discussed in this eBook.

About learning

All of us understand things in the light of our past experience. This is also true of 'learning' – we get our ideas of what 'learning' means from what happened to us in the past. So, for example, we may think of 'learning' as something which takes place in a school or college, in a classroom. We may think of it as a person sitting alone at night, trying to memorise a lot of facts so that s/he can pass an examination. However, a bit of reflection will show us that 'learning' is much wider than that. After all, children learn a great deal before they even get to school – they learn to speak, to walk. Educational psychologists tell us that any activity which leads to a change in our behaviour is 'learning' (Stones, 1966, pp.50-51).

Here are some more ideas about 'learning':

- Learning can be formal or informal. We learn informally from what we experience day by day – things which happen to us make us change the way we think and act. We may not even be aware that we are learning, which may cause problems – for example, health workers may learn bad attitudes from the example of others. Of course, learning may also be formal – we attend a course which is planned in a structured way, in a school or college.

- We don't just learn knowledge and facts – we also learn skills and attitudes. This is especially important for health workers, since it is in our practical work that we have an effect on the health of the people we serve. A skill that is often overlooked is the ability to make decisions well, and this has to be learnt systematically. Note that we learn knowledge, skills and attitudes in different ways – for example, we may learn a new idea from a discussion, but we learn skills by practising them and getting feedback.

- People learn in different ways. Researchers have identified different 'learning styles'. Some people are 'receivers' – they like to memorise what is given to them. This is a very common style. It is reinforced by teachers who expect students to memorise, and

reward them for it. Other people are 'detectives', they like to investigate what they are learning themselves to get to understand it. Yet others are 'generators', they like to decide themselves what they want to learn, and then look for opportunities to learn those things.

- Learning can be superficial or deep. If knowledge is only memorised (superficial learning) it is soon forgotten and may never affect the way that person does her/his work. If the learner is made to use the new knowledge actively, the learning becomes deep. The learner connects the new knowledge to the concepts that s/he already has and understands how it can be used practically. It is therefore much more likely to be remembered and used.

- Motivation is important for learning. What is it that makes people want to learn? Some learn because they want to do a better job – they get satisfaction from the feeling that they are competent. People are also very strongly motivated by the hope that they will be rewarded – for instance, by gaining a qualification, leading to a promotion and better pay. The need to pass exams is therefore a very strong motivator.

- Learning continues throughout a person's lifetime – at least informally. We all know that health workers should continue to learn throughout their careers because new information about health is constantly becoming available. However, many workers do not have access to formal in-service training. This means they have to take personal responsibility for staying up-to-date and they have to become 'life-long learners'.

About 'teaching'

Our understanding of what 'teaching' is, is based on our past experience. Our earliest experience was in school, where the teacher was also a 'master' or 'mistress', standing in front of the class, telling us what to do and what to learn. Some of us experienced the same kind of 'teaching' at college. Others may have experienced teaching

where the 'teacher' is more of an equal, who takes account of our experience and even learns from us. That is why Abbatt and McMahon say: 'teaching is helping other people to learn.' [and] go on to say that the job of 'teaching' health care workers has four elements:

- The teacher has to decide what students should learn. The students and their potential employers may take part in this decision, but all are guided by the same principle: it is the job that people have to do, that determines what they should learn. They have to learn all the knowledge, skills and attitudes needed to perform a specific job.

- The teacher has to help the learners to learn. This does not mean that the teacher 'spoon feeds' the students, as if they were babies. It does mean that the teacher's first concern should be that the students should learn as well as possible. Teaching sessions or classes have to be planned carefully, taking into account the learning styles, the language, the background of the students. In short, the teachers must be student centred, not teacher centred. Teachers are not dictators and students are not servants.

- The teacher has to make sure that the students have learnt – he/she has to assess them. Assessment helps teachers and students to see how well the students are progressing, so that they can attend to any weaknesses. It sets a standard, so that society is given people who are competent to practice. We must plan assessment carefully so that it supports the learning we want to see – we know that students learn what they believe they need to pass the exams, and leave out the rest.

- The teacher has to look after the welfare of her/his students. Students who are stressed and unhappy do not learn well. Good teachers try to ensure that the general living conditions of their students are adequate. They also provide opportunities for personal counselling for them. Teachers need to cultivate an open and trusting relationship with their students.

The BTEC Diploma in Healthcare Science

The specification for the BTEC Diploma in Healthcare Science was developed by the Modernising Scientific Careers group in consultation with the representatives of the different Healthcare Science specialisms.

What the student should learn

When putting a course of study together, the first step is to decide what the students should learn, and this is expressed as **Learning Objectives**. Learning objectives describe what will be taught, and teaching methods and course materials are designed to deliver learning to the student. For example the learning objectives for Chapter 1 Microorganisms and Viruses of the Microbiology and Infection Control eBook are:

- Classification and distinguishing features of bacteria, fungi, protozoa and viruses
- Symbiotic relationships between humans and microorganisms - mutualism, commensalism and parasitism

The learning objectives for Chapter 2 Identification of Microorganisms and Viruses are:

- How to collect and transport microbiological specimens for identification and culture
- How microbiological specimens are processed, cultured and identified in the laboratory

How the student should be assessed

Students must be assessed to determine if they have learned at the end of the course of study. This is expressed as **Learning Outcomes** -

statements that describe or list measurable and essential knowledge, competencies, and behaviours that can be displayed or observed and assessed against criteria. For example the learning outcome for Chapter 1 Microorganisms and Viruses is:

1. Understand the different categories of microbes and their classification

and the Assessment Criteria are

1.1 Describe the classification of different types of microbes
1.2 Explain the distinguishing features of different types of microbes
1.3 Explain the symbiotic relationships between humans and microbes
1.4 Explain the concepts of pathogen, infection and contagion, normal flora and opportunistic infections

For Chapter 2, the learning outcome is:

2. Understand how specimens are collected and transported, and how microbes are identified in the laboratory

with the assessment criteria:

2.1 Explain procedures for microscopy and culture of microorganisms in the laboratory
2.2 Discuss procedures for specimen collection from the eye and how they are transported to the laboratory
2.3 Explain the laboratory identification of a type of microbe relevant to own area of practice
2.4 Explain local protocols and procedures for sight-threatening corneal ulcers and endophthalmitis

Note that learning outcomes and assessment criteria are written as verbs, as they are describing what the student needs to do.

1.2 Domains of Learning

Beginning in 1949 Professor Benjamin Bloom, an educational psychologist, and co-workers developed a systematic method for developing learning objectives, with the purpose of providing a common language for teachers to discuss and exchange learning and assessment methods. This is now referred to as Bloom's Taxonomy, and over time it has undergone development and revisions. Taxonomy is the process of naming and classifying things into groups within a larger system, according to their similarities and differences.

Teaching and learning is considered in three domains: **cognitive** (thinking); **affective** (emotion/feeling), and **psychomotor** (physical/kinesthetic). The taxonomies for each domain are arranged so that they proceed from the simplest to more complex levels. Each category has associated key words, listed in Table 1 on page 15. (Clark, 2015)

Taxonomies of the Cognitive Domain

The cognitive domain underwent major revisions in 2000/01 and the revised taxonomy is presented here. Taxonomies are frequently illustrated as a pyramid or triangle, as shown in Fig. 1:

1. **Remembering:** Recognising or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information.

    Examples: Recite a policy. Quote prices from memory to a customer. Recite the safety rules.

2. **Understanding:** Constructing meaning from different types of functions be they written or graphic messages, or activities like

interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining.

Examples: Rewrite the principles of infection control. Explain in your own words the steps for performing a complex task. Translate an equation into a computer spreadsheet.
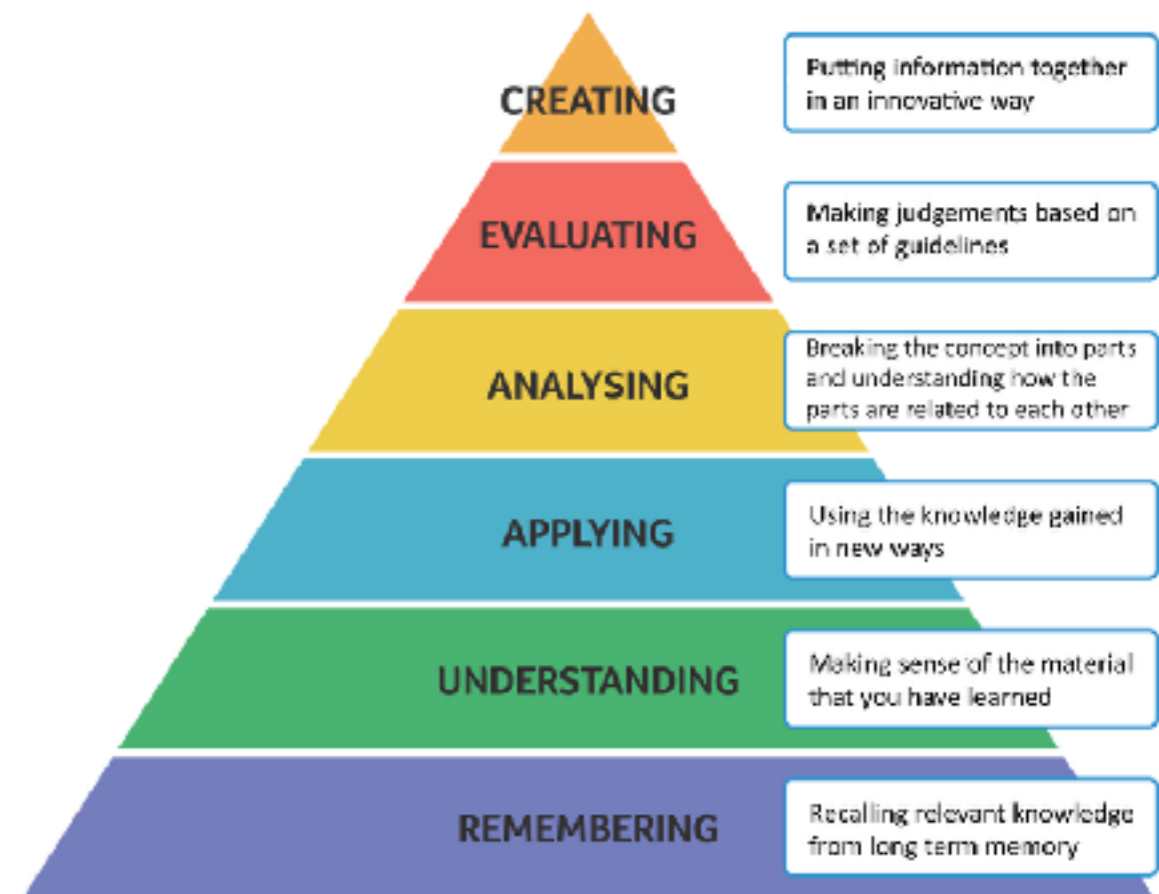

Figure 1: Taxonomy of the Cognitive Domain

3. **Applying:** Carrying out or using a procedure through executing or implementing. Applying relates to or refers to situations where

learned material is used through products like models, presentations, interviews or simulations.

Examples: Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the validity of a research finding.

4. **Analysing:** Breaking materials or concepts into parts, determining how the parts relate to one another, or how the parts relate to an overall structure or purpose. Mental actions included in this function are differentiating, organising, and attributing, as well as being able to distinguish between the components or parts. When someone is analysing, he/she can illustrate this mental function by creating spreadsheets, surveys, charts, or diagrams, or graphic representations.

Examples: Troubleshoot a piece of equipment by using logical deduction. Recognise logical fallacies in reasoning. Gather information from a department and select the required tasks for training.

5. **Evaluating:** Making judgements based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation.

Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget.

6. **Creating:** Putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way or synthesize parts into something new and different thus creating a new form or

product. This process is the most difficult mental function in this taxonomy.

Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrate training from several sources to solve a problem. Revise and process to improve the outcome. (Clark, 2015)

Taxonomies of the Affective Domain

This area is concerned with feelings or emotions. The taxonomy is arranged from simpler feelings to those that are more complex.

1. **Receiving:** This refers to the learner's sensitivity to the existence of stimuli – awareness, willingness to receive, or selected attention.

   Examples: Listens to others with respect. Listens for and remembers the name of newly introduced people.

2. **Responding:** This refers to the learners' active attention to stimuli and his/her motivation to learn – acquiescence, willing responses, or feelings of satisfaction.

   Examples: Participates in group discussions. Gives a presentation. Questions new ideals, concepts, models, etc. in order to fully understand them. Knows the safety rules and practices them

3. **Valuing:** This refers to the learner's beliefs and attitudes of worth – acceptance, preference, or commitment to a value. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalisation of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable.

   Examples: Demonstrates belief in the democratic process. Is

sensitive towards individual and cultural differences (values diversity). Shows the ability to solve problems. Proposes a plan for social improvement and follows through with commitment. Informs management on matters that one feels strongly about.
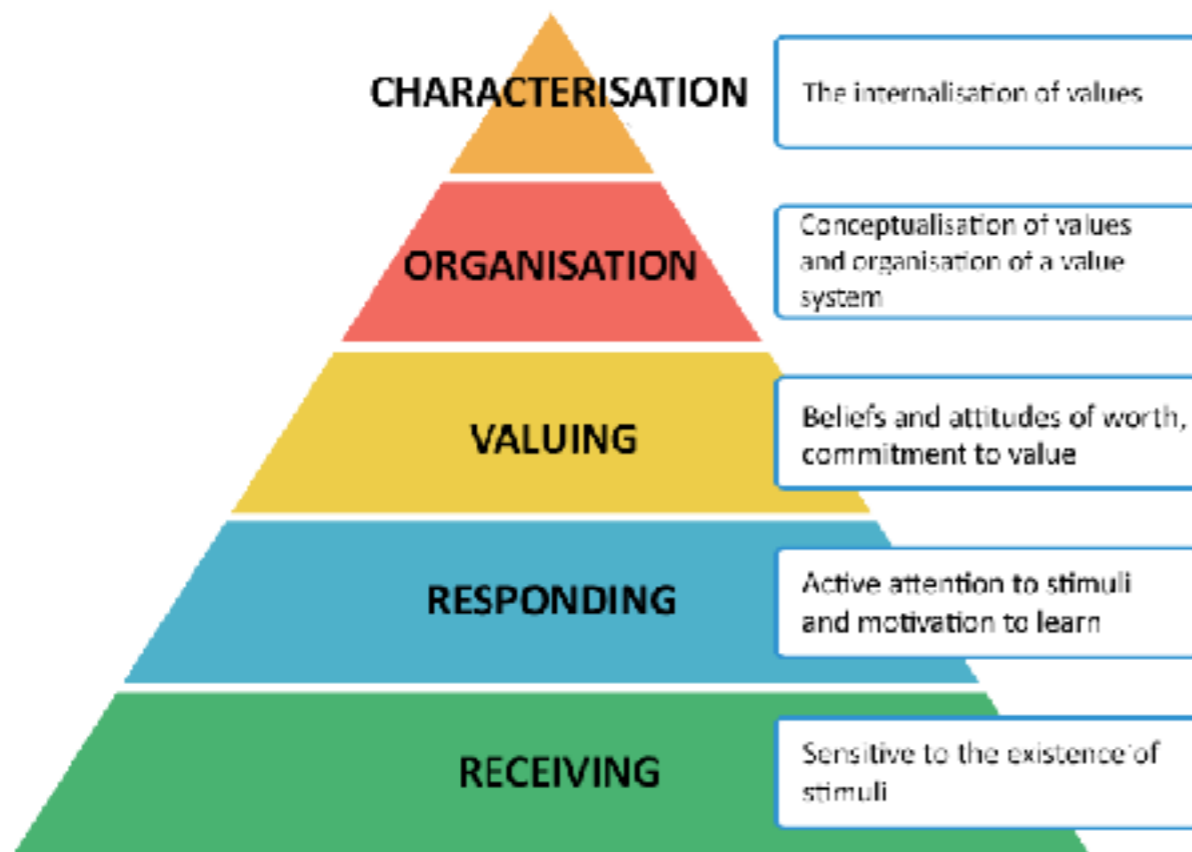

Figure 2: **Taxonomy of the Affective Domain**

4. **Organisation:** This refers to the learner's internalisation of values and beliefs involving (1) the conceptualisation of values; and (2) the organisation of a value system. As values or beliefs become internalised, the leaner organizes them according to priority.

Examples: Recognises the need for balance between freedom and responsible behavior. Explains the role of systematic planning in solving problems. Accepts professional ethical standards. Creates a life plan in harmony with abilities, interests, and beliefs. Prioritises time effectively to meet the needs of the organisation, family, and self.

5. **Characterisation:** The internalisation of values.

Examples: Shows self-reliance when working independently. Cooperates in group activities (displays teamwork). Uses an objective approach in problem solving. Displays a professional commitment to ethical practice on a daily basis. Revises judgments and changes behaviour in light of new evidence. Values people for what they are, not how they look. (Clark, 2015)

Taxonomies of the Psychomotor Domain

The psychomotor domain (there are several versions, this is from Simpson, 1972) includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. Thus, psychomotor skills rage from manual tasks, such as digging a ditch or washing a car, to more complex tasks, such as operating a complex piece of machinery or dancing.

1. **Perception (awareness):** The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.

Examples: Detects non-verbal communication cues. Estimates where a ball will land after it is thrown and then moves to the correct location to catch the ball. Adjusts heat of stove to correct

temperature by smell and taste of food. Adjusts the height of the forks on a forklift by comparing where the forks are in relation to the pallet.
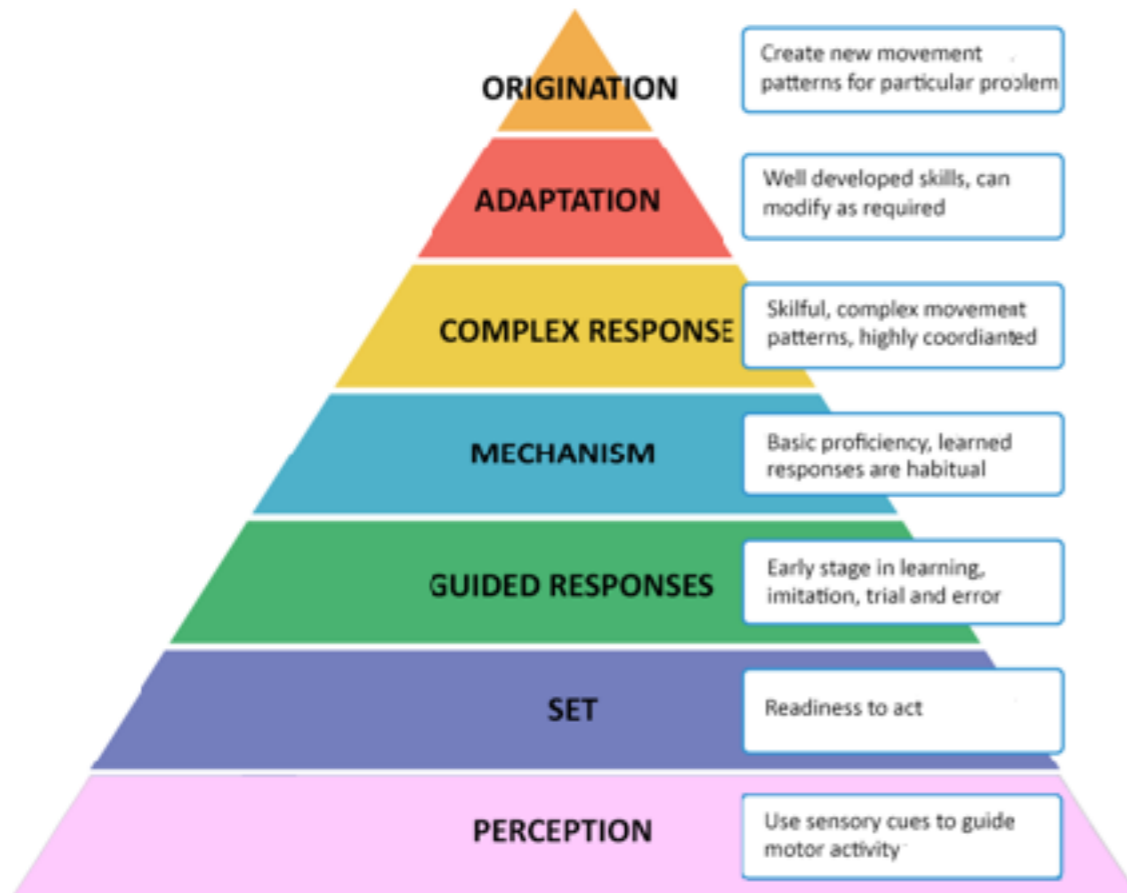

Figure 3: **Taxonomy of the Psychomotor Domain**

2. **Set:** Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets).

Examples: Knows and acts upon a sequence of steps in a manufacturing process. Recognises own abilities and limitations. Shows desire to learn a new process (motivation). NOTE: This subdivision of Psychomotor is closely related with the "Responding" subdivision of the Affective domain.

3. **Guided Response:** The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.

Examples: Performs a mathematical equation as demonstrated. Follows instructions to build a model. Responds to hand signals of instructor while learning to operate a forklift.

4. **Mechanism (basic proficiency):** This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.

Examples: Uses a personal computer. Repairs a leaking tap. Drives a car.

5. **Complex Overt Response (Expert):** The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance.

Examples: Manoeuvres a car into a tight parallel parking spot. Operates a computer quickly and accurately. Displays competence while playing the piano.

6. **Adaptation:** Skills are well developed and the individual can modify movement patterns to fit special requirements.

   Examples: Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Performs a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task).

7. **Origination:** Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasisze creativity based upon highly developed skills.

   Examples: Develops a new surgical procedure. Creates a new gymnastic routine.

(Clark, 2015)

Note that if the activity is simply something that is physical which supports another area - affective or cognitive - the objective should be termed physical rather than psychomotor. An example of something physical which supports specific cognitive development and skills might be looking through a microscope, and then identifying and drawing cells. Here the instructional intent is not to develop specific skilled proficiency in microscope viewing or in reproducing cells through drawing. Rather the physical action supports cognitive growth and recognition skills. The learner is using the physical action to achieve the cognitive objectives - identify, recognise, and differentiate varied types of cells. (Wilson, 2018)

Certainly more complex learning objectives can be written so that they that meld 2 or 3 domains. For instance, students can gain appreciation (a cognitive objective) for what a machine can do by observing and studying its functions. Learning to use the machine would fall under "skilled movements" in the psychomotor domain. Performing surgery requires skills in all three domains:

Table 1 lists key words that are used with different categories in the three domains. These are used, for example, when writing learning objectives and learning outcomes.

Table 1: Key words used with categories in the three domains

COGNITIVE DOMAIN		AFFECTIVE DOMAIN		PSYCHOMOTOR DOMAIN	
Category	**Key words**	**Category**	**Key words**	**Category**	**Key words**
Remembering: Recall or retrieve previous learned information.	define describe identify know list match name outline recall recognize relate repeat	**Receiving phenomena**: Awareness, willingness to hear, selected attention.	acknowledge ask attentive courteous dutiful follows listens understands	**Perception (awareness):** The ability to use sensory cues to guide motor activity.	chooses describes detects differentiates distinguishes identifies isolates relates selects
Understanding: Comprehends instructions and problems. States a problem in own words.	convert distinguish estimate explain generalise infer interpret paraphrase predict summarise	**Responds to phenomena:** Active participation on the part of the learners. Attend and react to a particular phenomenon.	answer assist aid comply conform discuss greet help label perform present tell	**Set:** Readiness to act. It includes mental, physical, and emotional sets (sometimes called mindsets).	begins displays explains moves proceeds reacts shows states volunteers
Applying: Applies what was learned into novel situations in the work place.	apply change construct demonstrate discover modify operate prepare produce relate show solve	**Valuing:** The worth or value a person attaches to a particular object, phenomenon, or behavior.	appreciate demonstrate empathise initiate invite justify propose respect share	**Guided Response:** The early stages in learning a complex skill that includes imitation and trial and error.	copies traces follows reacts reproduces responds
Analysing: Separates material or concepts into component parts to understand organizational structure. Distinguishes facts and inferences.	compare contrast categorize differentiate classify deduce experiment discover inspect dissect discriminate separate	**Organization:** Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating an unique value system.	compares, relates, synthesises	**Mechanism (basic proficiency):** This is the intermediate stage in learning a complex skill.	assembles calibrates constructs dismantles displays fastens fixes grinds heats manipulates measures mends mixes organises sketches
Evaluating: Make judgments about the value of ideas or materials.	appraise compare conclude contrast critique describe discriminate evaluate interpret justify summarise	**Internalizes Values:** Has a value system that controls their behavior. The behavior is pervasive, consistent, predictable.	acts discriminates displays influences modifies performs qualifies questions revises serves solves verifies	**Complex Overt Response (Expert):** The skillful performance of motor acts that involve complex movement patterns.	The key words are the same as Mechanism, but with descriptors that indicate performance is quicker, more accurate etc.
Creating: Builds a structure or pattern from diverse elements. Puts parts together to create a new meaning or structure.	combine compose create devise design generate modify organise rearrange reconstruct reorganize revise rewrite			**Adaptation:** Skills are well developed and the individual can modify movement patterns to fit special requirements.	adapts alters changes rearranges reorganizes revises varies.
(Adapted from Clark, 2015)				**Origination:** Creating new movement patterns to fit a particular situation or specific problem.	arranges builds combines, composes constructs creates designs initiate makes originates.

Applications of Bloom's Taxonomy

Bloom's original cognitive taxonomy described three categories or dimensions of knowledge - factual, conceptual and procedural - that could be processed at the different levels of cognition. For example facts could be remembered, understood, applied, analysed etc.; concepts could be remembered, understood, applied, analysed, and so on. With later revisions of the cognitive taxonomy, knowledge is considered in six dimensions:

- **Facts** - Specific and unique data or instance.

- **Concepts** - A class of items, words, or ideas that are known by a common name, includes multiple specific examples, shares common features. There are two types of concepts: concrete and abstract.

- **Processes** - A flow of events or activities that describe how things work rather than how to do things. There are normally two types: business processes that describe work flows and technical processes that describe how things work in equipment or nature. They may be thought of as the big picture, of how something works.

- **Procedures** - A series of step-by-step actions and decisions that result in the achievement of a task. There are two types of actions: linear and branched.

- **Principles** - Guidelines, rules, and parameters that govern. It includes not only what should be done, but also what should not be done. Principles allow one to make predictions and draw implications. Given an effect, one can infer the cause of a phenomena. Principles are the basic building blocks of causal models or theoretical models (theories).

- **Metacognition** - Knowledge of cognition in general, as well as awareness and knowledge of one's own cognition.

The cognitive and knowledge dimensions can be arranged in a matrix, as shown in Table 2 below, that can be used as an aid to developing learning objectives and learning outcomes. (Clark, 2017) Indeed Bloom's taxonomy has been used to develop the course specification for this Diploma in Healthcare Science.

Table 2: Matrix of Cognitive and Knowledge Dimensions.
Suggestions for key words are in italics

The Knowledge Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
Facts	*list*	*paraphrase*	*classify*	*outline*	*rank*	*categorise*
Concepts	*recall*	*explain*	*show*	*contrast*	*criticise*	*modify*
Processes	*outline*	*estimate*	*produce*	*diagram*	*defend*	*design*
Procedures	*reproduce*	*give an example*	*relate*	*identify*	*critique*	*plan*
Principles	*state*	*convert*	*solve*	*differentiates*	*conclude*	*revise*
Metacognitive	*proper use*	*interpret*	*discover*	*infer*	*predict*	*actualise*

Bloom's taxonomy enables teachers and course developers to see and understand how lower-level skills build into higher-order thinking, for example recalling facts and comprehending previous problems allows a student to apply their experience to similar problems. This can facilitate the ordering and prioritising of course material. For example, lower-level skills such as memorising factual knowledge can be developed before higher-level skills such as analysis of relationships are introduced.

Educators frequently face a confusing array of standards and curriculum requirements, and Bloom's taxonomy offers a guiding framework for breaking these criteria down into accessible chunks which can be used to direct day-to-day lesson plans.

Just as different levels require different instructional delivery methods, they also require different assessment methods. Bloom's taxonomy can be used as a checklist to ensure that all levels of a domain have been assessed and to align assessment methods with the appropriate course work and methodologies. In this way, the taxonomy also makes it easier for instructors to maintain consistency between assessment methods, content and instructional materials and identify areas of weakness. (University of Central Florida, 2017)

TRAINING AN EYE SURGEON

Although many ophthalmologists may be unfamiliar with the details of Bloom's taxonomy, they are likely to have an intuitive understanding of the domains and levels of complexity required to become a competent surgeon. It might be assumed that all a surgeon needs are skills in the psychomotor domain: basic aptitude with good hand-eye coordination at level 1 - Perception; appropriate mind Set at level 2; and, with training, should develop skills to at least level 5 - Complex Overt Response; and, in particular when dealing with surgical complications, would require skills at level 6 - Adaptation.

However, when a surgeon assesses a patient's suitability for, say, a cataract operation, he or she must consider the patient's wishes and expectations, and the risks versus benefits of surgery taking into account any other eye pathology that could compromise the outcome. The surgeon also needs to have a detailed understanding of the structures of the eye and how they may respond during the course of an operation. For this, and more, the surgeon needs skills in the Cognitive Domain to at least level 5 - Evaluating.

A surgeon also needs to have high ethical standards and a capacity to work with the theatre team, and in the Affective Domain needs to function at level 4 - Organisation, and level 5 -Characterisation. If a surgeon is highly skilled in the psychomotor domain but performs surgery for financial gain or self-aggrandisement, he/she may not be acting in the patient's best interests and may be more dangerous than a surgeon of more modest skills who operates appropriately within the limits of his or her competence.

1.3 How do students learn?

The emphasis of Bloom's taxonomy is on what students should learn, but when developing a learning programme it is also important to understand how students learn. There are a number of different theories and frameworks that endeavour to explain how people learn.

Kolb's Experiential Learning Theory

David Kolb published his experiential learning theory in 1984 from which he developed his learning style inventory. This works on two levels: a four-stage cycle of learning and four separate learning styles. Much of Kolb's theory is concerned with the learner's internal cognitive (thinking) processes.

Kolb argues that learning involves the acquisition of abstract concepts that can be applied flexibly in a range of situations. In Kolb's theory, the impetus for the development of new concepts is provided by new experiences.

"Learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p.38).

The experiential learning style theory is typically represented by a four stage learning cycle in which the learner 'touches all the bases'. Effective learning is seen when a person progresses through the four stages:

1. **Concrete Experience** - (a new experience or situation is encountered, or a reinterpretation of existing experience).
2. **Reflective Observation** (of the new experience. Of particular importance are any inconsistencies between experience and understanding).
3. **Abstract Conceptualisation** (Reflection gives rise to a new idea, or a modification of an existing abstract concept).
4. **Active Experimentation** (the learner applies them to the world around them to see what results)

Kolb views learning as an integrated process with each stage being mutually supportive of and feeding into the next. It is possible to enter the cycle at any stage and follow it through its logical sequence. However, effective learning only occurs when a learner is able to execute all four stages of the model. Therefore, no one stage of the cycle is effective as a learning procedure on its own.(Kolb, 1974)

Kolb's learning styles

Kolb's learning theory sets out four distinct learning styles, based on the four-stage learning cycle. He argues that different people naturally prefer a particular learning style, and that their preference is influenced by various factors such as social environment, educational experiences, or the basic cognitive structure of the individual.

Whatever influences the choice of style, the learning style preference itself is actually the product of two pairs of variables, or two separate 'choices' that we make, which Kolb presented as lines of an axis, each with 'conflicting' modes at either end:

A typical presentation of Kolb's two continuums is the east-west axis called the **Processing Continuum** (how we approach a task), and the north-south axis called the **Perception Continuum** (our emotional response, or how we think or feel about it).
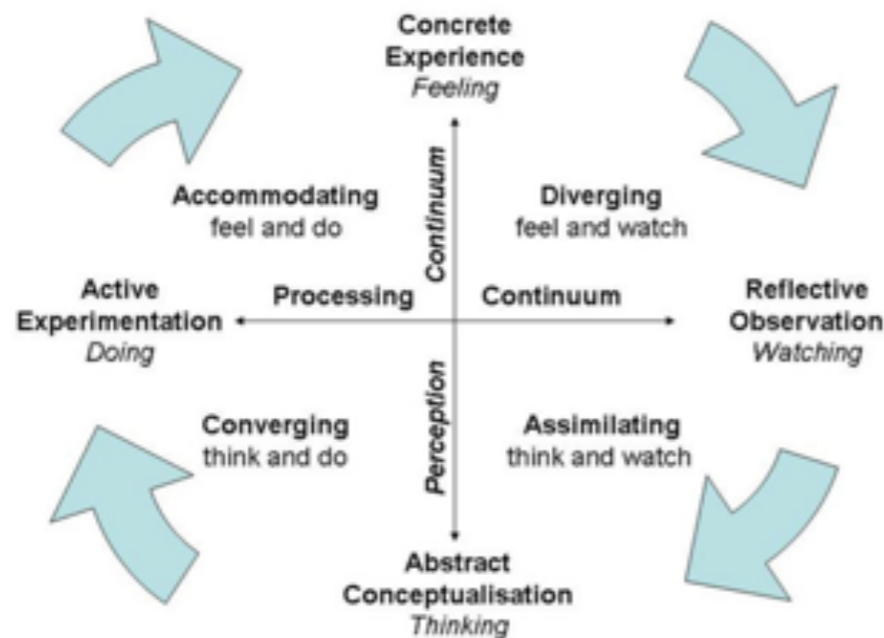
Kolb believed that we cannot perform both variables on a single axis at the same time (e.g. think and feel). Our learning style is a product of these two choices.

It's often easier to see the construction of Kolb's learning styles in terms of a two-by-two matrix. Each learning style represents a combination of two preferred styles. The matrix also highlights Kolb's terminology for the four learning styles; diverging, assimilating, and converging, accommodating:

	Active Experimentation (Doing)	Reflective Observation (Watching)
Concrete Experience (Feeling)	Accommodating (CE/AE)	Diverging (CE/RO)
Abstract Conceptualization (Thinking)	Converging (AC/AE)	Assimilating (AC/RO)

Learning Styles Descriptions

Here are brief descriptions of the four Kolb learning styles:

Diverging (feeling and watching - CE/RO)
These people are able to look at things from different perspectives. They are sensitive. They prefer to watch rather than do, tending to gather information and use imagination to solve problems. They are best at viewing concrete situations at several different viewpoints.

Kolb called this style 'diverging' because these people perform better in situations that require ideas-generation, for example, brainstorming. People with a diverging learning style have broad cultural interests and like to gather information.

They are interested in people, tend to be imaginative and emotional, and tend to be strong in the arts. People with the diverging style prefer to work in groups, to listen with an open mind and to receive personal feedback.

Assimilating (watching and thinking - AC/RO)
The Assimilating learning preference is for a concise, logical approach. Ideas and concepts are more important than people. These people require good clear explanation rather than practical opportunity. They excel at understanding wide-ranging information and organizing it in a clear logical format.

People with an assimilating learning style are less focused on people and more interested in ideas and abstract concepts. People with this style are more attracted to logically sound theories than approaches based on practical value.

This learning style is important for effectiveness in information and science careers. In formal learning situations, people with this style prefer readings, lectures, exploring analytical models, and having time to think things through.

Converging (doing and thinking - AC/AE)
People with a Converging learning style can solve problems and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with people and interpersonal aspects.

People with a converging learning style are best at finding practical uses for ideas and theories. They can solve problems and make decisions by finding solutions to questions and problems.

A converging learning style enables specialist and technology

abilities. People with a converging style like to experiment with new ideas, to simulate, and to work with practical applications.

Accommodating (doing and feeling - CE/AE)
The Accommodating learning style is 'hands-on', and relies on intuition rather than logic. These people use other people's analysis, and prefer to take a practical, experiential approach. They are attracted to new challenges and experiences, and to carrying out plans.

They commonly act on 'gut' instinct rather than logical analysis. People with an accommodating learning style will tend to rely on others for information than carry out their own analysis. This learning style is prevalent within the general population.

Knowing a person's (and your own) learning style enables learning to be orientated according to the preferred method. That said, everyone responds to and needs the stimulus of all types of learning styles to one extent or another - it is a matter of using emphasis that fits best with the given situation and a person's learning style preferences. Also, individuals can be helped to learn more effectively by the identification of their lesser preferred learning styles and the strengthening of these through the application of the experiential learning cycle. Ideally, activities and material should be developed in ways that draw on abilities from each stage of the experiential learning cycle and take the students through the whole process in sequence. (McLeod, 2013)

Honey and Mumford Learning Styles
In 1986 Peter Honey and Alan Mumford produced a Learning Styles Questionnaire (LSQ). Their work built upon Kolb's learning styles model, but their rationale for developing the questionnaire was that

most people do not consciously consider how they really learn, but to be an effective learner they must know their learning styles and preferences and find ways to learn using those methods.

The Honey and Mumford questionnaire probes general behavioral tendencies, designed on a continuum represented in the figure below. Knowing your learning style helps individuals to adjust the learning opportunities and preferences, thus increasing the range and variety of experiences that provide potential learning opportunities.

The following four learning styles are identified:

Activists: Activists are those individuals who learn by doing. Activists need to get their hands dirty. They have a receptive way to deal with learning, including themselves completely and without inclination in new encounters. The learning activities can be brainstorming, problem solving, group discussion, puzzles, competitions, role-play etc

Theorists: These learners get a kick out of the chance to comprehend the hypothesis behind the activities. They require models, ideas and truths with a specific end goal to participate in the learning procedure. Like to break down and integrate, drawing new data into a methodical and consistent 'hypothesis'. Their choice of learning activities includes models, statistics, stories, quotes, background information, applying concepts theoretically etc.

Pragmatists: These individuals have the capacity to perceive how to put the learning into practice in their present reality. Conceptual ideas and recreations are of constrained utility unless they can see an approach to put the concepts practically in their lives.

Experimenting with new ideas, speculations and methods to check whether they work is their mode of action. They learn better through taking time to think about how to apply learning in reality, case studies, problem solving and discussion.

Reflectors: These individuals learn by watching and contemplating what happened. They may abstain from jumping in and prefer to watch from the sidelines. They want to remain back and see encounters from various alternate points of view, gathering information and using the opportunity to work towards a suitable conclusion. They like paired discussions, self-analysis questionnaires, personality questionnaires, time out, observing activities, feedback from others. coaching, interviews etc.

A survey by Honey did not reveal any particular 'e-learning styles', although as a result of his research he speculated that 'Activists' (those with an open-minded approach to learning and who wish to involve themselves fully in the experience) would want the pace to be faster and the chunks of time to be shorter than 'reflectors' (those that prefer to stand back and view experiences from an number of different perspectives first).

Honey also suggested that 'Activists' might find it more difficult to motivate themselves and find time to complete the tasks than 'Theorists' (who like to analyse and synthesise, drawing new information into a systematic and logical theory) and 'Pragmatists' (experimenters, who try out new ideas and techniques to see if they will work) who are likely to be more disciplined and better at planning it into their schedules. Time management skills are particularly important for effective on-line study.
(E-Learning Network, 2017)

You can access a useful summary of learning theories and styles from the Open University here.

Visual-Aural-Read/Write-Kinaesthetic (VARK) model

The VARK model, developed in 1987 by Neil Fleming, was the first model to systematically present a series of questions with help sheets for students, teachers, employees, customers, suppliers and others to use in their own way. The initial model was Visual-Aural-Kinaesthetic (VAK), but Read/Write was added later for learners who preferred to learn with written texts rather than drawings and graphs. When learning experiences are tailored to the needs of the individual learner, that person is more likely to understand, recall and use new information.

The VARK learning styles can be categorized according to the most dominant "sense" the learner prefers to use.

1. **Visual:** These learners prefer to see the process demonstrated in a step-by-step way. They benefit from video demonstrations and from lectures that focus on watching an expert perform a task. They also tend to use traditional class notes more effectively than others.

2. **Auditory:** These learners are most effective when they listen to a process or concept being described. They benefit most from a traditional lecture. Participating by actively asking questions may help them learn better. They gain advantages from recording each lecture.

3. **Read/Write:** These learners prefer information displayed as words - reading and writing in all its forms but especially manuals, reports, essays and assignments. Most PowerPoint presentations and the Internet, GOOGLE and Wikipedia are essentially suited to those with this preference as there is seldom an auditory channel or a presentation that uses visual symbols.

4. **Kinesthetic:** Kinesthetic learners learn best by performing tasks. This is true even if they have not quite mastered the concepts and need to use trial and error. They can use either of the other learning styles as a secondary tool, but will benefit the most from project-based learning.

You can see clips of an interview with Neil Fleming here. Fleming does not consider VARK to be a full learning style inventory as it only uses

16 questions and thus examines only a small part of a student's learning preferences.

Whilst VARK or VAK is not the only classification of learning styles, it is one of the most recent and most widely referenced in contemporary adult education. You can use the VARK learning styles questionnaire (LSQ) to assess your own learning style here, and there are two other examples here (Educationplanner.org, 2011) and here. (Brainboxx.co.uk, 2018). The brainboxx website also has additional information about VAK theory here and you can follow links from this page to further learning resources.

> **What is your learning style? Does the VARK questionnaire correctly identify your own learning style? Do you think that knowing your learning stye will hep you with your studies?**
>
> "Educational research has shown that by becoming more aware of how you learn, you can become a more efficient and effective learner. There is no one single method of learning; there are many, and what works best depends on the task, the context and your personality. You will be a more effective learner if you are aware of the range of possible learning methods, and know when to apply them and what works best for you." (Rosewell, 2005)

Cognitivist learning theories

Learning styles theories is concerned with learning behaviours - the approaches and methods people use to learn. Cognitivist learning theories seek to explain how we receive, process and retain and retrieve information. Cognition is a term derived from the Latin cognoscere, referring to knowing and information. Cognitive theory in education considers that learning is a process depending on what the learner already knows (existing information) and their method of acquiring new knowledge (how they integrate new information into their existing schemas). It focuses on: how information is received; how information is processed and organised into existing schema; how information is retrieved upon recall. In other words, cognitive theory seeks to explain the process of knowledge acquisition and the subsequent effects on the mental structures within the mind. Inherent to the theory, the student must be an active participant in their own learning process.

Memory plays a vital role in the learning process. Information is stored within memory in an organised, meaningful manner. Memory can be classified as short-term, long-term and working memory.

Short-term memory is the capacity for holding, but not manipulating, a small amount of information in an active, readily available state for a short period of time. Short term memory can hold about 4 to 7 ± 1 units at a time, and the duration of the memory is believed to be in the order of seconds. For example, short-term memory can be used to remember a phone number that has just been recited. If you cannot make a note of this immediately you may rehearse (repeat the number in your mind) to retain it in your short term memory until you can. If you were told a 16 digit credit card number you would not be able to retain this in your short term memory.

Working memory is a cognitive system with a limited capacity that is responsible for temporarily holding information available for processing. Working memory is important for reasoning and the guidance of decision-making and behavior.

Long-term memory (LTM) is the stage where informative knowledge is held indefinitely. Our ability to retain memories is enhanced if the information is organised into a meaningful system, that have been termed a schema (plural schemas or schemata). The term schema refers to a mental framework humans use to represent and organise remembered information. Schemata present our personal simplified view of reality derived from our experience and prior knowledge. They enable us to recall, modify our behavior, concentrate attention on key information, or try to predict most likely outcomes of events. When new information is received it will, if possible, be assimilated into existing schema(ta), or related schema(ta) will be changed (accommodated) in order to integrate the new information.(Schunk, 2012)

A study by Bransford and Johnson (1972) provides a dramatic illustration of the role of meaningfulness in storage and comprehension. Consider the following passage:

> The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important, but complications can easily arise. A mistake can be expensive as well. At first the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then one never can tell. After the procedure is completed one arranges the materials into different groups again.

Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.(Schunk, 2012)

Without prior knowledge this passage is difficult to comprehend and store in memory because relating it to existing knowledge in memory is hard to do. However, knowing that it is about "washing clothes" makes remembering and comprehension easier. Bransford and Johnson found that students who knew the topic recalled about twice as much as those who were unaware of it. The importance of meaningfulness in learning has been demonstrated in numerous other studies. For more information about Schema theory see here.

An orthoptist who was line manager for staff performing visual field tests was struggling to maintain the quality of the visual fields they performed. She provided the training, explained what needed to be done to reduce artefacts. The quality would improve for a while but was not sustained, and when she repeated the training the staff seemed to have forgotten what they had been told previously. There are many possible reasons for this, but in many departments on-the-job training consists primarily of instruction in the process of doing the visual field with little provision of knowledge or understanding of what is a normal visual field, the pathology that causes visual field loss and how this affects the patient, how the visual field is measured, its importance in the management of the patient's condition, and the professional duty to provide high quality, patient-centred care. Without this "bigger picture" it is possible that the list of instructions without any reference schema were too easily forgotten.

As you have progressed through this Diploma programme you will have been organising your knowledge into a various schemas, some of which may have been unfamiliar. If you had little knowledge of anatomy and physiology you may have found this subject particularly challenging. All anatomy and physiology textbooks including *Introduction to the Human Body* present "schema" for constructing this complex subject area: Organization of the Human Body; Introductory Chemistry; Cells; Tissues; Body Systems etc. Did this help you organise and retain the information and did it give you a better understanding of the various eye conditions and diseases that you come across in your work? How well might you have retained the knowledge of anatomy and physiology if you had not been working in a healthcare environment?

1.4 The Learning Process

The principles of adult learning theory

Until the middle of last century most research into teaching and learning was focussed on children. From the 1950s Malcolm Knowles and others argued that adults learn differently from children. The term andragogy (Greek: "man-leading") refers to theories of adult learning whilst the term pedagogy (Greek: "child-leading") refers to theories of child learning. .Knowles published five assumptions of adult learning / andragogy, that are used in the design of adult-oriented training programs:

1. **Self-concept**
   As a person matures his/her self concept moves from one of being a dependent personality toward one of being a self-directed human being. Adult learners want respect and to be seen as capable learners. They should be offered choice and be encouraged to set their own learning goals. Adult learners:
   - are self-motivated and self-directed
   - are independent
   - like to find their own way
   - can make their own decisions
   - want to manage their own learning.

2. **Adult learner experience**
   As a person matures he/she accumulates a growing reservoir of experience that becomes an increasing resource for learning. They should be given the opportunity to use their existing knowledge and experience, which they can apply to new learning experiences. Adult learners:
   - have diverse experience and knowledge
   - may have ingrained ideas
   - apply their life experience and knowledge to new learning
   - use their problem-solving, reflecting and reasoning skills.

3. **Readiness to learn**
   As a person matures his/her readiness to learn becomes oriented increasingly to the developmental tasks of his/her social roles. Adults are ready to learn when they identify something they want to know or become proficient at, or when they experience something that connects with their life situations. They become ready to learn things in order to cope effectively with real-life situations. Adult learners:
   - are goal focused
   - want timely learning
   - seek meaningful learning experiences
   - need clear learning goals.

4. **Orientation to learning**
   As a person matures his/her time perspective changes from one of postponed application of knowledge to immediacy of application. As a result his/her orientation toward learning shifts from one of subject-centeredness to one of problem centeredness. Adult learners:
   - are practical – their learning should apply to their lives, job, etc.
   - want to be involved in planning their learning
   - focus on the aspects that are most useful to them.

5. **Motivation to learn**

 As a person matures the motivation to learn is internal (Knowles 1984:12). Adults are responsive to external motivators such as a better job or increased salary. However, the best motivators are internal; for example:

 - increased job satisfaction
 - heightened self-esteem
 - better quality of life
 - personal growth and development.

(Adult Learning Australia, 2019)

There appears to be a lack of research on whether this framework of teaching and learning principles is more relevant to adult learners or if it is just a set of good practices that could be used for both children and adult learners. (En.wikipedia.org, 2019) Knowles himself changed his position on whether andragogy really applied only to adults and came to believe that "pedagogy-andragogy represents a continuum ranging from teacher-directed to student-directed learning and that both approaches are appropriate with children and adults, depending on the situation. It has been argued that the difference in learning is not related to the age and stage of one's life, but instead related to individual characteristics and the differences in "context, culture and power" within different educational settings. Self-concept can be critiqued not just from the instructor's point of view, but also from the student's point of view. Not all adult learners will know exactly what they want to learn in a course and may seek a more structured outline from an instructor. An instructor cannot assume that an adult will desire self-directed learning in every situation.

There are also statutory and regulatory standards and requirements for many professions and occupations, and the learning outcomes and associated content of the courses will be set by the relevant professional or awarding body. or academic institution.

Active learning

Active learning is a process that has student learning at its centre. Active learning focuses on how students learn, not just on what they learn. Students are encouraged to 'think hard', rather than passively receive information from the teacher.

Research shows us that it is not possible to transmit understanding to students by simply telling them what they need to know. Instead, teachers need to make sure that they challenge their students' thinking. With active learning, students play an important part in their own learning process. They build knowledge and understanding in response to opportunities provided by their teacher. (Cambridge Assessment, 2020)

Strategies that promote active learning focus more on developing students' skills than on transmitting information and require that students do something - read, discuss, write - that requires higher-order thinking. They also tend to place some emphasis on students' explorations of their own attitudes and values. This can include a range of activities from the very simple (e.g., pausing lecture to allow students to clarify and organise their ideas by discussing with neighbours) to more complex (e.g. using case studies as a focal point for decision-making). Learners develop their existing knowledge and understanding in order to achieve deeper levels of understanding. This means that learners are more able to analyse, evaluate and synthesise

ideas (thus achieving the higher order skills of Bloom's Taxonomy). Suggestions for encouraging active learning can be found in the box below. Further information about active learning and techniques that can be used in the classroom can be found here. (Brame, 2019)

Distance learning does not provide the same opportunities for active learning as a classroom, but for a vocational programme the workplace offers abundant opportunities for active learning. The learner and their mentor or line manager should be alert to these opportunities that can form the basis for discussion at the time, after the event, or can be documented in the learner's reflective diary.

What are the benefits of active learning?

- Active learning develops students' autonomy and their ability to learn.
- Active learning gives students greater involvement and control over their learning.
- Active learning helps students to become 'lifelong learners'
- Because active learning encourages students to take a central role in their own learning, it prepares them better for both higher education and for the workplace.
- Analytical skills also help students to be better at problem solving and applying their knowledge.
- Active learning is engaging and intellectually exciting

How to encourage active learning

Start by asking participants to brainstorm problems which remain unresolved from the previous lecture or raise questions from the previous lecture or reading assignment.

Change the demands made on students every 10 to 15 minutes.

Pause for a few minutes two or three times during an hour lecture to allow students to consolidate notes and develop questions.

Generate discussion

Pause and ask participants to work in pairs to organise their notes and discuss the key points of the lecture. Each group could be asked to develop questions based on what is still unclear which can be addressed at the end of the lecture or at the beginning of the next one.

Give a demonstration, use cases and examples, give illustrations, show a film or videotape segment or use an audio recording.

Use other types of group work similar to those used for small groups

Ask students to stop taking notes before the end of the lecture and then ask them to reconstruct on a blank piece of paper, as much of the lecture as possible – either in outline form or diagrammatically. This forces participants to review and consolidate key points and discover points for review.

Encourage participation through:
• Questions and quizzes
• Gapped handouts and diagrams
• Data analysis and interpretation
• Brainstorms and buzz group
• Problems and cases

The Learning Environment

Maslow's hierarchy of needs

In the mid-1950s, psychologist Abraham Maslow proposed what is now known as Maslow's Hierarchy of Needs. where he explained that certain needs (in the lower levels of the hierarchy) must be met before a person will try to satisfy higher-level needs. This theory, often presented as a pyramid, can be used to structure the learning environment and teaching methods to enhance the motivation of learners.
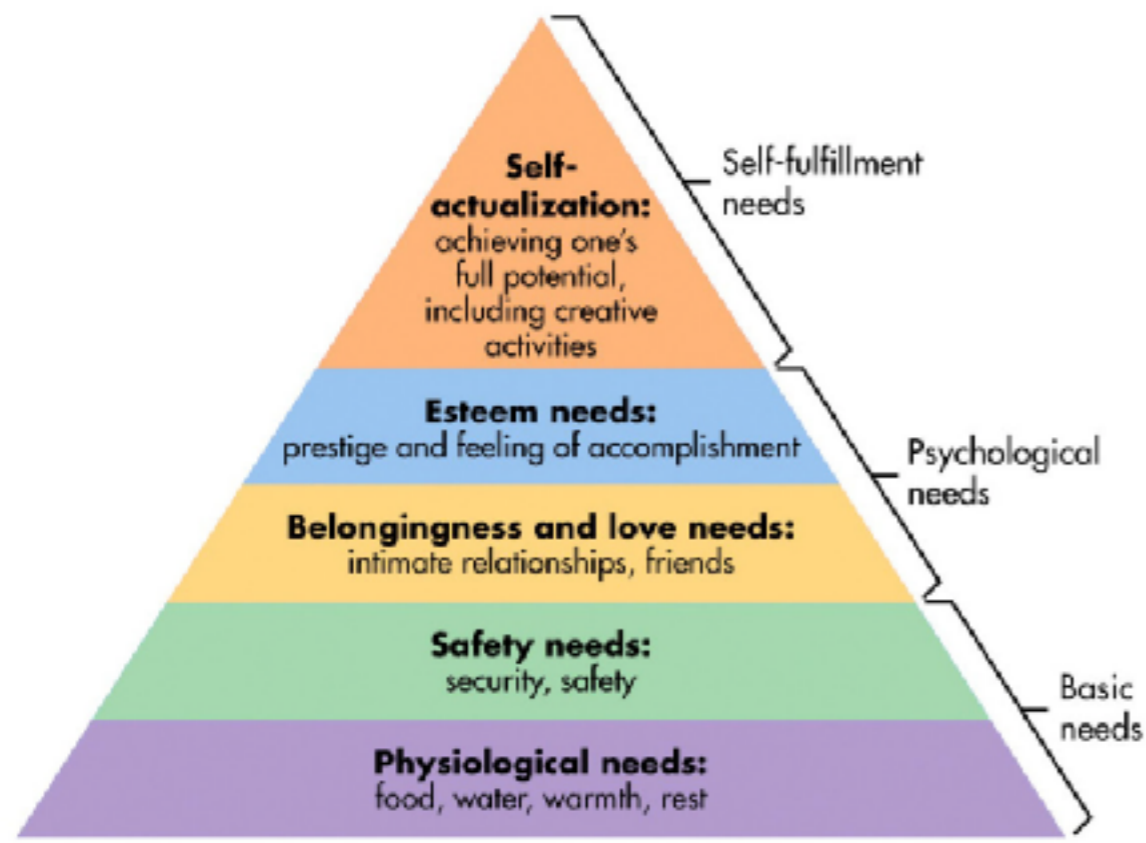
1. **Physiological needs.** The first, most basic level is physiological needs. This is essential for the person's survival and includes food, water and shelter. If the physiological needs have not been met, the students may not be able to focus fully on learning. In the classroom context there should be adequate lighting, space, ventilation (heating or cooling), refreshments or drinking water, toilet breaks etc.

2. **Safety needs.** The second level is safety needs. Students should not only feel physically safe in the classroom, but emotionally and psychologically safe as well. They should feel free to ask questions and share ideas without being mocked by other students or reprimanded by the teacher.

3. **Need for belonging and love.** At this level students need to feel a sense of belonging and love. They need to identify with other students and feel that they fit in, and feel that they are important as an individual and as part of the group. This is can be promoted by having sensible ground rules about treating others with respect and using inclusive learning techniques such as group work.

4. **Esteem needs.** According to Marslow's hierarchy, if the three basic needs are met, the student can move to the next level, the need for self-esteem. At this level students become confident in their ability to learn and take responsibility for their own learning, and seek self-esteem through recognition of their academic achievements. The need for self-esteem is a motivating factor for learning. Learner-centred activities such as peer-teaching and peer-assessment can enhance and facilitate the self-esteem needs of students.

5. **Self-actualisation.** At the fifth level, self-actualisation becomes the motivating factor for learning. Students proactively look for ways to fulfill their potential for learning, setting themselves higher learning goals and seeking to reach their full potential.

(Faisal, 2019)

The validity of Maslow's Hierarchy has been contested (add reference) but it can be used as a guide to providing an appropriate learning environment and teaching methods that enhance learning through motivation. (Cook, 2017)

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Chapter 2: Teaching and Learning Practical Skills

Learning objectives

- The acquisition of skills

- Assessment of skills

- Giving feedback

2.1 Acquiring Skills and Competence

The acquisition of skills

The Peter Principle

Peter and Hull (1969) devised the principle that people are promoted to their highest level of competence, after which further promotion raises them to a level just beyond this and they become incompetent.

These levels are as follows.

Unconscious incompetence – you don't know how to do something, but don't know that you don't know this. To reach the next level, you need to know what it is that you don't know.

Conscious incompetence – you know what you want to do, and start to appreciate the gap in your competence. To reach the next level you need to know how to become competent.

Conscious competence – you can do what you set out to do, but have to give it a lot of attention. Through repeated practice, you can reach the next level.

Unconscious competence – you can perform a skill easily without giving it a great deal of thought. Once you achieve unconscious competence, you are at a level which suits your ability at the time.

If you are promoted or try something different, you might return to the first level and become unconsciously incompetent again. This is useful to know, as your learners may reach and stay at one of these levels, or reach the highest level and then return to a lower level due to further progression.

Gagne's Conditions of learning

In 1985 Robert Gagne suggested that there are several different types or levels of learning. Each different type requires different teaching methods.

Robert Gagne is considered to be one of the foremost contributors to the systematic approach to instructional design and his theory has provided a great number of valuable ideas for trainers and teachers. Gagne's model of instructional design is based on the information processing model of the mental events that occur when adults are presented with various stimuli and focuses on the learning outcomes and how to arrange specific instructional events to achieve those outcomes. Gagne's theories have been applied to the design of instruction in several domains, such as the military, flying, leadership, engineering and healthcare.

Applying Gagne's nine-step model is an excellent way to ensure an effective and systematic learning program as it gives structure to the lesson plans and a holistic view to the teaching.

Instructional events refer to actions of both teacher and learners during the teaching session. Selecting appropriate events and planning them in the right format and the right sequence is crucial in a successful lesson design. A lesson design is a plan showing the type of instructional events, their order and the kind of activity taking place in each event. In designing a lesson plan, there are two important factors: the objectives and the learners.

Essential to Gagne's ideas of instruction are what he calls "conditions of learning": internal conditions deal with what the learner knows prior

to the instruction, external conditions deal with the stimuli that are presented to the learner, e.g. instructions provided by the teacher.

The first step in Gagne's theory is specifying the kind of outcomes to be achieved. He categorised these outcomes into five types:

- verbal information
- intellectual skills
- cognitive strategies
- motor skills
- attitudes.

Different internal and external conditions are required for each category of learning. For example, for motor skills to be learnt, there must be the opportunity for learners to practice new skills rather than just learn about them. For attitudes, learners must be able to explore these, for example, discussing and debating relevant issues.

The second step is to organise appropriate instructional events. Gagne outlined nine "Events of Instruction" that activate the processes needed for effective learning to take place. These are listed below. Each has a corresponding cognitive process (in brackets):

1. Gaining attention
2. Informing the learner of the objective
3. Stimulating recall of prerequisite learning
4. Presenting the stimulus material
5. Providing learning guidance
6. Eliciting the performance
7. Providing feedback
8. Assessing the performance
9. Enhancing retention and transfer

"Gagne believed all teaching and learning sessions should include a sequence of events through the nine levels.

(Kayvan Khadjooi, 2011)

How can these steps be implemented in a training session? Here are some suggestions for preparing and deliering a traiing session on Health and Safety;

1. Gaining attention

When students arrive at class, their attention can be directed toward many other things, so in order for any learning to take place, first their attention must be captured and their interest should be aroused. Here are some examples:

- An abrupt stimulus change, such as gesturing or speaking loudly
- Starting the lesson with a thought-provoking question or interesting fact. Perhaps describe and event where health and safety guidelines were breached leading to injuries or loss of life.
- Providing an interesting visual or sound stimulus. Depending on the audience, multimedia (like PowerPoint slides) can be used to combine photographs, pictures, and sound.

2. Informing the learner of the objective

Early in each lesson students should encounter a list of learning objectives. This initiates the internal process of expectancy and helps motivate the learner to complete the lesson.

A direct statement can be used such as: "upon completing this lesson "

you will be able to":

- Know health and safety legislation relevant to healthcare practice
- Know how to record and report health and safety incidents and requirements for RIDDOR reporting
- Know how to undertake a health and safety risk assessment
- etc.

3. Stimulating recall of prerequisite learning

Associating new information with prior knowledge and personal experience and getting the learners to think about what they already know can facilitate the learning process.

Learners can be asked about their own workplace, whether they are responsible for undertaking risk assessments etc.

4. Presenting the stimulus material

This event is where the new content is actually presented to the learner. Content should be organised meaningfully, and explained and demonstrated using a variety of media.

This will depend on the subject of the training session.

5. Providing learning guidance

This event means showing what appropriate actions constitute correct performance, plus additional suggestions, including use of examples, case studies, graphical representations, and mnemonics to help learners encode information for long-term storage, or in simple terms, "make the stimulus as meaningful as possible".

6. Eliciting the performance (practice)

The action now turns to learners. In this event, the learner is required to practice the new skill or behaviour. Eliciting performance provides an opportunity for learners to confirm their correct understanding, and the repetition further increases the likelihood of retention.

Learners might, for example, be asked to undertake a risk assessment for different aspects of health and safety.

7. Providing feedback

While observing each learner performing the procedure, individual and immediate feedback and guidance can be provided and any questions can be answered. In addition, feedback from other learners observing the performance is very helpful.

8. Assessing the performance

At this point, the students demonstrate what they have learned without receiving additional coaching or hints. However, a single performance does not ensure that the new capability has been reliably stored and additional practice is needed.

9. Enhancing retention and transfer

Once we are reasonably sure that the new capabilities are reliably stored, we can increase the likelihood that they will be retained over a long time period by providing practice and spaced reviews. The repetition of learned concepts is an effective mean of enhancing retention, although often disliked by students. Additionally, transfer of knowledge and skills to new problems and situations is a goal of most instruction, but classroom time constraint makes it more difficult to

achieve.

In designing a session like this, several factors need to be considered, including the nature of objectives, setting, time, available resources, institutional constraints, content, number of learners, their characteristics and their preferences. The most effective way to achieve psychomotor objectives is to get the learners to perform and practice the activity after preparing them with some lectures or demonstrations. The session should cover the 3 areas that are necessary for teaching psychomotor skills: 1) Before practice: objectives, performance criteria and how it should be performed by an expert. 2) During practice: critical cues and how to use the information. 3) After practice: feedback, enhancing retention and transfer

Conclusions

Gagne's theories provide a great deal of valuable information to teachers. Applying Gagne's nine-step model is an excellent way to ensure an effective and systematic learning program as it gives structure to the lesson plans and a holistic view to the teaching. We need to keep in mind that the exact form of these events is not something that can be specified in general for all lessons, but rather must be decided for each learning objective.

The performance most frequently required of students is to remember, while our intent is most often to help them understand, and by putting more structure into the objectives of the lesson plans we will be able to achieve this aim. As Gagne himself says, "organisation is the hallmark of effective instructional materials".

Instructional System Design (ISD): Using the ADDIE Model

The following pages are from an article by Steven J. McGriff, at Instructional Systems, College of Education, Penn State University

Instructional design is the systematic approach to the **A**nalysis, **D**esign, **D**evelopment, **I**mplementation, and **E**valuation of learning materials and activities.

Instructional design aims for a learner-centered rather than the traditional teacher-centered approach to instruction, so that effective learning can take place. This means that every component of the instruction is governed by the learning outcomes, which have been determined after a thorough analysis of the learners' needs.

These phases sometimes overlap and can be interrelated; however, they provide a dynamic, flexible guideline for developing effective and efficient instruction.

Analysis

The Analyze phase is the foundation for all other phases of instructional design. During this phase, you must define the problem, identify the source of the problem and determine possible solutions.

The phase may include specific research techniques such as needs analysis, job analysis and task analysis. The outputs of this phase often include the instructional goals, and a list of tasks to be instructed. These outputs will be the inputs for the Design phase.

Design

The Design phase involves using the outputs from the Analyze phase to plan a strategy for developing the instruction. During this phase, you

must outline how to reach the instructional goals determined during the Analyze phase and expand the instructional foundation.

Some of the elements of the Design Phase may include writing a target population description, conducting a learning analysis, writing objectives and test items, selecting a delivery system, and sequencing the instruction. The outputs of the Design phase will be the inputs for the Develop phase.

Development

The Develop phase builds on both the Analyze and Design phases. The purpose of this phase is to generate the lesson plans and lesson materials. During this phase you will develop the instruction, all media that will be used in the instruction, and any supporting documentation. This may include hardware (e.g., simulation equipment) and software (e.g., computer-based instruction).

Implementation

The Implementation phase refers to the actual delivery of the instruction, whether it's classroom-based, lab-based, or computer-based. The purpose of this phase is the effective and efficient delivery of instruction. This phase must promote the students' understanding of material, support the students' mastery of objectives, and ensure the students' transfer of knowledge from the instructional setting to the job.
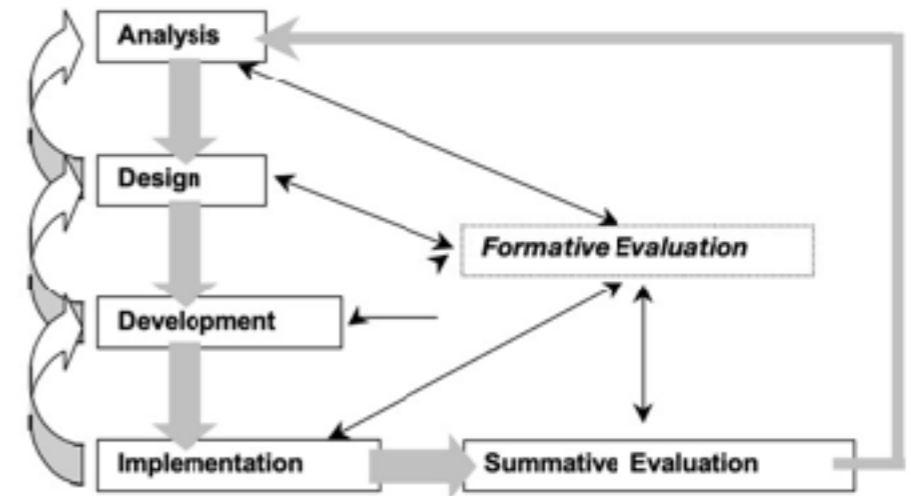
Evaluation

This phase measures the effectiveness and efficiency of the instruction. Evaluation should actually occur throughout the entire instructional design process - within phases, between phases, and after implementation. Evaluation may be Formative or Summative.

Formative Evaluation is ongoing during and between phases. The purpose of this type of evaluation is to improve the instruction before the final version is implemented.

Summative Evaluation usually occurs after the final version of instruction is implemented. This type of evaluation assesses the overall effectiveness of the instruction. Data from the Summative Evaluation is often used to make a decision about the instruction (such as whether to purchase an instructional package or continue/discontinue instruction).

The ADDIE Model is an iterative instructional design process, where the results of the formative evaluation of each phase may lead the instructional designer back to any previous phase.

The end product of one phase is the starting product of the next phase.

	Sample Tasks	Sample Output
Analysis the process of defining what is to be learned	• Needs assessment • Problem identification • Task analysis	• Learner profile • Description of constraints • Needs, Problem Statement • Task analysis
Design the process of specifying how it is to be learned	• Write objectives • Develop test items • Plan instruction • Identify resources	• Measurable objectives • Instructional strategy • Prototype specifications
Development the process of authoring and producing the materials	• Work with producers • Develop workbook, flowchart, program	• Storyboard • Script • Exercises • Computer assisted instruction
Implementation the process of installing the project in the real world context	• Teacher training • Tryout	• Student comments, data
Evaluation the process of determining the adequacy of the instruction	• Record time data • Interpret test results • Survey graduates • Revise activities	• Recommendations • Project report • Revised prototype

(McGriff, 2000)

2.2 Functions and Principles of Assessment

Function of assessment in learning and development

In general terms, the purpose of assessment is to determine whether learning has taken place. The function of assessment is concerned with process for achieving that purpose. The function of assessment can take various forms, adapted for the context and purpose of assessment. These can include the following:

Measurement and recording of achievement

The purpose of learning training and assessment for a vocational qualification is to ensure that individuals who attain the qualification have a common, agreed standard of knowledge and skills. This must be established through the process of measurement and recording of achievement. Vocational qualifications have an agreed set of learning outcomes that include elements of both knowledge and performance, and each learning outcome has a number of assessment criteria that describe what the individual must know and be able to do to achieve the learning outcome. For a qualification to have validity for a group of individuals, both contemporaneously and over a period of time, there must be standardised procedures for measuring and documenting achievement.

Identification of individual learner needs

Learners undertaking a particular training programme will have varied pre-existing knowledge and skills. Many programmes will specify that learners have core skills e.g. in maths, English and ICT before commencement of training, and if not these may be included in the training programme. There are, though, a range of other skills that can vary from learner to learner, that can include study skills such as accessing information, taking notes, understanding key points and presenting information in a clear and logical format. Learners may not have a quiet place to read and study, or may have varying commitments outside work that can compromise their ability to learn. Learners may have special needs, e.g. dyslexia, language barriers or physical disabilities for which adjustments need to be made. Individuals can have a range of different learning styles, and assessment for these at the commencement of a programme can indicate how the trainer and learner can adapt training to maximise learning potential. There can also be variation in the opportunities for training. A learner may be required to attain skills in an area that is not or is infrequently undertaken in their place of work, and training may need to be provided on another site. Also the intensity of work can vary, and learners may be pressured to cut corners and perform skills below the expected standard. The assessor is responsible for addressing these issues, through discussion and agreement with the learner and the employer.

Key concepts and principles of assessment

Purpose of assessment

The purpose of assessment for a vocational qualification is to determine whether an individual is competent to perform that role. The learner may benefit from gaining a qualification in terms of increased responsibility, remuneration, job satisfaction and career progression, but the primary beneficiaries are those who use and receive the goods and services of well trained employees. Employers may benefit if the quality of the goods and services leads to increased sales, improved efficiency or reduces staff turnover. Other beneficiaries are the

assessors, training organisations and awarding bodies.

In ophthalmic practice, diagnostic testing is an essential part of the diagnosis, treatment and monitoring of people with eye diseases. Doctors and other professional staff make clinical decisions based on these diagnostic test results. If there is no training programme or agreed standards for performance and assessment of competence, the quality of test results can be variable, and patients may be at risk from incorrect diagnoses and poor management. Professional staff are also at risk as they are accountable to their patients and their professional and registration organisations.

Key concepts and principles of assessment

Key concepts of assessment relate to ideas, whereas principles are how the ideas are put into practice (Gravells 2014).

Key concepts of assessment include the following:

- **Accountability.** Assessors are accountable both to the learner and the training body for correctly undertaking their role as an assessor. They should ensure that learners know why they are being assessed and what they need to do to meet the assessment criteria. For our programme, the training organisation provides a learning and assessment guide and an eBook for each unit and the assessor is responsible for ensuing that the students understand these and provides clarification and explanation as needed.

- **Achievement.** Achievement data may be analysed and compared to national or organisational targets, and funding may be contingent on learner's achievements. Outcomes of assessment documented in the learner's portfolio will track learner's achievements, and can be used to alert the assessor and the training body if a learner is falling behind.

- **Assessment strategies.** The strategies for assessment and quality assurance of a qualification may be outlined in the programme's qualification handbook, along with the experience and professional development required for assessors.

- **Benchmarking.** This involves comparing the accepted standard for a particular subject area against the current position of the learners' performance. Benchmarking can be used to compare organisations that provide a similar service, or to compare performance in different locations within the same organisation (Gravells 2014).

- **Evaluation**. Evaluation of the assessment process should always take place to inform current and future practice. All aspects of the assessment cycle should be evaluated on an ongoing basis and feedback obtained from all involved (Gravells 2014). Standardisation meetings are a forum where assessors can contribute to evaluation, and the assessors' documentation in e-portfolios contributes the evaluation processes of internal quality assurance.

- **Internally or externally devised assessment methods.** At present we use internally devised assessments, based on the awarding organisation's specification. When our programme becomes an apprenticeship, the End Point Assessment will become and externally devised assessment.

- **Progression.** Progression needs to be taken into account when assessing learners. In our programme learners are encouraged to

take the units in a specified order that is programmed into their individual learning plan, but this can be adjusted by the assessor according to the learner's requirements. There are some linked knowledge and performance units, and the performance is only assessed when the learner has completed the related knowledge unit.

- **Transparency.** To assist transparency, and assessor must ensure that everyone involved in the assessment process clearly understands what is expected and can see that there is nothing untoward taking place. That includes the assessor's own interpretation and understanding of the assessment requirements as well as each learner's understanding (Gravells 2014). E-portfolio records that are accessible to assessors and other organisation staff facilitate transparency.

Key principles of assessment include the following:

An important principle of assessment is known by the acronym VACSR:

- **Valid** – the work is relevant to what is being assessed and is at the right level
- **Authentic** – the work has been produced solely by the learner
- **Current** – the work is still relevant at the time of assessment
- **Sufficient** – the work covers all the requirements at the time
- **Reliable** – the work is consistent across all learners, over time

(Gravells 2014)

The evidence presented by each learner is assessed for validity, authenticity, currency and sufficiency. To demonstrate authenticity, the majority of written work must be in the learner's own words, copied work must be put in quotation marks, and all sources must be referenced. Plagiarism checkers can be used to identify work that has been copied. Reliability requires comparisons between the work presented by different learners, and is determined by procedures of internal and external quality assurance. "

Other key principles can include

- **Communication** between learners, other assessors, internal quality assurers, mentors and employers.
- **Continuing professional development (CPD)** of assessors to maintain skills, knowledge and understanding of assessment.
- **Equality and diversity** to ensure that all assessment activities incorporate the principle of non-discrimination and represent all relevant aspects of society.
- **Ethics** to ensure the assessment process is honest and moral and takes into account confidentiality and integrity. Learners and assessors in a healthcare setting must take particular care that patient consent is obtained when they participate in an assessment, and that there are no breaches of patient confidentiality in any discussion or documentation of assessments.
- **Health and safety**, relevant to all work settings but with specific issues of patient safety in a healthcare setting.
- **Standardisation** to ensure that assessment decisions meet the

standards set by the awarding body are interpreted accurately and that all assessors are making comparable and consistent decisions. (Gravells 2014).

2.3 Assessing Skills and Competence

Types and methods of assessment

There is a distinction between types of assessment and methods of assessment.

Types of assessment can include initial, formative and summative assessments. Formative assessments are usually informal and are not part of the record of achievement for the qualification. They can be carried out at any time and are used to check learner progress. Summative assessments confirm achievement and are usually formal. Formative and summative assessments can assess both knowledge and performance. Formative knowledge assessments can include quizzes and self-tests. Summative knowledge may be assessed by assignments, essays, and examinations. Formative assessments of workplace performance aid the development of skills and good practice and identify areas of weakness prior to summative assessments. Whilst the assessor will have discretion regarding informal assessments, formal summative assessments are subject to internal and external quality assurance and audit.

Methods of assessment are the activities used to assess learning and make a decision as to progress and achievements. Performance may be assessed by direct observations, oral questioning, professional discussions, projects, work products and witness statements. Methods of assessment and standards to be achieved must be appropriate for the occupational standards and the level of the qualification, and may be determined by the awarding body (Gravells 2014).

The assessment process

Depending on the subject being assessed, the assessment procedure will usually follow the assessment cycle, illustrated in the figure below:

- **Initial assessment.** This information may be obtained from application forms, interviews and discussions. This is called information for learning (Gravells 2014).

- **Assessment planning.** This may include agreeing suitable types and methods of assessment with learners, setting appropriate target dates, involving others e.g. mentors and line managers, and following organisational guidelines.

- **Assessment activity.** This should include methods and activities appropriate for the assessment of knowledge, understanding and performance. Assessments can be formative and/or summative. For example knowledge can be assessed with assignments, projects, PowerPoint presentations and online MCQ examinations, and performance can be assessed with projects, structured direct observation and questioning, professional discussion and witness testimony.

- **Assessment decision and feedback.** This involves making a judgement of success or otherwise, giving constructive feedback and agreeing any further action that may be necessary (Gravells 2014).

The assessment cycle is repeated for each new subject, topic or unit of the qualification (Gravells 2014).

Assessment methods, their strengths and limitations

As a general rule assessment methods should be SMART - Specific, Measurable, Achievable, Relevant and Time bound (Skills for Care, 2017).

When beginning the process of preparing an assessment the following formal requirements for the assessment need to be considered:

- **Regulations or standards**. These include specifications by the awarding organisation (that may or may not have Ofqual accreditation), apprenticeship standards, and End Point Assessment (EPAs).

- **Assessment plans** should be reliable and fit for purpose, and should be built on the unit assessment criteria. Assessment tasks and activities should enable learners to produce valid, sufficient and reliable evidence that relates directly to the specified criteria.

- **Learner needs.** Assessment plans should be flexible to reflect learner needs, i.e. at a time and in a way that matches the learner's requirements so that they can demonstrate achievement.

- **Employer and business needs.** When planning assessments, the assessor needs to know the arrangements for on-site and off-site teaching and training, and the key staff such as supervisors or line managers who may be responsible for ensuring the learner's training needs are met. Alternative arrangements may be necessary if the workplace cannot provide all the required experience."

- **Range of methods/activities to meet learner needs.** The assessment methods should to be contextualised for the learner's workplace and be appropriate for the task. Forms of assessment may vary according to the depth of knowledge or skill required. Oral questioning may be acceptable for assessing knowledge in units that have limited knowledge requirements but would not be appropriate for higher level units with a large knowledge

component. Witness statements may be acceptable for straightforward, commonly performed tasks but expert witness statements would be more appropriate for a complex, specialised area of practice.

- **Naturally occurring evidence.** Learners may be expected to demonstrate competence in a range of circumstances, some of which may occur infrequently. The learner and supervisor should be alerted that the learner should be observed when these circumstances, confirmed by a witness statement from the supervisor

- **Learners with specific needs.** Learners may have specific needs in relation to assessment. For example dyslexic learners may need more time for examinations, and questions should be constructed so that they are not disadvantaged. If the learner has a difficulty or disability, reasonable adjustments may need to be made. In practice this means the assessor should do things differently if the usual way would substantially disadvantage a learner, or it might mean providing additional services or equipment. Reasonable adjustments can include:
  - Changing standard procedures, such as delivery or assessment procedures
  - Adapting the programme, modifying teaching delivery or providing alternative forms of assessment
  - Adapting facilities, such as IT facilities or using assistive technology
  - Providing additional services, such as a sign language interpreter or learning materials in alternative formats

  - Training staff to understand their responsibilities
  - Altering the physical environment to make it more accessible.

- Peer and self-assessment. Peer assessment involves a learner assessing another learner's progress. Self-assessment involves a learner assessing their own progress. Both methods encourage learners to make decisions about what has been learnt so far and to reflect on aspects for further development" (Gravells 2014)

  Peer assessment can be used when there are groups of learners at a similar stage in a learning programme, and preferably in the same workplace or learning centre. Peer assessment needs to be planned so that learners understand who will give feedback to whom, and the assessor needs to confirm or otherwise the peers' judgements. Careful management is needed to ensure there are no subjective bias, personality conflicts or unjustified comments. In the right circumstances peer assessment can generate discussions that increase understanding and the attention and enthusiasm of learners.

  Self-assessment has none of the geographical or temporal disadvantages of peer assessment. It encourages reflection and can help learners to take ownership of their learning and identify when they are ready for formal assessments. Limitations include potential for overestimation of achievements, or excessive self-criticism that can inhibit confidence and progression through the training programme. Self-assessment should be undertaken with the support of the assessor. Self assessment reviews, target setting and action planning can promote learner involvement and build confidence.

2.4 Giving Feedback

The contents of this section are adapted from a British Medical Journal publication Giving feedback in clinical settings. The full publication can be accessed here. (Cantillon and Sargeant, 2008)

What is feedback?

Feedback is an essential component of effective learning and teaching. Without feedback, good practice is not reinforced, poor performance is not corrected, and the path to improvement not identified. Feedback is about providing information to learners to narrow the gap between their current performance and the standard required for competent performance. Feedback encourages learners to think about their performance and how they might improve.

Research has shown that feedback helps learners to develop knowledge, change their performance, and feel motivated for future learning. However, negative feedback, if not carefully managed, can result in demotivation and deterioration in performance.

Feedback and assessment are closely related activities that overlap in terms of purpose and methodology. Assessment may be formative or summative. Formative assessment is about providing feedback to learners to support and enhance learning. Summative assessment is about judging and grading learner's achievements and competence.

Consequences of not giving feedback

Providing constructive feedback can be difficult. Trainers and assessors can fear that negative feedback will damage their relationship with learners and undermine the learner's self esteem.

Learners may be apprehensive about asking for feedback, and may be defensive when given corrective feedback. However, although difficult, the negative effects of not seeking or giving feedback are considerable:

- Good performance is not reinforced and poor performance remains uncorrected
- If a trainer or assessor makes no comment, learners may assume that all is well
- Learners may have to rely on unreliable hearsay from colleagues and supervisors to get the feedback they need
- Learners may have to guess their level of competence, based on how well they are coping
- Learners may have to learn by trial and error at patients' expense

Principles of effective feedback

The following eight general principles of effective feedback are derived from educational theory and research literature addressing feedback in the fields of education and personnel management.

1. Feedback should be seen as a normal everyday component of the trainer-learner relationship, so that both sides can expect it and manage its outcomes. Learners are more likely to appreciate feedback if they know from the start that their trainers, tutors and assessors expect and welcome feedback from learners.

2. Ensure that learners are clear about the criteria against which their performance will be assessed. If learners do not have some understanding of what a good performance looks like, feedback information may not make sense and it will be difficult for learners to evaluate the gap between actual and desired performance.

3. Give feedback on specific behaviours rather than on general performance. For example, a phrase such as "great job, well done!" may warm the heart, but it will not help the learner to improve performance nor guide future learning. On the other hand, feedback like "You explained the procedure to the patient and sought information about any difficulties they may have in performing the test. Well done" helps the learner focus on features of his or her performance that might be accentuated or changed in future.

4. Feedback should be based on what was directly observed and should be phrased in non-judgmental language. For example, "I noticed that the patient had difficulty maintaining fixation on the target light. I appreciate you kept reminding the patient to look at the target, but is there anything else you could have done to help their compliance? " is far more effective (and acceptable) than "That was awful, you really should have checked that the patient could see the target before you started the test?" The first example encourages the trainee to reflect on performance and plan for improvement, whereas the second represents a verbal kick in the pants.

5. For maximum effect, offer feedback at the time of the activity or shortly afterwards. It may be awkward to share immediate corrective feedback in front of patients or peers. In such a situation the corrective feedback should be given in private as soon as possible after the event.

6. Feedback should be limited to one or two items only. Trainers are often tempted to point out all the faults that have been detected in a learner's performance. However, a torrent of corrective feedback is more likely to overwhelm and demoralise the learner.

7. Trainer led feedback should be balanced by deliberately seeking learners' own perceptions of their performance and their ideas for improvement. Encouraging learners to routinely appraise and correct their own performance helps them to develop the skills of lifelong learning, which are vital for autonomous practice.

8. Feedback should lead to changes in the learner's thinking, and behaviour, and performance. For this to occur, the learner needs not only to comprehend the feedback but should also know how to apply the feedback in practice. The feedback conversation should therefore include a discussion about how the learner plans to narrow the gap between actual and desired performance.

Feedback techniques

On the basis of these principles several approaches can be used to give feedback in clinical settings. In these examples, the feedback is delivered using non-judgmental language and is based on what the trainer observed.

On the job, informal feedback

Although trainers offer immediate feedback while working side by side with trainees, this feedback is often non-specific and therefore unhelpful - for example, "Well done, that was good." How can the trainee make use of this feedback? What was "good"?

Informal feedback should be specific: it should describe what learners do (their behaviours) so that they know what aspect of their performance they should reflect on. This should encourage planning to improve next time. An example: "Well done, you appreciated that Mr

Jones would find it difficult to perform a visual field test with his reduced vision and you took all the appropriate measures to overcome this."

The feedback sandwich

Trainers are more likely to give effective feedback if they can develop an approach that is unlikely to embarrass or cause offense. One such approach is the so called "feedback sandwich" - reinforcing and negative feedback are offered in a few sentences, for example:

Reinforcing statement: "I like the way that you read the previous clinical notes, understood that Mrs Smith is suffering from dementia and becomes anxious and more confused when her daughter is not with her, and made sure her daughter accompanied her into the examination room"

Corrective comment: "I noticed that you only looked at Mrs Smith's daughter, and not Mrs Smith, when you gave instructions for performing the test."

Reinforcing statement: "You managed to get a reliable test result, despite the difficulties, well done!"

The commonest mistake that trainers make using a feedback sandwich is to use the word "but" before introducing the corrective comment. Students quickly learn to ignore the positive comments and focus on what comes after the "but." Another tendency of trainers when using the feedback sandwich, especially in a busy clinic, is to concentrate on the positive, leaving less time to discuss improvement in the areas that truly need attention. It is important not to leave the learner with a false positive impression.

The power balance in a feedback sandwich clearly favours the trainer. However, feedback should ideally be a "conversation about performance" rather than a one way transmission of information. Learners should be encouraged to express their own views about their performance, as well as listening to the observations of the teacher. By describing and commenting on their own performance, students are learning how to critically assess and modify their own behaviour as they develop into independent practitioners.

The Pendleton model

Pendleton described a structured approach for establishing a conversation about performance between a trainer and a learner. It is a modification of the feedback sandwich in which the trainer's comments are preceded by the learner's observations. The Pendleton model usually consists of four steps:

1. The learner states what was good about his or her performance

2. The trainer states areas of agreement and elaborates on good performance

3. The learner states what was poor or could have been improved

4. The trainer states what he or she thinks could have been improved.

The Pendleton model lends itself to discussions about performance after the event, outside the immediate clinical environment. It allows for a more detailed review of performance than the feedback sandwich, and encourages the learner to become better at recognising what should be maintained or developed about their own performance. As with the feedback sandwich, though, this approach can create a somewhat artificial structure that may prevent the trainer and learner "getting to the heart of the matter." The essential feedback

conversation is about what the learner feels he or she didn't do well and wants to work on; the deficits in performance that the learner did not detect; and how the learner plans to deal with the identified performance deficits.

The reflective feedback conversation

To overcome these deficiencies a third, modified interactive, feedback approach has been proposed, which focuses on the essential goals of feedback - to encourage learners to reflect on their actions and to motivate subsequent improvement in performance. This method is similar to Pendleton's teacher-learner "conversation" but places greater emphasis on the learner's own ability to recognise performance deficits and includes a discussion about how the learner plans to improve.

- The trainer asks the learner to share any concerns he/she may have about the recently completed performance: "Let's review the visual field examination. Is there anything you have concerns about, that perhaps didn't go as well as you had hoped?"

- The learner describes concerns and what they would have liked to have done better: "As you could see, the patient had a very high glasses prescription and I had difficulty in getting the lenses to stay in the lens holder ."

- The teacher provides views on the performance of concern and offers support: "If you had transposed the lens prescription you could have used a plus sphere and a minus cylinder and the lenses wouldn't have fallen out of the lens holder."

- The teacher asks the learner to reflect on what might improve the situation: "Is there anything you can think of that might work better,

make it easier, or improve it for next time?"

- The student responds: "I have struggled to understand optics. I did read through the relevant section but it made no sense to me."

- The trainer elaborates on the trainee's response, correcting if necessary, and checks for the trainee's understanding: "I think it will help if you have an opportunity to observe an optometrist doing sight tests. Mr Ghopal has agreed to have other learners attend his practice, and they have found this really helpful. But you should try to improve your understanding of optics as this will help you to make the most out of your time with him."

The reflective feedback conversation approach encourages the development of the learners' ability to self assess and leads to a shared view of what the agreed improvements will look like. With practice, this strategy can be done quickly and can be routinely incorporated into clinical teaching and learning.

Conclusion

Feedback is fundamental to effective teaching and supervision of learners. Without feedback, good performance is not reinforced and poor performance may be repeated at the expense of patients or colleagues. Properly handled, feedback enhances the trainer-learner relationship and leads to beneficial changes in learners' behaviour. Trainers should regard the art of giving feedback as a critical skill to be acquired through repeated practice and augmented by reflection on their own performance.

Summary points

- Feedback is about sharing information with learners, with a view to

narrowing the gap between observed and desired performance; it encourage learners to reflect on what they have done and to think about making appropriate changes.

- Giving (and receiving) feedback should be a regular feature of clinical practice and should encompass all aspects of a learner's work: interactions with colleagues, performing procedures, etc

- Feedback should be specific, offered at the time of an event or shortly afterwards, and based on what the teacher observed - for example, "This is what I saw . . . ; what do you think?"

- Feedback should be a conversation about performance in which the learner is encouraged to articulate his or her own observations about the "event" in addition to those of the teacher

- Feedback should end with a clear and agreed plan for change

Giving feedback – don'ts
- Don't forget the student's emotional response
- Don't criticise without recommending
- Don't comment on personal attributes (that can't be changed)
- Don't generalise
- Don't be dishonestly kind – if there was room for improvement be specific and explore alternative approaches
- Don't forget that your feedback says as much about YOU as about the person it is directed to!

Guidelines for receiving constructive feedback
- Listen to it (rather than prepare your response/defence)

- Ask for it to be repeated if you did not hear it clearly
- Assume it is constructive until proven otherwise; then consider and use those elements that are constructive
- Pause and think before responding
- Ask for clarification and examples if statements are unclear or unsupported
- Accept it positively (for consideration) rather than dismissively (for self protection)
- Ask for suggestions of ways you might modify or change your behaviour
- Respect and thank the person giving feedback

(London Deanery Multiprofessional Faculty Development Unit, 2017)

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