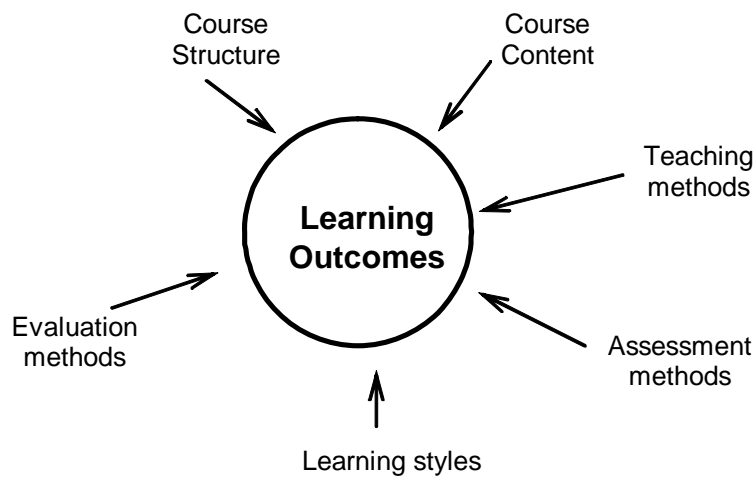


Learning Outcomes

A Practical Guide



A workbook to encourage debate and feedback

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1. Acknowledgements

Production of this document would not have been possible without the help of many people within the School of Health Sciences at Newcastle upon Tyne University. As is usually the case we uncovered a significant amount of work that has already been carried out and would like to thank all those who brought the material to our attention. Much of this material has been incorporated into the present document.

Thanks must go to Jane Stewart (Postgraduate Institute of Medicine & Dentistry at Newcastle) who has developed a rating scale to assess the competencies of pre-registration house officers which we used to derive a number of examples of learning outcomes for this document.

The cartoons are by Edwin Rostron and appeared in a undated publication; 'Teaching and managing large groups - a collaborative guide' compiled by Sally Brown of the educational service at the Sutherland building, Sunderland University.

The first version of this document was circulated in 1997 and since that time many people have provided useful comments hopefully the latest version reflects many of them and makes the guide even more useful.

Robin Beaumont Newcastle upon Tyne 2005

Important Note:

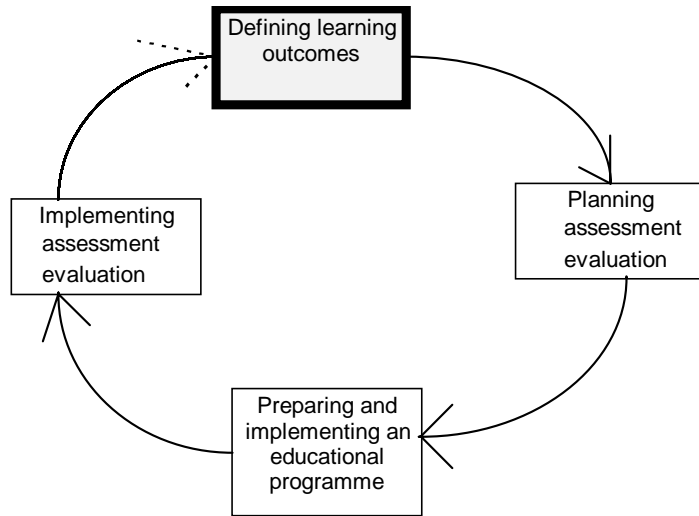
This document has been produced to encourage debate concerning the use of learning outcomes. It is expected that the document will undergo many revisions before a final user friendly version is produced. It is not written from an 'expert' perspective but rather from that of the user. The writing style therefore attempts to be informal and hopefully relatively light-hearted.

Any comments, including corrections and suggestions would be most welcome and should be directed to either of the authors; addresses and emails can be found at the front of this document.



2. Learning outcomes and the educational process

The development of learning outcomes should not be considered in isolation from other educational activities such as course design and evaluation. Guilbert (1987) provides a useful graphical explanation of the relationship which he calls the 'educational spiral'. It is given below in a slightly simplified version:



The above is basically nothing more than the well known audit cycle which itself is based upon the standard 'Plan →implement →evaluate' concept. The historical development of this approach is described clearly in Fitz - Gibbon (1996).

The diagram illustrates how desirable it is to define measurable learning outcomes in any course *in order to facilitate monitoring and evaluative feedback from a number of perspectives including that of the students, teachers and any quality assurance bodies.* However, this document will be specifically concerned with the students perspective. Incongruities between any

of the above aspects, i.e. the planning implementation and evaluation stages, is a major reason why courses fail to live up to expectations. It is also something that the Quality Assurance Agency for Higher Education (QAAHE) looks very closely at with regard to match / mismatch. The subject review (December 1997) Handbook from QAAHE asks, in the subject review 'aide-mémoire'

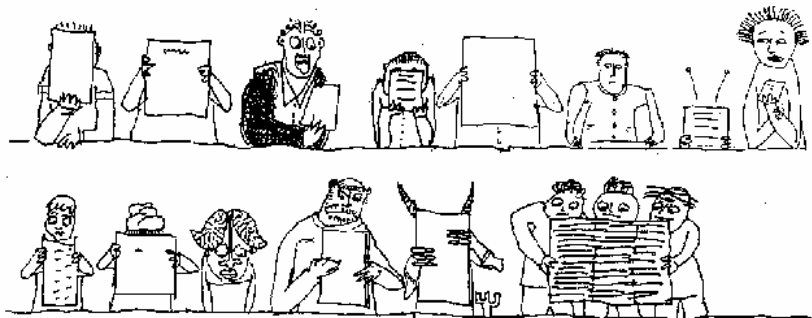
"Is the programme of teaching, learning and assessment activities appropriate in terms of intended learning outcomes . . ."

Just to labour this point:

"The key to a good course or curriculum design is to forge educationally sound and logical links between ... learning outcomes, teaching learning methods, and the assessment of student learning." (Newble & Cannon, 1994)

Newble & Cannon (1994), provide a table showing clearly the link between learning outcomes, teaching content /method and learner assessment.

The idea of stating the desired outcomes at the start is also reflected in most standard project management methods where you start with defining the 'deliverables'. Once you know what you want it's just a question of working out how you get there and what you need to achieve it in the required time scale! Sounds simple.



3. Learning outcomes

3.1 What are they?

McAvoy (1985), provides an interesting history of learning outcomes/objectives from the time of Cicero. Different writers have defined and named the same concept very differently of which further details are provided in the appendix. For this practical guide we will be pragmatic.

A course has overall **aims** which can be broken down into learning outcomes which can then be further divided up into smaller, more specific ones. Writers use different terms for various levels of specificity, such as 'aims, goals, objectives and outcomes', 'general, intermediate and specific professional tasks', or 'course, units and elements' for NCVQ's. Various writers also specify a varying number of levels. The important point to realise is that at the lowest level a learning outcome has the following key characteristics:

Key point:

A student learning outcome is a defined outcome of a learning process that can be assessed in some way i.e. it is measurable

Examples of some learning outcomes

1. *In an anatomy module, the ability to describe the muscle insertion points in the Femur.*
2. *In a public health module, being able to describe the effect Chadwick had upon various law reforms.*
3. *In a community care module, being able to demonstrate the appropriate behaviour when visiting a patient at home.*
4. *In a clinical skills module, the ability to demonstrate effectively basic resuscitation techniques on a mannequin.*
5. *For a stage three student, the ability to perform an appropriate examination.*
6. *For a pre-registration house officer, the ability to collate all patient information for ward rounds.*

Further examples can be found in the appendix.

The important thing to realise is that a Learning outcome can be measured. And given this assertion it means that the Learning outcomes must therefore be clearly defined. There is no place for woolly descriptions when writing learning outcomes.

A learning outcome may also possess additional characteristics which are discussed below.

3.2 Aspects of learning outcomes

Many people say that learning outcomes should be SMART:

| Aspect | Description | Example |
|--|---|---|
| <u>S</u>pecific | Contains an unambiguous action verb | Administer, List, Categorise, Contrast, Define, Operate, Identify, Analyse, State etc. |
| <u>M</u>easurable | It should be assessable | Obtain a mark of more than 40% for a set of MCQs |
| <u>A</u>chievable / <u>A</u>greed | The learner should be able to achieve the objective. If you are using a student centred approach the outcome should also be agreed with the student | For a Stage 3 student obtaining blood |
| <u>R</u>elevant | Be related to the general aims of the course and thereby 'professionally relevant' | |
| <u>T</u>imed | Specify by when the outcome should be achieved. This can also mean 'sequenced' that is the position of the outcome in relationship to those that have gone before and follow on. | By the end of the session, module, within 6 weeks etc. This learning outcome is designed to follow on from those defined in module XXX |

Once again many writers have provided additional criteria. Possibly the most important are two criteria which combine elements of specificity and timing:

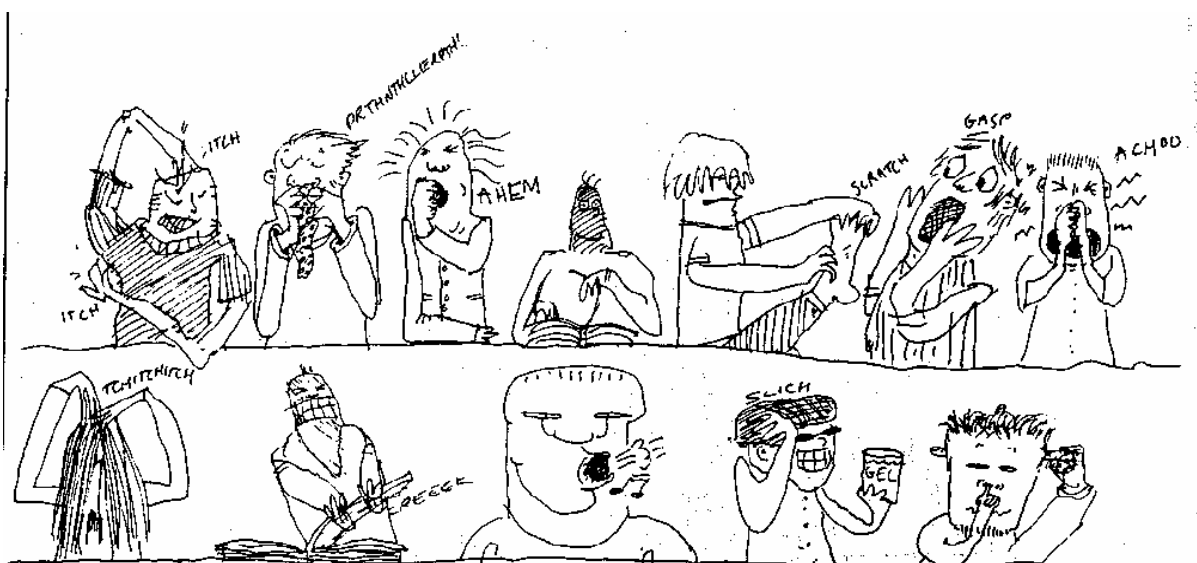
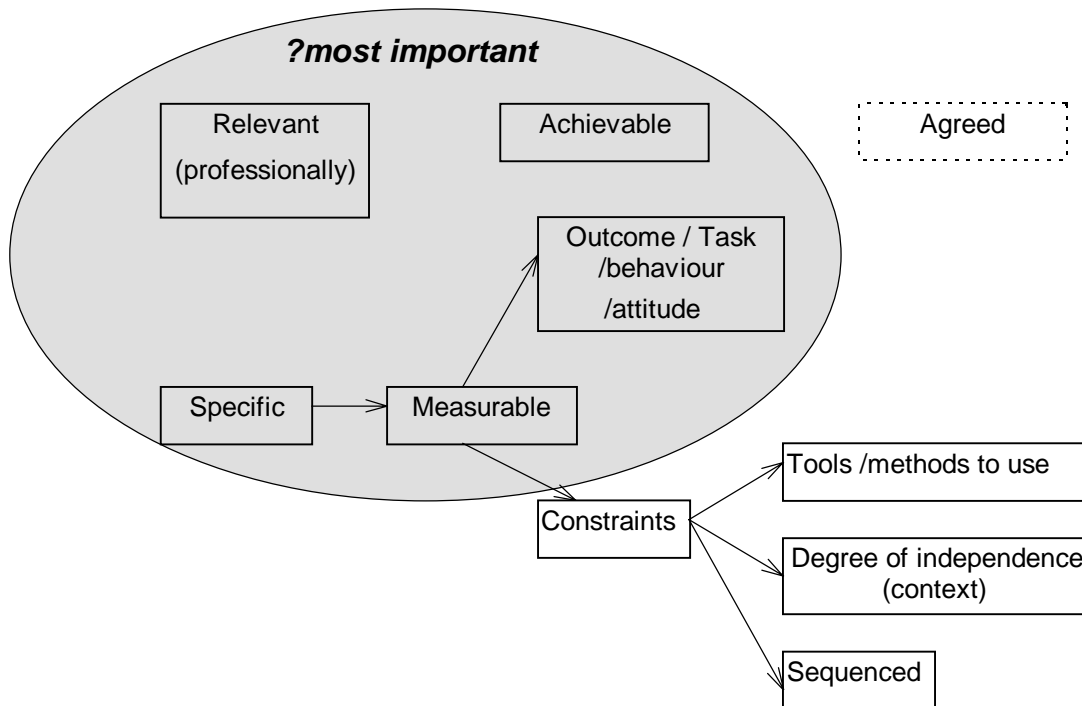
| Aspect | Description | Example |
|--------------------|--|--|
| Constraints | Specifics and constraints such as a particular situation and / or time scale | [carry out a routine patient examination]..... <i>within a hospital environment within 30 minutes.</i> This characteristic is very important to consider in medical education as skills are often expected to be performed in increasingly complex situations at different stages of training. |
| Tools | Similar to the above but this aspect can be thought of as things that facilitate or validate the learning outcome. | Using the standard clerking form for the specialty The assignment should be produced using Word for Windows..... |

Saxton considers a learning outcome to consist of three aspects:

- Behaviour we want from the learner
- Degree of independence required
- The complexity and / or significance of the situation in which the learner is expected to demonstrate this learning.

The last aspect could easily be incorporated into the other criteria listed in the above tables while the other two are already included.

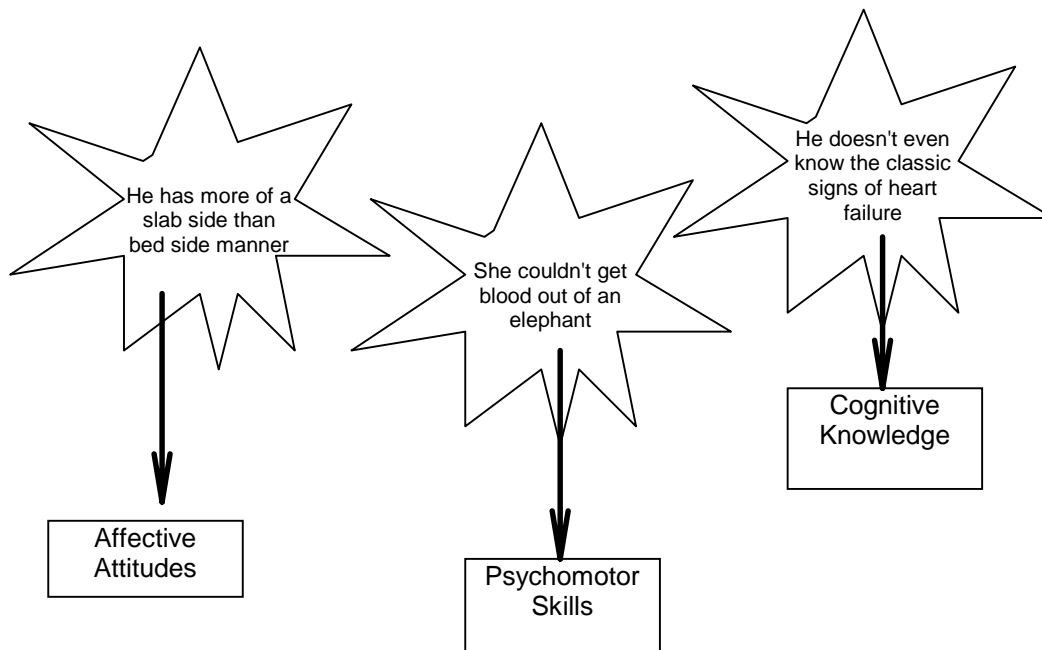
It must be realised that the above list should not be considered to be prescriptive but just a general guideline. It is possible to construct learning outcomes which do not possess all the above characteristics, as the examples throughout this document will demonstrate. The diagram below attempts to summarise the above information.



3.3 Types ('domains') of learning outcomes

Learning outcomes are often perceived as being 'behavioural'. However this is not necessarily the case as we shall see in examples presented latter in this section. Writers tend to separate learning into three domains for which each has had several, often conflicting, taxonomies developed.

- Cognitive - Knowledge
- Psychomotor - Skills
- Affective - Attitudes



In practice most learning outcomes do not purely belong to one domain.

Another way of looking at this classification is as follows, after Guilbert, (1987):

- Cognitive - Knowledge - Means the information handling aspect
- Psychomotor - Skills - Means the practical techniques that can be developed
- Affective - Attitudes - Means the temperament exhibited. Guilbert (1987, p137) considers this to be equivalent to communications skills - read on.

Exercise

Both Reece & Walker, (1997) and Guilbert, (1987) provide useful exercises, along with answers of which an abstract is provided below.

Cover up the three right hand side columns, score each learning outcome and then compare your answer with the printed answer. Guilbert warns that there is not a correct answer. If yours is different from his it is probably due to ambiguity in the wording used.

| Learning outcome | Domain | | |
|---|-----------|--------|----------|
| | Knowledge | Skills | Attitude |
| Check the availability of equipment needed for emergencies (drugs, instruments, beds), using a checklist. | ✓✓ | | |
| Treat, in order of urgency, several patients who arrive at once. | ✓✓ | ✓✓ | ✓ |
| Support the vital functions of a child, in accordance with an <i>ad hoc</i> outline of procedures. | ✓ | ✓✓ | ✓ |
| Avoid any action that could endanger the life of the child. | ✓✓ | | |
| Reassure the child. | | | ✓✓ |
| Explain to the parents why the child must be kept in hospital. | ✓ | | ✓✓ |
| Offer moral support to the parents. | | | ✓✓ |
| Decide to move the patient. | ✓✓ | | |
| Plan the move. | ✓✓ | | |
| Prepare a newborn baby for transfer. | ✓ | ✓✓ | ✓ |
| Prepare a child for transfer. | ✓ | ✓✓ | ✓ |
| Explain to the parents how the administrative structures involved in admissions and departures function. | ✓✓ | | ✓ |
| Identify the various administrative structures involved in a referral. | ✓✓ | | ✓ |
| Distribute the work among health personnel assigned to the emergency service. | ✓✓ | | ✓ |
| Elicit the reasons for various surveillance activities from nursing staff. | ✓ | | ✓✓ |
| Explain the reasons for various surveillance activities to nursing staff. | ✓✓ | ✓ | ✓ |
| Reassure the mother of a child admitted to hospital. | ✓ | | ✓✓ |

Although each domain will now be considered separately it must be realised that often a learning outcome may possess characteristics from more than one domain.

Exercise:

Choose a particular topic in your specialist area and list below some learning outcomes you expect the student to attain. Look back at the SMART criteria to help you

3.3.1 Starting from where the learner is at

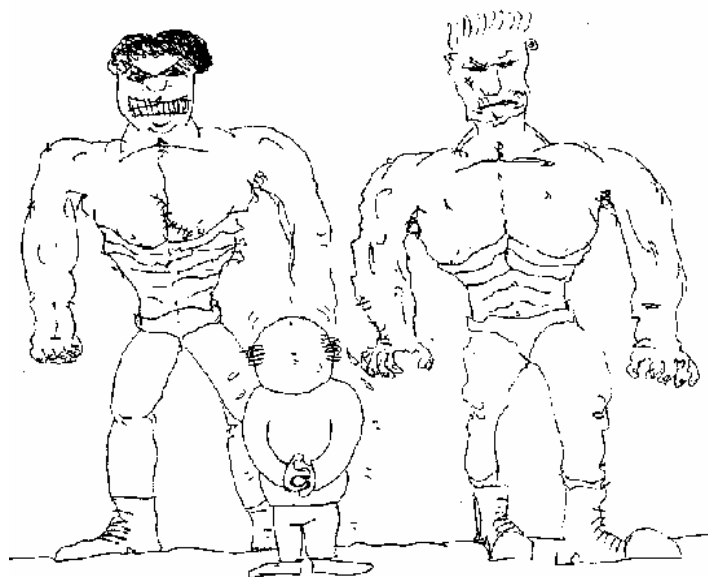
Besides classifying learning outcomes into the three domains, each domain is further divided into a number of levels, frequently referred to as a taxonomy. Each level represents a certain degree of complexity for that particular domain. The levels are ranked in order of complexity, analogous to the 'grade exams' for learning a musical instrument.

When designing a course it is useful to consider these various levels and consider where the students are at for a particular learning outcome, as well as how far up the levels you may wish them to progress.

Key point:

When designing a course it is sensible to start at the place the students are at and work upwards by using the levels for each of the domains.

The various complexity levels for each of the domains will now be discussed.



3.4 Cognitive / Knowledge domain

Saxton states that one of the easiest ways to derive learning outcomes in this domain is to use Bloom's well established taxonomy of cognitive objectives which consists of six levels. However, we find this number of divisions unwieldy and propose the following four levels suggested by Reece & Walker (1997, p265) as more useful.

| Level (after Reece and Walker 1997) | Description | Example |
|-------------------------------------|---|---|
| Knowledge | Recognises and recalls facts. | List the main causes of Ascites. |
| Comprehension | Interprets or summarises given information. | Presentation of a patient on a teaching ward round. Explain the functions of the kidney in relation to common pathologies. |
| Application | Uses information to solve a problem. | The student having completed the cardiology module is capable of making a valid diagnosis of mitral regurgitation when presented with the appropriate patient. |
| Invention (analysis etc.) | Compares, contrasts, analyses, judges. | The student faced with a pathological condition for which s/he has not been prepared is able to get on the right track by applying scientific methods and a sound experimental approach (taken from Guilbert p139). |

In contrast to the above four levels Guilbert, (1987, p138) recommends only three;

- Recall of facts
- Interpretation of data
- Problem solving.

The original Bloom six level taxonomy along with a medical example, can be found in the appendix.



3.5 Psychomotor / Skills domain

As with the previous domain different writers propose a different number of levels. Reece & Walker (1997, p68) present a five level taxonomy from the work of Dave (1975), whereas Guilbert suggests a three level taxonomy which is presented below:

| Level | Description | Example |
|-------------------|--|--|
| Imitation | Observes skills and attempts to repeat it | Carry out simple suturing under supervision. A student nurse who has seen intramuscular injections performed before her several times tries to imitate the movements involved using a orange (Guilbert p138). |
| Control | Can carry out skill according to a set procedure. Also able to differentiate between several skills and choose the appropriate one. Can also combine several skills in sequence ('Articulation') | The student becomes accustomed to carrying out certain acts while performing routine minor surgery under supervision (Guilbert p138). |
| Automatism | A high degree of proficiency is obtained and the skills are completed automatically ('Naturalisation') | An experienced nurse washes a bed-ridden patient carefully and without causing any discomfort; or a physician deftly intubates a road accident victim in the mist of the surrounding confusion (Guilbert p138). |

Another interesting classification of skills, directly related to medical students, are those suggested in the Core Competencies Project (DFEE, 1997 p7):

| Level | Description | Example |
|-------------------|--|---|
| Foundation | Student should be able to perform competently, though performance may not be required routinely by the PRHO. | Measuring and recording vital signs and growth parameters. Insertion of nasogastric tube or urinary catheter. Take swabs for microbiology. |
| Level 1 | On qualifying the student should be competent to perform skill without direct supervision. | Venepuncture, insertion of a intravenous cannula into a peripheral vein, manage an intravenous line, set up and operate a syringe driver, perform a vaginal delivery. 12 lead ECG. Perform pulse oximetry in a very sick patient. |
| Level 2 | On qualifying the student should be able to perform with direct supervision , with the aim of becoming competent by the end of the PRHO year. | Measure CVP, set up a blood transfusion, Insertion of a chest drain, abdominal paracentesis, complete request forms for; x-ray, blood tests, blood transfusion. Complete; death certificates, cremation forms, discharge summary. |
| Level 3 | On qualifying the student should have observed the skill and be able to describe it to a clinician and simply to a patient. | Insertion of a CVP line, exercise ECG, endoscopy of upper and lower GI tract. Colposcopy. Echocardiogram, angiogram, bronchoscopy. |

The above classification makes use of the idea of a 'constraint' as discussed on page 6.

3.6 Affective / Attitudes domain

Guilbert, (1987) appears to take very much a behavioural view of attitudes. To give you some idea an extended quote is provided below:

". . . The dictionary tells us that an attitude is '*behaviour representative of feeling or conviction: a persistent disposition to act either positively or negatively towards a person, group, object, situation or value*' (Webster).

.....We shall restrict this domain to everything concerning relations between health personnel and the members of the community they will serve. It will therefore be almost entirely a matter of *interpersonal relations*. This is why it is referred to as a communication skill." (Guilbert 1987, p137).

Guilbert then suggests three levels of attitudes.

| Level | Description | Example |
|----------------------------------|--|--|
| Receptivity / attention | Sensitivity to the existence of a certain phenomenon and indicates a willingness to receive. | Noticing the anxiety of a patient awaiting the result of a laboratory test for a disease that can have serious consequences (Guilbert p137). |
| Response | Sufficient interest in the noticed phenomenon to do something about it | In the case described above, the response would be to say a few reassuring words to the patient so that she does not feel alone (Guilbert p137). |
| Internalisation / empathy | The phenomenon has found a place in your scale of values and has effected you long enough for you to adapt yourself to the value system of the other person. This enables you to adapt your attitude to the other person as <i>if you were experiencing the same phenomenon yourself</i> . | Having noticed the anxiety of a patient awaiting the result of a laboratory test for a disease that can have serious consequences, your attitude will show that you care about their anxiety and are ready to help them cope with it. This does not mean that you have internalised their anxiety but you have internalised the attitude that enables you to offer them effective help. |

For those readers who are interested in investigating alternative taxonomies Reece & Walker (1997), provide an alternative taxonomy adapted from that of Krathwohl et al (1964).

4. How do you set about writing learning outcomes?

There are four main stages to developing learning outcomes:

1. Decide your starting point
2. Develop your template
3. Develop your learning outcomes
4. Schedule
5. Review

4.1 Decide your starting point

Saxton suggests that one way is to look at the indicative content of a traditional syllabus and develop learning outcomes from that. Newble & Cannon (1994), suggest other ways objectives can be derived including the use of critical incidents.

Alternatively, this being the preferred method, is to derive learning outcomes at the very start, as the diagram on page 4 illustrates. Taking this approach you would consider the course aims and progressively break them down to eventually produce the learning outcomes.

4.2 Develop your template

Clearly different individuals will want to develop learning outcomes at different levels of complexity. Some individuals may be happy with defining learning outcomes which do not specify various constraints /tools or the actual level within a particular domain to be attained. It is therefore a good idea for the individual to list the various characteristics s/he feels happy to consider when developing learning outcomes.

It should be noted that learning outcomes concerning psychomotor skills often also specify constraints such as degree of independence. See page 6 to review the main characteristics of a learning outcome along with the examples on the same page and those in the appendix if you feel unhappy with this point.

Exercise A:

Looking at the diagram on page 7, list the characteristics you feel happy to consider when writing a learning outcome. List any additional ones you think are important.

Looking at the diagram on page 8, which would you say was the most and least important domain for your learning outcomes to concentrate on?

Looking at the table on page 11, showing the levels of cognitive activity, which levels do you want to use?

Looking at the table on page 12, showing levels of skill development, which levels do you want to use?

Looking at the table on page 13, showing levels of attitudinal development, which levels do you want to use?

Exercise B:

Using the responses you gave in the above exercise now develop a one page template to act as a aide-mémoire when developing a learning outcome.

An example is given below:

| |
|---|
| <p>Which domain? Cognitive / Skill / Attitude (<i>circle one</i>)</p> <p>Which levels? (<i>Consider the relevant domain(s) below - synonyms in square brackets</i>)</p> <p>Cognitive (<i>circle one</i>):</p> <ul style="list-style-type: none">Knowledge [list/recall]Comprehension [explain]Application [solve problem]Analysis [discuss] <p>Skills (<i>circle one</i>):</p> <ul style="list-style-type: none">ObservesPerforms under direct supervisionPerforms under minimal supervisionPerforms competently unsupervised <p>Attitude: Receptive[aware of] / Appropriate responses (<i>circle one</i>)</p> <p>Any constraints?: end of session / module / exam + dates etc. (<i>circle one</i>)</p> <p>Any tools / methods to use?: forms / software / techniques / methods etc. (<i>circle one or more</i>)</p> <p>The learning outcome:</p> <p>Remember to check for:</p> <ul style="list-style-type: none">• Relevance to overall module aims• Suitability of position in course.• Suitability for intended learners. |
|---|

4.3 Develop your learning outcomes

Now you have decided both the source from where you are going to derive the learning outcomes and have also developed a template, you can now start to develop the actual learning outcomes.

When developing the actual learning outcomes there are several important issues to take into account each of which is discussed below.

4.3.1 How should I word the learning outcomes?

The important thing is that they are unambiguous and can therefore be measured. The following chapter considers this aspect in more detail.

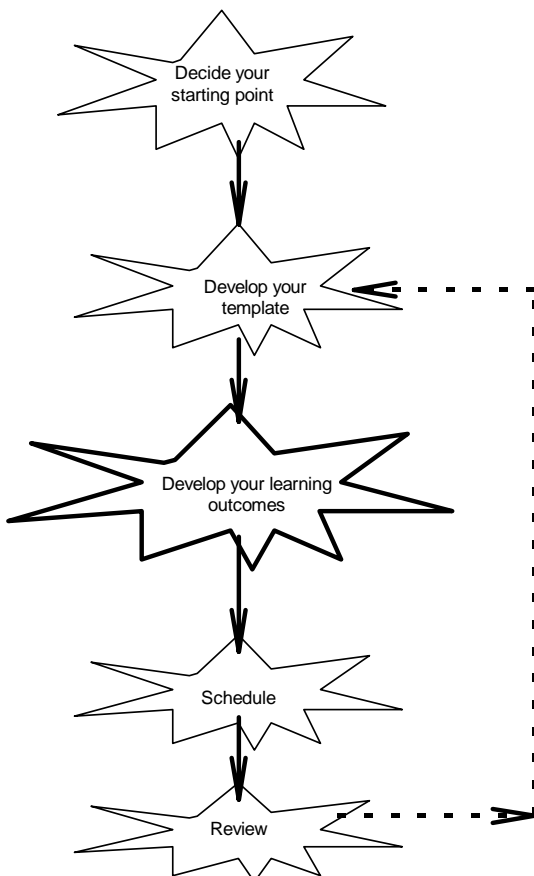
4.3.2 What about the level of the outcomes?

Clearly the level of the learning outcomes depends upon the course you are designing. For example a non- certification level introductory course may consist of learning outcomes at the lower levels of Blooms taxonomy whereas a post Graduate Diploma or masters course would require Learning outcomes at the highest of blooms taxonomy (i.e.

4.3.3 How many learning outcomes?

Regarding the question of how many learning outcomes is appropriate for a session, a module, a course etc., we have been unable to find any 'evidence based' guidance in the literature. However, common sense / gut feeling suggests that one should limit the number of stated outcomes (a) since it may be impossible to achieve them in the session, and (b) since their effect becomes diluted and confuses the students. We therefore recommend;

Depending upon the detail of your learning outcomes you will expect to develop anything from 3 to 10 for an average session.



4.4 Schedule

Once you have a set of learning outcomes, you might want to put them into some type of order, alternatively you may have developed them in an orderly fashion.

4.5 Review

To review the learning outcomes you've devised how about getting a group of peers or even ex-students! The criteria you use to review them with can be from a number of sources, this document including the SMART framework, your own template or those that your reviewers suggest.

5. Wording used to describe learning Outcomes

At the beginning of this practical guide it was emphasised that learning outcomes should be unambiguous so that they can be measured. Since the millennium a large number of Web sites have been created dealing with learning outcomes and specifically various practical aspects. I have abstracted two of them below. Both abstracts deal with using the correct words to describe learning outcomes.

The first extract is taken from: NCGIA GISCC Learning Outcomes:

<http://www.ncgia.ucsb.edu/education/curricula/giscc/units/format/outcomes.html>

5.1 Verbs that you might think of using to specify different levels of cognitive learning outcome

| | | | | | |
|----------------------------|-------------|---------------|-----------|--------------|-------------|
| Knowledge level | arrange | order | define | recognise | duplicate |
| | label | recall | list | repeat | memorise |
| | name | state | relate | reproduce | ** |
| Comprehension level | classify | locate | describe | recognise | discuss(?) |
| | report | explain | restate | express | review |
| | identify | select | indicate | translate | ** |
| Application level | apply | operate | choose | practice | demonstrate |
| | schedule | dramatise | sketch | employ | solve |
| | illustrate | use | interpret | write | ** |
| Analysis | distinguish | categorise | examine | compare | experiment |
| | analyse | differentiate | appraise | discriminate | calculate |
| | contrast | question | criticise | test | ** |
| Synthesis | arrange | formulate | assemble | manage | collect |
| | organise | compose | plan | construct | prepare |
| | create | propose | design | write | ** |
| Evaluation | appraise | judge | argue | predict | assess |
| | rate | attach | score | choose | select |
| | compare | support | estimate | evaluate | ** |

[End of abstract]

5.1.1 Inappropriate words

While there may be additional words not listed above the important thing to realise is that several description words, I would even take issues with several of the above, such as 'understand' or 'discuss' provide room for so many interpretations that their use which be avoided.

The second example is taken from: <http://www.ide.mat-su.k12.ak.us/science/taxonomy.htm>

5.2 Using a check list to keep track of curriculum content

Teachers do not necessarily include the entire taxonomy in each and every academic unit presented during the school year. It is necessary, however, that teachers use the taxonomy "profile" each and every time they prepare a new academic unit. The teacher must track how many of these skills are included in the different units included in the instructional program for the class during the course of a full school year. Teaching higher order thinking skills is an area of concern for all schools. These elements are much discussed but too often neglected because teachers don't always have a resource guide or strategy or simply take the time to use a checklist to keep track of how many levels of the taxonomy students are allowed to engage in a full school year. The following format has been adapted from many sources.

5.2.1 Descriptions of Bloom's Taxonomy:

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

Illustrative Behavioral Terms: Defines, describes, identifies, labels, lists, matches, names, reproduces, states.

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

Illustrative Behavioral Terms: Converts, explains, extends, generalizes, gives examples, infers, paraphrases, rewrites, summarizes.

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

Illustrative Behavioral Terms: Changes, computes, demonstrates, discovers, manipulates, operates, prepares, produces, relates, shows, solves, uses.

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

Illustrative Behavioral Terms: Breaks down, diagrams, differentiates, discriminates, distinguishes, outlines, points out, relates, selects, separates, subdivides.

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

Illustrative Behavioral Terms: Combines, compiles, composes, creates, devises, designs, generates, modifies, organizes, plans, rearranges, reconstructs, reorganizes, revises, rewrites, writes.

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

Illustrative Behavioral Terms: Compares, concludes, contrasts, criticizes, describes, discriminates, explains, justifies, interprets, relates, summarizes. All of the foregoing with supportive evidence.

5.2.2 Roles, Process Verbs & Products from Blooms Taxonomy of the Cognitive Domain

Listed below is a detailed description of Bloom's Taxonomy organized into four areas;

1. Teacher Roles
2. Student Roles
3. Process Verbs
4. Products

Each of the six levels of the taxonomy is listed to include the four areas of each.

Level of Taxonomy: **KNOWLEDGE**

Definition: Recall or recognition of specific information.

| Teacher Roles | Student Roles | Process Verbs | | Products | |
|--|---|--|--|--|--|
| Directs Shows Examines Questions Evaluates | Tells Responds Absorbs Remembers Recognizes Memorizes Passive recipient | define record select underline sort repeat recall group | name match cite know label listen recite | choose review quote list memorize relate show locate distinguish give example reproduce describe | quiz definition fact worksheet reproduction label list test workbook |

Level of Taxonomy: **COMPREHENSION**

Definition: Understanding of information given

| Teacher Roles | Student Roles | Process Verbs | | Products | |
|--|---|--|--|---|--|
| Demonstrate Listens Compare Contrasts Examines | Explains Translates Demonstrate Interprets Active Participant | restate discuss retell convert annotate translate describe report recognize review observe | identify locate research research explain tell express summarize ask identify calculate expand upon give examples of paraphrase give main ideas | outline account interpret explain tell explain tell summarize ask identify calculate expand upon give examples of paraphrase give main ideas | recitation summary reproduction collection explanation dramatization show & tell story problems example definition quiz list test label debate outline |

Level of Taxonomy: **APPLICATION**

Definition: Using methods, concepts, principles and theories in new situations.

| Teacher Roles | Student Roles | Process Verbs | | Products |
|---|---|---|--|---|
| Shows Facilitates Observes Evaluates Organizes Questions | Solves problems Demonstrates use of knowledge Constructs Active participant | translate manipulate exhibit illustrate calculate sketch interpret prepare make experiment list practice apply relate operate interview paint change record | translate produce compute sequence employ show solve schedule collection demonstrate dramatize construct use teach adapt draw | prediction scrapbook product photograph illustration simulation sculptor experiment interview performance presentation demonstration puzzle relate diary report diorama poster diagram lesson model journal map |

Level of Taxonomy: **ANALYSIS**

Definition: Breaking information down into its constituent elements.

| Teacher Roles | Student Roles | Process Verbs | | Products | | | |
|---|---|--|---|---|---|--|---|
| Probes Guides Observes Evaluates Acts as a resource Questions Organizes Dissects | Discusses Uncovers Lists Active participant | distinguish question experiment examine separate arrange sift calculate solve compare scrutinize | contract appraise inspect probe inquire investigate research criticize interpret inventory discover | survey detect group out debate diagram relate categorize out organize differentiate deduce discriminate | detect order sequence analyze contrast dissect point test diagram dissect point classify | diagram investigation graph conclusion category questionnaire illustration spreadsheet checklist | chart outline list plan summary survey database mobile abstract report |

Level of Taxonomy: **SYNTHESIS**

Definition: Putting together constituent elements or parts to form a whole requiring original, creative thinking.

| Teacher Roles | Student Roles | Process Verbs | | Products | | | | |
|--|---|---|---|---|--|---|--|---|
| Reflects Extends Analyzes Evaluates | Discusses Generalizes Relates Compares Contrasts Abstracts Active participant | compose assemble manage arrange invent systematize compile modify derive construct revise prepare originate | pretend organize generalize show forecast devise propose plan collect develop imagine | generate prediction combine organize suppose formulate design create hypothesize predict infer reorganize play improve | write set up blend produce concoct act role-play | film project blueprint solution game pantomime video newspaper painting Hypercard stack product advertisement | story plan new song invention product event collage design | poem formula machine goal play cartoon invention product radio collage design |

Level of Taxonomy: **EVALUATION**

Definition: Judging the values of ideas, materials, and methods by developing and applying standards and criteria.

| Teacher Roles | Student Roles | Process Verbs | | Products | | | |
|--|--|--|--|--|---|--|--|
| Clarifies Accepts Harmonizes Guides | Judges Disputes Develops Active participant | judge predict revise determine tell compare select choose deduce | rate asses infer prioritize why defend measure conclude | debate recommend discriminate appraise probe decide criticize award reject | justify value argue estimate rank support referee | investigation opinion survey debate verdict conclusion recommendation panel | judgment report editorial scale evaluation |

[end of abstract]

6. Afterthought

Although there has been a substantial move towards outcome driven teaching and learning in higher education, including medicine, it is only one of many theoretical frameworks and has its limitations. It has its roots in behavioural psychology and can be said to see education in 'assembly line' terms, hence the production of skills and competencies. The learner uses these to be able to function in, and adapt to a changing environment. There is a tendency for the learner to find the knowledge 'external', since the learning process is devised and controlled by the teacher. The major critiques of this tradition focus on this issue; and on the fact that it is neither possible to derive outcomes for all learning nor can everything that can be learnt be reduced to small steps.

Several attempts have been made to incorporate other approaches into the learning outcome framework. Stenhouse, (1975) discusses 'process' rather than outcome measures from a humanistic perspective. The postmodernist school have also considered education in general (e.g. Usher & Edwards 1994). Unfortunately there does not appear to be anything specifically concerned with medical education, although Fox (1993) discusses a postmodernist view of health in general. This is possibly an area for research.

Another area that has become increasingly popular in the last few years is that of 'learning styles'. In some institutions teaching material is offered in a number of formats to cater for those with different learning styles. However other institutions take a different approach and offer learning opportunities to strengthen those who have deficits in certain learning style areas (see www.learning-styles.co.uk). What is interesting is that there is relatively little empirical research in this area from three fundamental aspects; firstly concerning the validity of the various classification of learning styles suggested, secondly concerning actual outcome measures (predictive validity) of test scores and lastly the effectiveness of applying training to modify ones learning style.



7. References

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The above references are deliberately not produced in a strictly standard format, for example full names are given of those individuals readers' of this document may wish to contact.

Appendices

1. Examples of learning outcomes

Example 1

- **By the end of the module be able to apply knowledge of liver pathology to a set of patients notes with known liver pathology**

The above learning outcome is:

Domain: mainly cognitive; application level.

Level of independence expected from the learner: minimal.

Example 2

- **By the end of the module be able to apply knowledge of liver pathology to a patient with an unknown history by examining the patient**

Domain: Cognitive; analysis level. Skill level; automatism. The patient may show no signs of liver pathology or alternatively some other pathology which may mimic it to a greater or lesser extent.

Level of independence expected from the learner: minimal; the learner may vary the examination based upon findings while examining?

No constraints/tools specified.

Example 3

By the end of the session and related directed study you should be able to:

1. **discuss the need to ration health care resources,**
2. **recognise the concepts of rationing and priority setting and their inherent problems,**
3. **differentiate between approaches to rationing health care resources including explicit priority setting and**
4. **describe the Oregon experiment (taken from MBBS Stage 2 medicine in Society, Module 3 Study Guide)**

Set of four learning outcomes for a session. Number two is problematic as it really is two learning outcomes at very different levels (recognise and possibly evaluate?)

Domain: Cognitive; various levels (discuss = analysis level; recognise / differentiate /describe = comprehension).

Constraints / tools: constraints not mentioned.

By the end of the session and related directed study you should be able to:

1. **describe the different theories of ageing and their contribution to our understanding of the ageing process,**
2. **describe the changes in intellectual ability which occur with advancing age,**
3. **discuss the findings of cross-sectional versus longitudinal studies in relation to the ageing process and**
4. **identify examples of the ageing process in all age groups (taken from MBBS Stage 2 Medicine in Society Module 3 Study Guide).**

Set of four learning outcomes for a session.

Domain: Cognitive; various levels (discuss = analysis level; identify/describe = comprehension).

Constraints / tools: constraints not mentioned.

2. Evaluating someone else's Learning outcomes

Given the information provided in this document it is easy to develop a draft schema for evaluating a set of learning outcomes. There are three aspects that need consideration:

- The process
- The product (i.e. the learning outcomes):
 - Taken as a whole (are the appropriate domains and levels covered, do they link in with the assessment and curriculum etc.)
 - Individual learning outcomes (i.e. the quality of each using the SMART criteria)

Below are given two tools that might be used to help assess learning outcomes.

| | |
|--|---|
| <p>Cognitive 1=Knowledge; 2=Application; 3=Analyse.</p> | <p>Skill 1=Observation; 2=Imitation; 3=Perform unsupervised+ new circumstances</p> |
|--|---|

Enter each learning outcome:

| | | |
|------|--|--|
| | | |
| | | |
| | | |
| | | |

| Component | Marks | Description |
|---------------------------|--------|--|
| 1. Identification | 0 | No appropriate learning outcomes identified |
| | 1 – 4 | Some learning outcomes identified |
| | 5 – 7 | Most (i.e. >60% learning outcomes Identified |
| | 8 – 10 | All learning outcomes identified |
| 2. Quality | 0 | Clearly no understanding of Blooms levels or distinction between cognitive and skills etc. |
| | 1 – 4 | Variable but most are acceptable |
| | 5 – 7 | All learning outcomes use appropriate language |
| | 8 – 10 | Clear descriptions and shows a understanding of the characteristics required |
| 3. Distribution of levels | 0 | All set at inappropriate levels |
| | 1 – 4 | Inappropriate levels set in >50% |
| | 5 – 7 | Appropriate levels set for curriculum material given in >50% of cases |
| | 8 – 10 | Appropriate levels set for material given in most cases |

3. Bloom's cognitive taxonomy

Bloom (1964) devised a six level hierarchy. The lowest level, 'knowledge' representing fact retrieval and the highest, 'evaluation', the process of making some value judgement based upon a range of information. Details along with medical examples are provided below:

| Level | Explanation - from Miller, Sadler, Mohl & Melchiode 1991 |
|----------------------|---|
| Knowledge | The recall of specifics or related facts. This process emphasises the psychological processes of remembering. It includes knowledge dealing with specific facts, trends, classification and theories as well as procedures employed in a specific subject field. Knowing the major risks for a patient with a particular illness would be an example of this level. |
| Comprehension | This represents the lowest level of understanding. Comprehension involves making use of an idea without necessarily relating it to other material or realising its full implication. Examples are interpreting the meaning of a graph or predicting the continuing spread of a contagious disease. |
| Application | The use of abstractions or principles to solve problems. These may be in the form of generalisations or theories which must be remembered and applied. Examples include applying scientific terms discussed in a paper to other situations, or solving health problems using scientific knowledge. |
| Analysis | The breaking down of complex information into simpler parts to understand how they are related or organised. Analysis is intended to clarify and provide an understanding of the interactions between elements. An example would be relating a patient's previous symptoms to a current medical condition. |
| Synthesis | The process of combining concepts to constitute a new whole. This includes creating completely new products such as writing a composition or developing a differential diagnosis for a patient. |
| Evaluation | Making value judgements based on some given criteria or standard. Comparing two different medical procedures regarding patient prognosis is an example of this level. |

Saxton suggests a list of questions to help decide the level for a particular learning outcome:

| Level | Question |
|----------------------|--|
| Knowledge | What do you expect the learner to know? |
| Comprehension | How do you expect them to convey what they understand? (i.e. interpretation, recognition) |
| Application | How can they apply their knowledge and beliefs? (i.e skills) |
| Analysis | How can they analyse their learning? (i.e. elements, relationships and organisation) |
| Synthesis | How can they synthesise their learning? (i.e. construct, plan develop a new set of abstract relationships) |
| Evaluation | Can they evaluate using their learning? (i.e. make judgements, appraise) |

4. Different definitions of learning objectives

Much of the information in this section has been taken from McAvoy 1985, Guilbert 1987 and Reece & Walker 1997.

| Tyler 1949 | Mager 1962 | Gagne & Briggs 1974 |
|---|---|---|
| <p>Behaviour</p> <p>The kind of behaviour to be developed by the student</p> | <p>Behaviour - 'What'</p> <p>Identify and name the overall behaviour act (terminal behaviour)</p> | <p>Action</p> <p>Behaviour defined by an action verb</p> |
| <p>Content</p> <p>The content or area of life in which the behaviour is to operate</p> | <p>Conditions - 'How'</p> <p>Define the important conditions under which the behaviour is to occur (gives and/or restrictions and limitations)</p> | <p>Object</p> <p>Describe what is produced or processed</p> |
| | <p>Criteria (standards) - 'How well'</p> <p>Define the criteria of acceptable performance</p> | <p>Situation</p> <p>Situation that faces learner when asked to carry out objective</p> <p>Tools and other constraints</p> <p>'How must the performance be carried out</p> |

Guilbert 1987 bases his work on that of Mager of which the most recent publication he gives is 1973. Guilbert considers the act + the content + the condition = the task. Therefore for him an educational objective is a task + criteria.

1. Example of a complex session plan

Title of session Subject area Location Length Level Date

Group characteristics Group size

Relevant previous knowledge Recap previous topics

| Time (mins approx.) | Topic | Prompt | Teaching technique | Student activity | aids / refs |
|---------------------|-------|--------|--------------------|------------------|-------------|
| | | | | | |

| | |
|-----------------------|---------------------------|
| References - personal | References - for students |
|-----------------------|---------------------------|

Remember: Recap at end, Anything assessment related,

Follow up activities.

Next topic

Close session THANK GROUP (continued overleaf)

Example of a complex session plan (continued).

Learning outcomes for session:

| Knowledge | Skills | Attitudes |
|------------------|---------------|------------------|
| | | |

1. Example of a user friendly session plan

Aims:

Learning outcomes:

Entry behaviour / knowledge of learners:

Teaching content and process:

| Time | Content | Teacher activity | Learner activity | A/V aids or material |
|------|---------|------------------|------------------|----------------------|
| | | | | |