Principles of Medical Education

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Third Edition

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Dedicated
to
All Children of the World

Preface to the Third Edition

It is a pleasure to write a preface for the third edition of *Principles of Medical Education.* The previous two editions have been very well received and have earned great reviews in national and international journals. We do hope, this edition will also maintain the support enjoyed by the earlier editions.

While the basic format of the book has been retained, a number of new tools, especially those dealing with assessment of practical skills have been added. The emphasis, as earlier has been on the utility of these tools.

We hope that medical teachers of not only Pediatrics but all disciplines will find this book useful.

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Preface to the First Edition

The persistent efforts of Pediatricians have finally borne fruits to get the status of a separate subject to Pediatrics. This has however, brought added responsibilities for teachers of Pediatrics–that is to ensure that medical graduates are well versed in the care of children.

The quality of end-products of any system of education depends a lot on skills and orientation of the teachers. With this perspective, IAP Education Center has taken the responsibility of orienting teachers of Pediatrics to educational technology and pedagogy. This book is a humble attempt to fulfill that mandate.

Written in the format of a self-instructional manual, this book is the outcome of authors' experience of conducting educational workshops. Many of the examples given in the book have been generated out of these workshops and we do not claim any proprietary over them.

We do hope that this book will make an enjoyable reading and enable teachers to apply many of the educational principles in their day-to-day teaching. Better health care available to children through doctors better trained in this task will be our ultimate reward.

It may also be pointed out that although the book gives examples from the subject of Pediatrics only, it will be equally useful for teachers of other subjects also.

We would welcome suggestions and comments to improve the quality of this book.

Authors

Acknowledgements

Darkness to Light

O Lord, please protect us both, the teacher and the taught. May our learning be lustrous and revealing. Bestow strength on us so that we may work with mutual reverence and communion. May our learning illumine our minds and may we attain the glory of wisdom. May there be no hostilities between us.

Enlightened teacher is the cultural and educational reservoir that transmits an elevated and competent posterity. He should thus, preserve and propagate the fundamental beliefs, weed out the corruptness and accept change with an innovational versatility. After all, his image initiates and orients the followers.

Contents

1 *Teaching and Learning*

Learning Objectives
- ❏ Define teaching and learning.
- ❏ Enumerate principles of learning.
- ❏ Apply these principles in actual class-room situation.

A teacher can never truly teach, unless he is still learning himself.

Rabindranath Tagore

The contemporary thinking in medical education, tends to lay emphasis on "teaching-learning", as opposed to the greater importance previously attached to "teaching" alone. Presently the educationist is more interested in understanding what and how students learn, why some of them do not learn and when they learn better. Whatever they learn, is it relevant to the health needs of the community ? What should they learn in this reference and how ? Hence, the attention is more focused on learning and the learner.

The purpose of teaching is to facilitate learning and encourage the learners to learn more effectively. The purpose of teaching is not mere dispensing of information, but to develop life long learning habits.

Teaching

It is wrong to presume that all the information transmitted to the students is always learnt or since that does not happen, a lot more information should be transmitted so that something will be learnt! It is also wrong to presume that our students are immature and irresponsible. The students tend to behave in a manner similar to what they are considered to be. If they are considered to be responsible, they will behave in a responsible manner.

Presently the educationists feel that the role of a teacher is not of bossing around and being authoritarian. The major role of a teacher is to be a considerate and friendly person, to create an appropriate

Learning

atmposphere for effective learning, so that the learning is an enjoyable process and is a plesaure.

Are we, as teachers and students together, able to create such an atmosphere in our institutions? We need to think more and more about such matters. We need to undertake a continuous objective analysis of the teaching-learning process. To do the same, we need to be aware about the different factors and forces involved in the process. Let us consider in this context, learning in more detail.

What is learning? Learning is a process resulting in some change or modification in the learner's way of thinking, feeling and doing. The change may be temporary or permanent.

The more effective the learning experience, better is the learning. Provision of more effective learning experiences depends on the teacher. Therefore, depending on the ability of teacher to deliver an effective lecture or conduct a clinic or demonstrate an experiment, the consequent learning would be satisfactory or unsatisfactory.

The new experience is just a beginning step in the process of learning. Further processes involved are: New experience-registration and analysis-reflection-action and analysis another experience or exposure and repetition of the process, till a demonstrable change occurs in the learner.

Learning is thus a cyclical process; however, it can be considered as an uprising spiral motion, where with time, there is a change in the level of attainment. It is this sequence which can be referred to as learning spiral and makes learning a dynamic process.

When and where one gets the new experiences and how often these are repeated, is referred to as learning opportunities. A new experience, a new piece of information may be first heard and seen during a lecture and may be accepted and analysed as something relevant and important. On reflection, it may seem to be significant for some purpose. On recall it may be spoken aloud or written/drawn on a paper, analysed to be incompletely recalled, may be library or may be discussed with a friend and ultimately may become a part of the permanent memory. This is how learning occurs. Learning is to progress from one step to another.

Learning is individual: We all learn, different things at different rates and hypothetically anybody can learn anything given sufficient time and resources. However, at a practical, hard ground level, our learning is limited. We all learn different matters attaining different levels of achievement.

The scope and magnitude of learning depends to a large extent on the personality types of the individuals, e.g. those who prefer sensing would learn better about those things which they can see, hear, touch and experience by five senses, whereas those who prefer in tuition would like subjects that allow to create theories. Ideas and hypotheses would fascinate them.

Now let us consider some basic principles of learning.

Principles of Learning

1. **Relevance:** Learning is better with subject matters of immediate relevance. When the relevance is remote or obscure and the students has to learn with a belief that the knowledge perhaps might be of use some day, the learning is difficult. However, a student can be motivated to learn effectively by explaining the importance of subject matter with reference to his ultimate goal, e.g. the future clinical practice in the community. This could mean that some of the basic principles are relevant and important to be learnt now and some finer details may be learnt later in actual practice.

2. **Sequential Learning:** We learn by adding to what we already know. We learn by progressing from simple matters to complex and more complex matters. A suitable example or interesting anecdote may attract the learner's attention and through it some facts and principles can be communicated.

   Learning is better, when it progresses from an observation to reasoning, from a particular point to a generalisation, from a particular experience to an abstract concept. However, sequence is a matter of commonsense and it is not essential to adhere to any rigid rational order or logical sequence while teaching a subject matter. Depending on the topic to be explained or taught and depending on the learning atmosphere and opportunity, the learning sequence can be altered and adjusted accordingly.

Process of Learning

1. **Active Involvement:** Learning is more effective with an active involvement of the learner in the process, e.g. a small group discussion is more effective than a lecture.

2. **Formative Assessment and Feedback:** Learning being a process of acquiring new knowledge and skills which enable the students to do something that they could not do before, providing feedback on their performance helps the students to learn better. You will learn more about it in the chapter on **assessment.**

3. **Rebound Effect of Evaluation:** The system and process of evaluation has a definite effect on learning and learners. Students are generally blamed to be examination oriented. However, the very fact that

students learn for the sake of examinations can be utilised for better learning. For example, if more questions are asked regarding the health problems faced by the community, automatically students would work more for those topics and would learn more about them.

4. **Social and Cultural Ethos:** The degradation of social and cultural values is affecting education also. Medical education is no exception. An observation that non-deserving candidates may score better does affect the learning behaviour in a negative manner. To maintain a positive atmosphere in the educational institutions is a joint responsibility of all those who can afford to preserve and practice high moral principles on the basis of their spiritual strength.

Having considered different aspects of learning, let us now consider teaching.

Teaching: Some teachers have an inborn gift of the art and skill of teaching, but most of us learn and develop the skills as we progress in our career.

Most teachers are interested in teaching effectively and some may work for an improvement. The technique of microteaching should be useful for such interested teachers. Later in the book, you will find a discussion on this simple technique of teacher training.

Under the present situation, teachers find themselves confronted with a large number of students, a vast body of knowledge to be comprehended, a rapidly changing field of information in many areas and a limited time available for teaching, in which students are expected to achieve a maximum level of understanding.

Therefore, the teacher may have to consider, what experiences will motivate the students and enable them to learn; how the information can be structured for a given group; which sequence and form of presentation would be most effective and how the individual differences amongst the students can be taken care of.

Considering all the above aspects, it seems that a teaching-learning programme based on community oriented learning by objectives should be most suitable in present circumstances. Properly developed learning objectives based on health needs of the cummunity and current academic needs should be helpful both to the students as well as to the teachers.

Learning by Objectives

Attempts are being made to develop learning objectives of different levels for different disciplines. However, for the time being, you may also consider to develop and document learning objectives for whatever topic the students would learn under your supervision. Similar exercise undertaken by a group of teachers working in a particular discipline or

department would be even more effective and helpful to the learners.

Traditionally teaching is an interaction between the teacher and student under the former's responsibility, in order to bring about expected changes in the latter's behaviour.

What is the Purpose of Teaching?

The purpose of teaching is to facilitate learning. Meaningful and effective teaching should help the student to:

- Create an interest in learning for the topic in particular and more knowledge in general
- Develop proper life-long learning habits and attitudes.
- Acquire, retain and utilize the knowledge.
- Achieve appropriate skills and use them with confidence.

What to Teach?

To learn everything in the field of medicine is impossible even in a life time. Some form of selection is therefore essential. Some form of stratification is also necessary. The accepted recommendation is to divide the subject matter into:

Prioritisation

A. Must know—Vital
B. Should know—Essential
C. Could know—Desirable
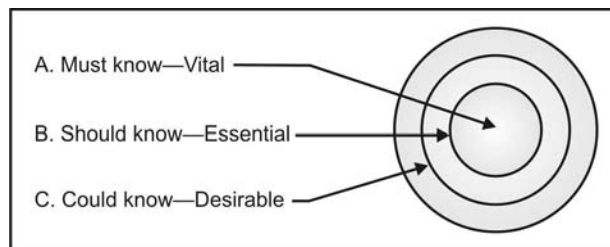
Since the time is limited, the major aim of your teaching should be to cover the vital and most of the essential. The desirable could only be mentioned or suggested for self study.

How to Teach?

We usually teach the way we were taught, unless there are reasons for change.

How we teach also depends upon how much we care for the students, for the subject and for our reputation as a teacher; how much we respect ourselves, our students, our subject; and our institution; and how much concern we have for the welfare of the students, community and the institution. If we do care, respect and have reasonable concern, it does not matter how we teach—it would automatically be effective and interesting. Perhaps there is nothing like the way for teaching.

Teaching-learning process is therefore a complex phenomenon. It appears to be an open ended spiral movement as compared to the linear model of conventional teaching. Considering the dynamic status of medical knowledge today, a medical teacher has to be a life long learner himself to keep up-to-date and be well informed about recent advances in different fields.

The present manual is a humble attempt to induct medical teachers into the teaching-learning process. On the basis of what has been discussed in the preceding pages, it is possible to identify three distinct components of this process. These include:

• Learning objectives
• Subject matter and teaching methodology
• Assessment

In the chapters that follow, we have tried to retain this basic format for our discussion. Let us emphasise here that all these components are inter-dependent and one cannot be sustained without adequate support from the others.

2 *Curriculum*

Learning Objectives
- ☐ Discuss the concept of curriculum.
- ☐ Enumerate curricular foundations and components.
- ☐ Distinguish between various curricular strategies.
- ☐ Plan the curriculum in your own subject area.

Definition

You must have heard the term 'curriculum' a number of times during your teaching career. Before proceeding further, try to define the word curriculum in your mind. You may have come up with one or more of the following definitions:

- A statement of learning objectives.
- A statement of learning experiences.
- A statement of learning outcomes.
- A listing of the subject matter.

While all of the above statements are true, none of them individually reflects the concept of curriculum. In fact, they represent various schools of thought prevalent at various times. A curriculum is much more than any of the above put individually.

Let us take you to the origin of the word 'curriculum'. It has originated from a Latin root, which means 'race-course'. You will appreciate that it essentially denotes two important aspects—the path to be followed and the frame within which it has to be followed. If we synthesise these aspects, it emerges that a curriculum is a plan of action which incorporates the learning outcomes to be attained over a period of time by exposing the learner to various learning experiences. This type of definition provides flexibility to the teachers to use different kinds of learning experiences to attain similar learning outcomes. A corollary of this being that even within a given subject area, you can have different types of curricula. We shall discuss about that a little later.

Foundations

Planning the Curriculum: To be able to plan the curriculum, you should know about two more terms *viz.* curricular foundations and curricular components. Let us discuss each one of them. If you are interested in names, let us tell you that this method of planning the curriculum has been devised by Zais and is aptly termed as Zais model.

Curricular foundations are represented by four questions, the answers to which will help you to give a desired shape to the curriculum. These are:

- Why a subject is being taught? (i.e. the need, rationale *etc.*).
- Who is being taught? (i.e. what are the characteristics, background and knowledge of the learners).
- How a subject is being taught? (i.e. is it a face to face teaching or is it through distance mode).
- What will have been achieved when a subject has been taught? (i.e. what will be the learning outcomes after going through a course of instruction).

You should be absolutely clear of answers to these questions as your teaching methodology and learning resources will be dependent upon them. Let us illustrate it by an example:

Why is biochemistry being taught?

So that students can score better at USMLE → Emphasis on recent advances and newer modalities

So that students can better understand the disease process → Emphasis on basics as related to disease process
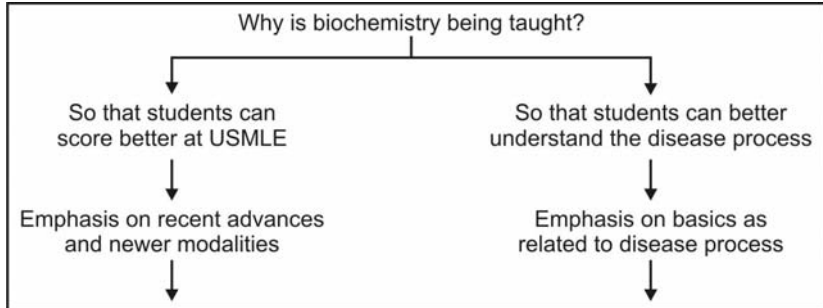
Same is true of answers to other questions, *e.g.* if the students are of higher ability, you would teach in a very different way as compared to students from say a rural medical college. This is the reason, why we called these four questions as foundations of curriculum—the whole curriculum is built on this foundation.

Components

Curricular Components: These aspects are decided on the basis of curricular foundations. Whatever type of curriculum it may be, it will essentially have the following four components:

- Objectives, i.e. what will the learner be able to do at the end of instructions. You will find a detailed discussion on this in the chapter **Educational Objectives.**

- Materials include all learning resources like books, manuals, models, A-V aids, etc.
- Methods denote the way the materials will be used, *e.g.* lectures, practicals, group discussions, self-study, field visits, *etc.*
- Assessment, which helps to provide a feedback to the learner and the teacher and also helps to certify the attainment of stipulated proficiency. You will learn more about it in the chapter on **Assessment.**

These curricular components are not independent but are highly dependent on one another. Thus your assessment has to be based on teaching methodology and conversely, the teaching methodology has to be in concurrence with assessment techniques. This inter-relation can be expressed with the help of the following diagram:

Interde-pendence

```
 ┌──────► Objectives
 │          ↓
 │        Assessment planning
 │          ↓
 ├──────► Material
 │          ↓
 ├──────► Methods
 │          ↓
 └────── Assessment
```
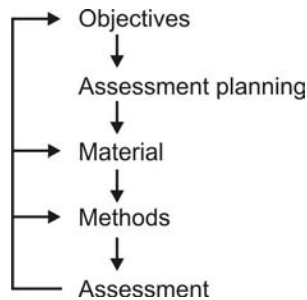
Did you notice that assessment planning comes immediately after objectives and not as an end product. This approach makes a decision about material and methods easy and more rational. It also avoids any mismatch between what is taught and what is assessed.

Zais model of curriculum planning
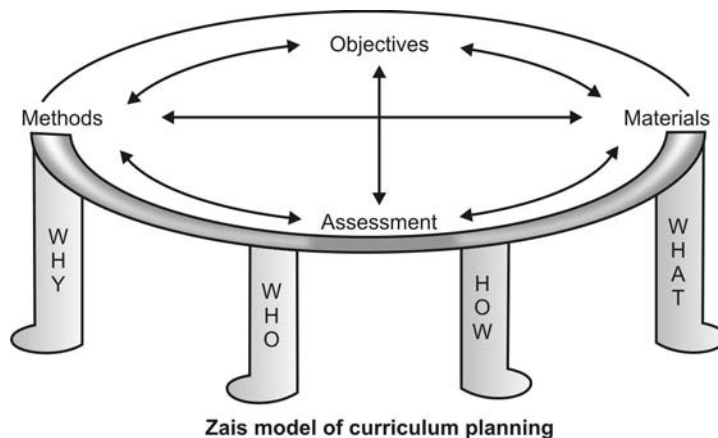
Approaches

Innovations

Approaches to Curriculum Planning: You will recall that a lot of flexibility can be built into the curriculum planning process to attain the same learning outcomes. As a very practical example, it can be said that if you want the student to learn about communication skills you can adopt any one of these methodologies—lecture, demonstration, role play, video recordings or field situations. Based on the choice of individual teachers, the approach to curriculum can be one of the following types.

Subject centered approach, where the emphasis is on completing the subject matter in terms of so many lectures, so many topics and so on. The contemporary MBBS curriculum is a typical example of subject centered approach.

Learner centered approach is another way where emphasis is on fulfilling the needs of the learner. There is a danger, however, that these needs may not be congruent with national health needs. The learners, for example, may be learning with the intent of faring well in USMLE examinations !

Problem solving approach emphasises the ability of the learner to solve a given problem and thus takes into account, both the above approaches. It, however, requires great care to strike a balance between needs of the subject and needs of the learner.

You will appreciate that none of the approaches outlined above are entirely satisfactory. The subject centered approach is the least satisfactory of all. It has been rightly pointed out that through years at an authoritarian medical school, idealistic young doctors are moulded into rigid doctors, who have lost much of their original ability to sympathise with the patients and listen to their problems. This problem has been felt the world over and as a result, six keys elements in medical curriculum have been recognised, each seen as a continuum. These include :

Student centered _____ Teacher centered
Problem based _____ Information gathering
Integrated _____ Discipline based
Community based _____ Hospital based
Electives _____ Standard
Systematic _____ Opportunistic

Let us make it very explicit that these questions in any medical school do not exist in absolute black and white; rather they exist in varying shades of grey. The more your curriculum is on the left side of the continuum, the better it is. This model of curriculum is commonly referred to as SPICES model.

Stages of Curriculum Planning: A curriculum is not an inert document. It does not exist in vacuum—rather it is a deliberate attempt to bring the needs and expectations of the society into the centre-stage of educational process. To a great extent, it has to be a corporate effort. The keyword of this process has to be 'relevance' to the needs of the society.

As easy and accepted way of curriculum planning is to follow what is called 'systems approach', which in effect means keeping the interdependence of various factors in mind. Simply stated, it means following the steps given below:

Systems Approach

```
                    Needs of the society
                            ↓
                    Needs of the learners
                            ↓
            ┌────→   Learning objectives
            │               ↓                  Resources and
            │         Selection criteria  ←──  constraint
   Feedback │               ↓
            └───→   Choice of methods
            │               ↓
            │       Development and trial
            │               ↓
            └──────── Assessment
```
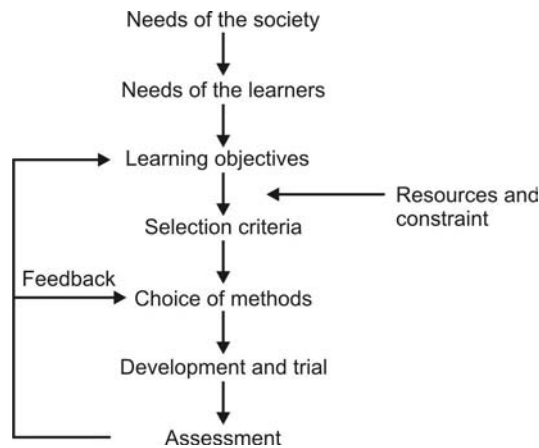
Based on this approach, a number of planning models are available—we do not intend to go into those details. However, if you are keen on knowing them, we have listed some books for you to go through. One of the models, which we feel is very simple, goes like this.

```
        Subject                        Students
               ╲                    ╱
    Educational  →            ←  Psychology
    phillosophy                   of learning
                        ↓
              Purpose of education
                        ↓
                   Objectives
                    ╱       ╲
    Learning activities    Learning experiences
                    ╲       ╱
                   Assessment
        (In the programme and of the programme)
                        ↓
                   Modification
```
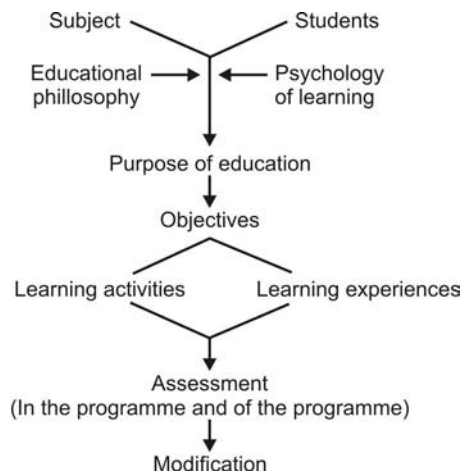
You may find some of these terms difficult to understand at present but as you progress through this book, you will find them simple and more understandable. We suggest that you go though this chapter once again after you have read the chapters on **Educational Objectives** and **Assessment.**

Before we close this discussion, we will like to re-emphasise that the outcome of a given curriculum is the result of interaction of various curricular components and our frustration with the present system of medical education is often the result of our inability to understand the interdependence of these components.

3

Educational Objectives

Learning Objectives
- ❑ Discuss importance of writing objectives.
- ❑ Enumerate domains of learning.
- ❑ Classify transactions into appropriate domains of learning.

Have you ever experienced that if you have a precise goal in mind, things begin to happen easily and effectively. Take a simple example you are going on a vacation with the goal of seeing Brindavan Gardens. You would make a definte plan, take a train to Bangalore and then to Mysore. You will not have to ask yourself this question midway: Where do I go from here ? On the other hand, if you didn't have a goal, you may still have had a vacation but the places you visited would have been all haphazard. Something similar is the case with education.

For teachers and students to work successfully towards achievement of some goals, a clear description or outline of the goals and the step by step accomplishments on the way is necessary. The goals stated with clarity and in concrete terms are usually referred to as objectives. Let us describe an educational objective for you.

Definition

An educational objective is a statement describing the expected results of learning as they should manifest themselves in the performance or behaviour of the learner. In other words, educational objectives state what the learner should be able to do at the end of the learning course. Therefore, they are also called 'learning objectives'.

Benefits

You may be curious to know the benefits that you can derive by stating objectives. In general, learning objectives help and guide the learner in the process of learning, thus making your tasks easier. Educational objectives can benefit teachers also, in their self-appraisal, in planning the teaching-learning activities and in student assessment.

The concept of objectives offers a practical approach to the improvement of the teaching-learning programme. The teachers benefit

Levels

by having measurable and observable objectives that are useful in planning and implementing learning activities and also in evaluating the pupil's progress. The students benefit by knowing exactly what is expected of them in acquiring knowledge and skills and being fully appraised of the criteria by which their performance will be judged. The institution benefits by defining the basic purpose for its existence. For instance, an institution might state as one of its primary objectives that "at the end of the formal training, the graduate should be academically competent, socially relevant and spiritually alive."

Based on the purpose for which they are being formulated, the objectives, therefore, can be of different levels. The broadest or most comprehensive objective is the statement of an institution's aim or purpose. This is usually the reason for the existence of the institution. We have already given you an example of this.

Once that broad statement has been made, the various components within the institution (departments, divisions, sections) are in a position to state what they expect to contribute towards the achievement of institutional objectives. The department of pediatrics in a Medical College might state that "Learners should be able to apply the knowledge in pediatrics towards solving common health problems of children."

Within the department teaching programme, specific instructional objectives can now be stated, e.g. "The learner should be able to diagnose and manage pneumonia in children."

The relationship between different levels can now be discussed in more details.

Institutional objectives: These are the broad, general statements to describe an institution's end product. Such statements should provide directions and limits to the institution's efforts by describing the ultimate role, function and tasks that the graduate must assume to satisfactorily execute the future health work in the community.

You will appreciate that institutional objectives do not specify what is to be learnt or how. However, some inferences to guide the learning activities can be drawn from them.

Intermediate objectives: Since at present, most of the medical education is discipline-based and the teaching-learning activities for different subjects are organised by different departments, an intermediate level of statement of purpose for each department or section is also necessary.

Integration

The intermediate level objectives can be developed by deliberations amongst members of the department. However, it should be remembered that the discipline/department is a part of the whole institution which is responsible for a proper education of the students and the fulfilment of the overall objectives. Therefore, it may be good to interact at least with other related disciplines, while discussing the intermediate level objectives, as this will ensure horizontal and vertical integration to some extent, e.g. pediatrics department also involves physiology, anatomy, medicine, pathology, microbiology and social and preventive medicine.

You will notice that inspite of being little more specific than the institutional objectives, these statements are still directional in nature and are not precise descriptions of what students should be able to perform. Some objectives of a general nature such as development of better communication skills, leadership qualities, etc. should also include in the department level objectives.

Specific learning objectives: These are also called specific instructional objectives or simply, instructional objectives. These are statements that describe the performance or behaviour of the learner expected to result from a specific unit of teaching-learning activity.

The specific instructional objectives or learning objectives describe what the student/learner is expected to learn in the three familiar domains, namely knowledge (cognitive, or domain of the mind), practical (psychomotor, or domain of the hands) and attitudes (affective or domain of the heart). We will discuss this in a little more detail shortly.

Domains of Learning

In general, much attention is given to the first two domains. The affective domain which is also equally important, does not attract attention during teaching-learning and also in assessment. You will appreciate that assessment of attitudes is a very specialized area and deserves more consideration than what is being given today. Development of positive attitudes in some matters such as management of AIDS or leprosy, problems of drug abuse and rational drug use, should be considered very important. Affective domain includes ethical aspects also and although some institutions do consider it important to deal with these matters, how effectively these are being dealt with, needs a critical analysis.

Taxonomies in the field of education provide a classification of various instructional objectives. This constitutes a descriptive system based on logical principles in accordance with the existing data on education and psychology.

Knowledge Component

COGNITIVE DOMAIN deals with knowledge, comprehension, application, analysis, synthesis and evaluation.

Knowledge in general refers to recall of information as it was learnt. In simplest form, it includes knowing the terminology, specific facts, dates, concerned persons or scientists associated with an area of the subject matter. At a more complex level, it would involve the major sub-areas, methods of enquiry, and some of the principles and theories with adquate explanations.

Comprehension refers to interpretation of information in one's own words or in some other original way. It may also mean extrapolation of the understanding to new but related ideas and their implications.

Application is the use of learned information to solve a problem. This may mean, carrying over the knowledge of facts or methods learnt in one specific context to another completely new area.

Analysis deals with identification and appreciation of the subject matter's most elemental ideas and their interrelationships.

Synthesis is creating something new and good, based on some sound criteria.

Evaluation is judging the value of something for a particular purpose. This means making a statement of something's worth based on either one's own criteria or on the well understood and well accepted criteria of another. It is like discussing the clinical or therapeutic status of an individual drug from a group and mentioning the drug of choice with valid reasons.

We may add here that in order to simplify things the last three levels are new collectively taken under a new nomenclature, i.e. problem solving.

Skills Component

PSYCHOMOTOR DOMAIN deals with imitation, control and automation.

Imitation refers to the initial activity of a learner after being exposed to an observable action, when the learner attempts to undertake a similar action at the level of his muscular system.

Control means performing an act according to instruction and not merely on the basis of observation. The learner begins to differentiate between one set of acts and another and also becomes capable of selecting the required act. It also refers to the skills attained in manipulating selected implements.

Automatism indicates the highest level of proficiency, achieved in performing an act or a series of articulated acts. The skillful activity is performed with minimum expenditure of energy, once the level of automation is achieved.

Attitude Component

AFFECTIVE DOMAIN involves the attitudes and communication skills and deals with receiving, responding, valuing, organisation and characterization by a value or value complex.

Receiving refers to paying attention, knowing that something exists or something is going on or happening. It also includes an alert watching and active listening.

Responding means participation and an active exploration and developing interest in the matter under consideration and may include pursuit of a given activity, person or a thing with a sense of pleasure or satisfaction.

Valuing indicates a consistent behaviour showing positive regard for a set of values. This may mean behaviour in keeping with advice from others about the right actions. At a deeper level, it involves commitment, expression of a particular point of view, and assuming a responsible role.

Organisation includes a state of holding consistent point of view about many aspects of life without contradiction or conflict. It is reflected by a consistent behaviour according to a definite set of life principles.

Characterisation by a value or **value complex** means showing a strongly detectable and effective pattern of growth or adjustment to life in general. This is the level of internalisation. This implies that our perception of a phenomenon has found a place in the scale of values and has affected us long enough to adopt to the value system of other persons too. For example, on the death of a child, our response to the members of the family would show then that we care about their grief and are ready to help then to get over it. This does not mean we have internalized their grief but that we have internalized the attitude that enables us to offer effective help.
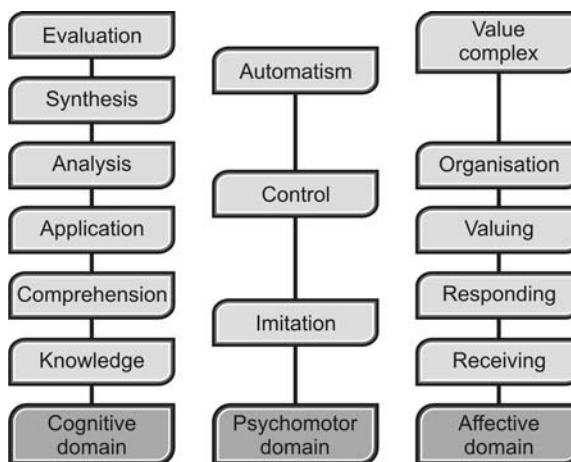
Domains of Learning

Depending on the subject area for learning, the instructional objectives may have to be framed in all the three domains. It may be a good idea to make the task of developing educational objectives a corporate task.

The learning objectives should be revised from time to time and all the concerned teachers and students should try to look at them with a constructive critique. Whenever adequate reasons exist, the learning objectives should be changed or modified. You may now like to lay more emphasis on AIDS rather than smallpox in your teaching.

We have already pointed out that objectives give a direction to teaching-learning process. In addition, they will help you, as a teacher, to decide appropriate teaching methodology. If your objective belongs to affective domain, you will have to adopt small group discussion and demonstrations rather than lecture method. They also provide a direction to the assessment process. In fact, the assessment should always be based on the instructional objectives. However, if you realise during the process of assessment that some particular aspect seems to be important and worth assessment but has not been included in the instructional objectives, the point should be noted for future. Similarly, you should note that those aspects which are never evaluated, would not attract any student's attention.

By now, you would appreciate that the concept of learning by objectives has a great significance for medical education. The learning objectives can focus a strong light on those areas of learning which need greater attention and can also help a learner to decide how deep one needs to go with reference to a particular point. Learning objectives help a teacher in proper planning and execution of the teaching activities.

Before concluding, let us summarise the advantages of 'learning by objectives' approach. These are:

- By providing a direction to both teachers as well as the students, objectives help in designing relevant and efficient educational programmes. They assist in selection of appropriate resources as well as in selection of appropriate teaching-learning activities. They force the teacher to think carefully about what is important.
- They help in designing appropriate assessment tools and provide a criteria against which the performance of the student can be measured.
- They provide future professional profile to the learners, thus promoting better integration. They also facilitate the functioning of a self check system, thus avoiding vague and irrelevant learning.
- They provide a facilitating milleu to the learner by providing a point of entry into the learning process and also by providing directions

regarding expected learning outcomes.
• They provide a shared means of educational communication between teachers, students, administrators and society.

There may be certain disadvantages also, of relying too much on this approach. Some of the concerns voiced in the literature include:

• They can give a totally wrong direction to learning, if not properly prepared.

Disadvantages
• If students are not involved in formulation of learning objectives, they can discourage creativity.

• They may not be actually translated into practice and thus may remain on paper only.

For your convenience, we have reproduced in the annexure a set of instructional objectives given by MCI in its 1997 recommendations. You can use them as a guide to formulate your own department objectives.

4

Writing Instructional Objectives

Learning Objectives
- ❒ Enumerate the components of an instructional objective.
- ❒ Identify components of a given instructional objective.
- ❒ Write instructional objectives for each domain of learning.

"If you are not certain of where you are going, you may very well end up somewhere else and not even know it."

This statement by Robert Mager aptly summarises the importance of stating objectives so that the students as well as teachers know precisely as to *where they have to go.* In the previous chapter, we discussed the levels at which objectives can be stated. The present discussion will specifically focus on instructional objectives or *learning objectives.*

We hope that by now you are clear about the difference between aim and objectives. Let us repeat it for you. Aim is broad statement of an educational activity while objective is a precise point in that direction. To take a simple example, you may aim towards south with the objective of reaching Bangalore. Coming back to education, we can say that the aim of medical education is to produce a good doctor. This however, does not tell us about what goes into the making of a good doctor. This interpretation is often left to individual teachers. The teacher has then to decide how much of a topic to include in his teaching and to what level to take it. Let us try to state this in another way. An aim can be defined as an answer to the question of why a topic is taught and an objective as an answer to the question of what will have been achieved when it has been taught.

Recall for a minute, the education spiral. You would notice that the process of education begins with statement of objectives, which leads to choosing appropriate teaching-learning strategies and thereafter deciding means to assess attainment of these objectives. What does it mean? It means that teaching methodology as well as assessment are heavily dependent on objectives and if they have not been precisely stated, then the other two processes are unlikely to be appropriate.

Systems Approach

Let us take you for a while to systems approach in education. You have already come across this term in the context of curriculum. In a nutshell, systems approach states that education means certain inputs (books, lectures, experience) which are processed to produce a permanent change in behaviour (learning). Diagrammatically, it can be represented as follows:

Input	Process	Output
Reinforced practice	Internal processing	Permanent change in behaviour
Learning events	Learning	Behaviour
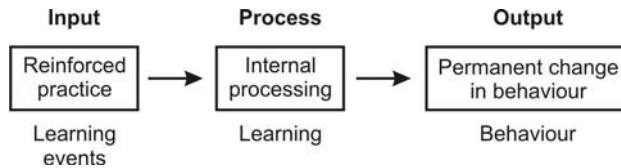
You have rightly noticed that as a teacher, the phenomena you can control are learning events and observation/measurement of performance. In other words, you as a teacher, must be able to use a more precise language which describes in behavioural terms, what the student will be able to do at the end of a lesson. When you have stated the change in behaviour that you hope to produce in the student, you have written an objective.

The learning objectives can be divided into 3 basic categories: (i) Objectives related to development of knowledge (ii) Objectives related to practical skills and; (iii) Objectives related to inculcation of attitudes. Yes, you have guessed right—these categories relate to cognitive, psychomotor and affective domains. The categories vary considerably not only between subjects but also between teachers teaching the same subject and between students learning the same subject from the same teacher.

Does it mean that weightage to different categories of objectives depends on the whims and fancies of individual teachers? The answer is a categorical 'No'. For any course and any subject, the relative weightage should be predecided, based on what the final product of the system will be required to do. Let us clarify it with an example. If an MBBS doctor is not required to perform an exchange transfusion, then objectives related to this aspect should get less emphasis while more emphasis should be laid on diagnostic and referral aspects of neonatal hyperbilirubinemia. To make it less subjective and clear to all teachers, you can prepare what is called a table of specifications or a blueprint. You can understand it better by looking at the following example:

Topics	Weightage	Cognitive	Psychomotor	Affective
Cardiovascular	25	50	40	10
Respiratory	35	50	40	10
Neurology	10	30	50	20
Abdomen	30	40	40	20

Methodology

You will be eager by now to know the ways in which objectives can be written. Two approaches are commonly used for this purpose - that suggested by Mager and the other suggested by Gronlund. Mager's approach is simple, straight forward and universally accepted-although it is criticised for being too simplistic! In our opinion, for the undergraduate level, it still remains the best approach. For higher levels of learning, e.g. for postgraduate courses, Gronlund's approach could be used. In the subsequent discussion, we shall restrict ourselves to Mager's approach.

Mager has suggested that a learning objective should have 3 specific elements viz.
- Specific performance of the student,
- Conditions under which this performance is expected, and

Components

- The minimum acceptable level of performance.

Let us now try writing instructional objectives based on these criteria.

The student will be able to :
- Palpate the liver of a child to the accuracy of ± 0.5 cm.
- Recognise at least 3 major symptoms of pre-eclampsia during an antenatal check-up.
- Record weight of a newborn using a lever scale to the accuracy of ± 50 gm.

Can you recognise the 3 criteria in each of these objectives?

They are —

	Performance	*Condition*	*Minimum level*
1.	Palpate the liver	Child	accurate to ± 0.5 cm
2.	Recognise pre-eclampsia	Antenatal visit	3 major symptoms
3.	Record weight of newborn	Using lever type scale	accurate to ± 50 gm

Examples

In general, all learning objectives will have these three criteria. Now look at the following objectives and try to find them out.
- Identify ova in a stool smear.
- Recall common causes of diarrhoea in a child.

You have rightly noted that there is no minimum level of performance in these objectives. However, it is taken for granted that it is 'correctly' (Recall *correctly* the common causes of diarrhoea). This type of writing will, however, be applicable only if there is only one acceptable response possible for the students.

Did you notice another point—that all objectives begin with a verb? This is because the basic purpose of writing objectives is to be able to observe the performance as a proof of learning. This observation is possible only when the student does something.

We have reproduced a list of action verbs which you can refer to, whenever you are writing objectives. It is generally better to use verbs with narrow interpretations (draws, recalls, does, labels) rather than those which can have variable meaning (understands, learns, comprehends).

All learning objectives do not qualify to be called good. The qualities of a good objective can be enumerated as follows:

Qualities

- It is relevant to the health needs of the society. For example, it prompts the student to learn more about tuberculosis than about degenerative disorders.
- It is not loaded with what is called ' window dressing' Rather, it is straight forward with no scope for ambiguity and subjective interpretation.
- It is feasible within the given constraints and restraints of time, faculty and university requirements.
- *It is observable:* in fact, the whole emphasis in objective writing is on observability.
- It is measurable objectively. This provides you and the student with a means on which to base feedback.

Technique of writing good objectives: By now, you are well versed with the basic components of a learning objective. Can you enumerate them? They are the performance, the condition and the minimum level of acceptance. Out of the various qualities of a good objective listed above, in our opinion, the most important is relevance. Thus, not only should an objective be technically sound, it should also be relevant to what a student is actually going to do after completion of his course. It is clear that good objectives are derived from actual base and not from imagination. You would be wondering, that forms this base. Let us tell you about some techniques which will help you in writing relevant objectives.

Basis of Writing Objectives

a. *Critical incident method:* Subject experts are requested to observe a student and describe a specific incident in which the student performed a task very well and reasons for arriving at that conclusion. Accumulation of such incidents from a large number of independent observers leads to a full range of expected professional competencies. There is, however, risk of subjective bias creeping in.

b. *Job analysis:* In this method, a dissection of what a physician does, is carried out by observers, patients and physicians themselves and thus, a list of professional competencies is arrived at. However, this gives

an indication of what is presently being done rather than what should actually be done. You must have noticed that both the methods described above involve a subjective element and any wrong practice being carried out may also become legitimised. Well, to overcome this problem, you can use the following methods.

c. *Referral patterns:* These provide a useful insight into what is not being done. For example, if children with diarrhoea are not being given ORS, it is an indirect indicator of the need to give more emphasis to objectives in this area.

d. *Morbidity and mortality statistics of a country or region:* These provide a useful guideline regarding 'relevance' of a disease. Thus, we are obviously more concerned with diarrhoea, pneumonia and malnutrition rather than with rare syndromes.

Sounds complicated? Well, may be it is. But this type of exercise is necessary to maintain relevance of medical education to the needs of the country. This assumes more importance in view of the fact that medical education in India is highly subsidised; the end products of the system must be able to address the common health problems of our people.

Table of Action Words to be used in framing objectives					
Knowledge/Comprehension			*Application*	*Problem solving*	
Arrange	Order	Apply	Illustrate	Analyse	Illustrate
Cite	Outline	Assemble	Infer	Appraise	Infer
Classify	Recall	Calculate	Interpret	Argue	Inspect
C Convert	Recite	Change	Modify	Arrange	Interpret
O Copy	Record	Choose	Operate	Assemble	Judge
G Define	Relate	Compute	Practice	Assess	Justify
N Describe	Reproduce	Defend	Predict	Categorize	Manage
I Discuss	Repeat	Demonstrate	Prepare	Choose	Modify
T Distinguish	Report	Discover	Produce	Combine	Organize
I Explain	Restate	Draft	Relate	Compare	Plan
V Express	Review	Dramatize	Schedule	Compose	Predict
E Give example	Rewrite	Draw	Select	Conclude	Prepare
Identify	Specify	Employ	Show	Construct	Propose
Indicate	Summarize	Estimate	Sketch	Contrast	
Question					
Label	Tell	Explain	Use	Convert	Rate
List	Translate			Create	Relate
Locate	Underline			Debate	Score
Match				Define	Select
Name				Devise	Solve
				Differentiate	Support
Knowledge/Comprehension			*Application*	*Problem solving*	
				Discriminate	Test
				Distinguish	Value
				Estimate	Write
				Evaluate	
				Examine	
				Experiment	
				Formulate	
Accept	Locate	Affirm	Perform	Act	Integrate
A Accumulate	Name	Approve	Practice	Adapt	Mediate
F Ask	Point to	Assist	Propose	Change	Organize
F Describe	Respond to	Choose	Select	Defend	Revise
E Follow	Select	Complete	Share	Display	Solve
C Give	Sensitive to	Conform	Study	Influence	Verify
T Identify	Use	Describe	Subscribe to		
I		Discuss	Work		
V		Follow			
E		Initiate			
		Invite			
		Join			
		Justify			

Contd...

	Knowledge/Comprehension		Application		Problem solving	
P	Complete	Press	Activate	Loosen	Adapt	Fix
S	Demonstrate	Pull	Adjust	Manipulate	Combine	
	Generate					
Y	Distinguish	Push	Assemble	Measure	Compose	Illustrate
C	Hear	See	Build	Open	Construct	modify
H	Identify	Select	Construct	Operate	Convert	
	Organise					
O	Locate	Set up	Copy	Perform	Create	Plan
M	Manipulate	Show	Demonstrate	Remove	Design	Repair
O	Move	Sort	Disassemble	Replace	Devise	Service
T	Pick up	Specify	Disconnect	Rotate		
O	Point to	Touch	Draw	Select		
R	Practice	Transport	Duplicate	Set		
			Execute	Slide		
			Load			
			Locate			

5 *Microteaching*

Learning Objectives
❑ Explain the concept of microteaching.
❑ Use microteaching in your day-to-day work.

Need

Our teaching techniques improve gradually over the years as we gain experience and also because of the continuous practice undertaken for different kinds of teaching-learning situations. Educational technology, however, has evolved ways and means for better development of teaching skills even at earlier stages by undertaking some methodical exercises, one of which is Microteaching. What is Micro about it? The technique attaches importance to a small fraction or a particular aspect of the teaching skill and needs a small time to demonstrate the same.

Microteaching is an innovative technique of teacher training. It aims at development of competence in teaching skills through the practice of microteaching sessions. Even an experienced teacher can benefit by this technique, particularly for learning some new skills. The teaching learning activities such as lectures, small group discussions, tutorials or demonstrations involve a combined use of many skills such as the use of overhead projector, slide projector or the age old blackboard.

Each of these components can be performed in a more effective manner by properly planned practice sessions under peer observations. This is the main function of the educational game referred to as microteaching. It is called as a game here, because an effective utilisation of the technique is possible when there is a group with sportish atmosphere.

Technique: A short lesson is taught by you to a group of four to six peers or pupils for a period of 5-10 minutes. The emphasis is on how to teach rather than what to teach. The session can be organised for the

proper use of any visual aid such as chalk-board, specimens, models, projection instruments such as OHP, slide projector, audio-aids or audio-visual aids.

The pupils/peers observe carefully your teaching behaviour during a microteaching session and later discuss whether the particular skill was properly executed or not. Thus, the feedback would be immediate.

Technique
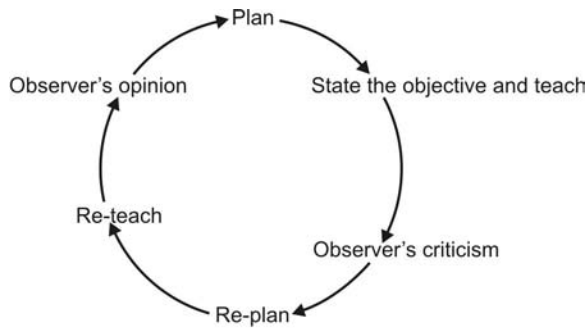
The cycle of 'Microteaching'

After a short break you should reteach the micro lesson making use of the feedback to improve on your previous performance.

In brief, the microteaching sessions will occur in the following sequence:

Process

A microteaching session should begin with the statement of the objectives of the session by the trainee teacher followed by the presentation of the matter in an organised, sequential manner, with appropriate speed of presentation, use of illustrations and examples and suitable jokes and humour as and when necessary. The topic should be summarised at the end with a mention of additional sources of reading. During presentation, adequate and appropriate use of audio-visual aids should be undertaken and an active participation of the students also be ensured.

Observers can evaluate the performance in an objective manner by making use of properly designed observation chart shown on the next page. Why don't you try a few microteaching sessions in your own departments? Try to include as many teaching skills as possible. You will definitely be impressed by its utility in improving your teaching skills.

Microteaching
Observation chart for peers/pupils
(Please indicate the observations in the right hand column)

	Yes	No	Cannot say	Not applicable
1. The speaker stated the objectives.				
2. The speaker presented the matter in an organised sequential manner.				
3. The speaker used humour to lighten the mood.				
4. The speed of presentation varied with emphasis.				
5. Examples/illustrations were used to emphasize the component.				
6. The speaker summarised the topic at the end.				
7. The speaker suggested additional sources of reading.				
8. The speaker used audio-visual aids (slides, charts, chalk-board, overhead projector, model)				
9. If he did use the aids, they were clear, explanatory, well prepared.				
10. The speaker allowed students to participate actively by: (a) Allowing questions (b) Inviting questions (c) Suggesting questions (d) Suggesting questions and answering the questions.				
11. Any suggestion for the speakers to improve the teaching / learning exercise.				

6   *Taking a Lecture*

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Learning Objectives

❒ Plan a lecture.

❒ Enumerate points for delivery of a good lecture.

❒ Incorporate the guidelines in your lecture sessions.

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Problems

You must be aware of the criticism which is often leveled against lecture as a teaching method-yet most of you must be using this as a primary mode of teaching. The reasons are simple—lecture is one of the most cost-effective method which can transmit a large amount of information to a large number of students. Given the current situation, there is no doubt that lecture as a teaching method is here to stay for a long time to come.

Let us give you some guidelines to make best use of lecture as a teaching method. A certain amount of lecturing is inherent in any course, specially to build up basic theoretical knowledge, which must be gained before we can use other interactive methods like tutorials or small group discussions. Lecture, however, is unsuitable for teaching of skills or promoting attitudinal change. It is a one way communication in which students largely remain passive. Unless you are sensitive to your audience, you may not know whether or not students are taking interest in what you are saying. You may have little opportunity to clarify meanings or to handle the wide diversity of abilities and attitudes which the students represent.

You must consider the communication problems before taking your lecture. you must study the nature of your audience, adapting the topic to their interests and understanding. You should organise your material in a manner which is effective and use aids where appropriate. You should also plan for variation in your presentation, including time for questions and discussion, which will reveal how much learning has taken place.

Making a Plan

Planning the Lecture: Before you plan your lecture, you should try to find answers to the following questions:

• Who is your audience?
• What is the purpose of your talk?
• What is the time available?
• What is the subject matter?

Knowledge of the audience will help you to know the baseline level of knowledge on which you will have to build up. It may be helpful to start with a general discussion or ask questions to get opinions. This approach will help you to make last minute adjustments, if necessary.

Knowing the purpose of your talk (e.g. giving general information, giving detailed information, changing attitudes, etc.) will make it easy for you to select appropriate material and to decide on the most effective way to present it.

A good lecturer respects the clock by adjusting his lecture to suit the time available. You should appreciate that it is better to have an audience still interested and wanting to know more after a short and fully used period, than to have them tired and uninterested after a long and boring talk. It may be interesting for you to know that the sag period in the interest of the audience occurs after about 20 minutes and hence you should plan your delivery in such a way that the interest is maintained. This can be done by appropriate use of humour, interesting examples, rhetorical questions and audience participation.

Preparation

Subject matter is crucial for a good lecture, for lack of knowledge about it means a sure death for the lecture. It is important to speak from your own knowledge and experiences but at the same time you should keep the needs of the audience in mind. It is a good idea to mark a few basic headings under which you can list ideals. Jot down the material by consulting reference books, texts, previous notes, etc. After you have collected the material, categorise it into 'must say',' should say', and 'could say'. What do you want your audience to remember at the end of your lecture? Put your emphasis on this and narrow down your subject matter accordingly, bearing in mind the time available.

There is plenty of evidence to show that people remember a greater percentage of short talk rather than a longer one. Do a little well, rather than a lot badly. Remember the iceberg. Only a small part of the total mass of information available at your disposal may rise above the surface. But this visible part is as truly supported by the rest as in case of an iceberg.

You should make a special effort to plan the concluding part of your lecture. In addition to giving a brief recapitulation of various points, give some indication of where we go from here. The quality of your conclusion is more important than what you think.

Practical Tips

Delivering the Lecture: The written word can only be of limited help when it comes to speaking techniques. What you need is practice followed by constructive criticism. You may have guessed it—we are talking of 'microteaching'. You can improve the quality of your presentations by using this simple teacher training technique, which we have discussed in the previous chapter. In addition, some of the essential points you should keep in mind are:

- Arrive a few minutes before the scheduled time, giving yourself time to overcome any anxiety you may have. You can also use this time to check and arrange your teaching aids.
- You can speak from your notes but do not put your nose into them. Do not read entire lecture—the students feel more interested in your experiences rather than a literary oration.
- Speak from a posture that is comfortable to you. Avoid pacing up and down on the stage like a caged tiger!
- Be poised, courteous and sincere. Careless choice of language or humour may create blocks to communication.
- Establish eye contact with your audience. Looking out of the window or down at the notes blocks communication. Talk to whole class and not just the front row. Do not fix on a particular student or a group of students.
- Any action or gestures should be natural and spontaneous. Mannerism are distracting and should be avoided. Try to avoid leaning on the table or putting your hands in your pockets.
- The tone of your voice should be modulated to convey confidence, emotions, emphasis and indignation. Speech should follow the rate of thoughts—don't be afraid of a pause or silence. They can be used to let an idea sink in.
- Use everyday language avoiding slang. Prefer short and familiar words, keeping sentences short. Be careful with funny stories, specially if the audience is unknown to you.

Before we end this discussion, let us again remind you that rehearsal and practice are the only two things that will make you good at lecturing. Try to use the technique of microteaching and you will really be surprised at the results that you get.

7   *Tutorials and Small Group Discussion*

Learning Objectives
- ❒ Explain the concept of tutorials and small groups.
- ❒ Effectively conduct a tutorial and small group discussion.

Differences

Small group discussions and tutorials are teaching-learning activities in which one teacher interacts with about 8 to 10 students. Though the two appear to be quite similar, there are some qualitative differences which are worth considering. Let us do it for you.

Tutorials is a teacher centered activity, while a small group discussion is a student centered activity. Tutorials, usually conducted after few lectures or a series of lectures, are mainly designed to find out the extent of understanding and learning achieved by the student. The concerned teacher, responsible to conduct tutorial class, evaluates by way of asking questions, the performance of students and may also clarify some of their doubts. Whatever the activity during tutorial, it is controlled by the concerned teacher. Hence, the teacher is the authority. The students are observes and evaluated. Depending on the need, some amount of mini-teaching may also be undertaken by a teacher. The teaching-learning atmosphere created during the tutorial classes depends largely on the attitude of the teacher. An understanding, supportive approach is more beneficial for students as compared to a critical and negative approach. A soft but firm dealing may encourage the students to come prepared for the tutorial discussions. Day to day evaluation of each student and negative marks for remaining absent without valid reasons, can ensure regular attendance and effective participation.

Methodology

Small group discussion is considered to foster active learning by the students. However, it is necessary to create an appropriate atmosphere for the same. The purpose and process of small group discussion should be shared with the students in a clear manner. The learning objectives should also be clearly defined. The group activity should be managed

by one student acting as a group leader and each student should get an opportunity to act as leader sometime or the other. The role of teacher in such sessions is described as that of a facilitator and a proper understanding of this role is very necessary. Since small group discussions are meant for active learning by the students, use of different resource materials such as books, notes, comments and contributions from the teacher or fellow students are all welcome. The teacher does not have an authoritarian role to play here nor to provide spoon feeding. The teacher has a more friendly role to play and also provide an academic support by acting as a resource person when necessary. Thus, it is a more complex role for you.

For the student, a group should provide a relaxed atmosphere to develop better understanding of the subject matter suitable to his/her individual needs and abilities. An active participation by all members of the group is ideal; however, some can gain a lot even by listening to the discussion. Appropriately developed and effectively utilized peer pressure can also bring in positive change for some students. This may, however, need guidance from the teacher.

The background use of properly defined learning objectives seems to be important both for tutorials and small group discussions.

You must appreciate that the emphasis in small group discussion happens to be on active learning by each individual in the group whereas, during the tutorial it is presumed that most members of the group have learnt the subject and the extent of learning is being evaluated and them extended depending on the need.

Small group discussions are very likely to be time consuming. A good time management by the teacher may be helpful for the students. Some learning objectives may not be suitable for group discussion at all, e.g. those related to memorisation.

The time spent in tutorial discussions may vary from teacher to teacher. The effective utilisation of the time spent may also be different by different teachers. Your way of conducting the discussion is very likely to influence students' interest in positive or negative manner particularly during the tutorial classes. Both tutorials and small group discussions have their own advantages, and therefore, an appropriate mix of the two should be very useful for students. In general both the activities need a base-background information provided to the learner by way of a brief two-way talk or a brief lecture or a lecture series, depending on the subject matter for learning. Both the activities can help in developing better learning and better learners with aptitude for life-long learning.

You may find these suggestions helpful to conduct an effective small group discussion.

Application

1. Formulate clear objectives for the course (other than covering X number of chapters) which are clearly communicated to the students. Useful objectives relate to what students should know, understand, be able to apply, or use effectively by the end of the semester.

2. Use a variety of approaches to teaching during each session and over the course of the semester according to what is most appropriate for the material being presented. An entire course session of only lecture or only slides becomes tedious, not only for the students but for the instructors as well.

3. Develop clear expectations for what you expect from the students and how they will be tested. These expectations should follow logically from the objectives you formulate for the semester. Students need to understand what they will have to know, how well they need to know it, and how they will have to demonstrate what they know.

4. Students learn the most when they can take an active part in learning instead of being passive recipients of information.

5. If you want students to learn critical thinking skills or be able to synthesize several sources of information into a coherent perspective, you need to model those processes and give students a chance to practice them.

6. Have clear objectives for the discussions and communicate them clearly. Formulate and communicate your expectations of the students.

7. Avoid yes/no questions. Ask "why" or "how" questions that lead to discussion and when students give only short answers, ask them to elaborate.

8. Don't fear silence. This may be the most difficult thing to do but it is absolutely essential.

9. When possible, set up the room for discussion. A circle works best, especially if the group can sit around a table. If this is not possible, then move around the room, sit among the students; become a discussion participant rather than a teacher.

10. Provide positive feedback for participation.

11. Show enthusiasm for the subject. You can't expect students to become interested in a discussion topic for which the instructor shows no enthusiasm.

12. Assign roles to the students. These roles should be self-managed. Ask them to elect a discussion leader, time keeper, recorder and a reporter. The habits inculcated at this stage are of great use in later professional tasks.

8   *Student Assessment*

Learning Objectives

❒ Enumerate the functions of assessment in the teaching-learning process.

❒ State the types of assessment and their uses.

❒ Prepare a table of specifications for your subject area.

Terminology

Have you ever thought that if the human body didn't secrete glucagon and other hormones in response to hypoglycemia, what would happen? The results would be simply catastrophic. Let us see, what the body did — it 'measured' the levels of glucose, evaluated them in the context of the needs and then sent corrective signals for counter-regulatory mechanisms. This is exactly what we do when we assess students. We measure the performance, compare it with previously decided standards and take corrective action in case of any deviation. One important corollary of this sequence is that assessment is not just concerned with proving a certain point but with improving the whole educational process.

Before proceeding further, let us clarify for you, certain terms which are commonly used in this context.

Measurement refers to the application of mathematical tools for finding the degree of achievement. Awarding marks to an MCQ is an example of measurement.

Assessment is used for those attributes which do not lend themselves to precise measurement and where some subjective decision is involved. Marking of essay type questions is an example of assessment.

Evaluation is a broad term and involves passing a value judgement based on the information obtained from measurement and assessment. Generally, the term is used in the context of educational programs.

By convention, the term assessment is used for student related while evaluation is used for program related activities.

Importance

Let us now come back to the discussion on Assessment. For most of us, assessment is taken to be synonymous with end of the course tests, with the intention to classify students as pass/fail. However, this is not

so. Assessment is considered a major curricular component, at par with educational objectives and learning experiences. For a minute, refer back to the educational spiral and you will notice that assessment is influenced and in turn influences the other two curricular components. In other words, other than a pass/fail function, assessment also serves to modify the objectives as well as the learning experiences.
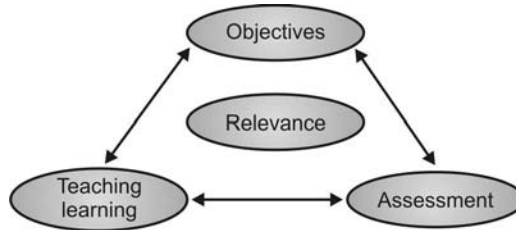
You may now be wondering about those other 'functions' of assessment. Let us have a look at them:

Functions

a. *Diagnosis:* The results obtained from assessment serve to diagnose areas which have not been properly learnt and which require remedical measures.
b. *Prediction:* Most of the aptitude tests rely on the predictive utility of assessment with the underlying assumption that a candidate scoring high on these tests will do well in real life situations also.
c. *Selection:* Entrance tests to MBBS (and other professional courses) make use of this function.
d. *Grading:* We assess to rank order the students of any given class for prizes, scholarships etc.
e. *Programme assessment:* As already stated, assessment helps us to modify a programme and make it more cost-effective.

Let us now look at certain other used in the context of purpose of assessment. These include:

Types of Assessment

a. **Formative assessment** is used to help the learner and the teacher to know the progress of the student in an informal way and take remedial action in case of any difficulty. Questions asked during the course of teaching, class tests, quiz programmes are all examples of formative assessment.

    Since the basic purpose of formative assessment is to help the learner know about his progress, the results of formative assessment should never be used for a final pass/fail decision. If this is done, them learners may try to hide their weaknesses and the very purpose of formative assessment may be lost.

b. **Internal assessment** is the term used when assessment is carried out by the teacher himself, who has taught that subject. To be meaningful, this assessment has to be of a continuous nature. You will find a more detailed discussion on internal assessment in a later chapter of this book.

c. **Summative assessment** refers to the end-of-term or end-of-course assessment. University professional examinations are examples of summative assessment.

You will notice that working on this principle, the final pass/fail decision has to be made after taking into consideration the performance on internal assessment as well as summative assessment. For sake of simplicity, the inter-relationship of various types of assessments can be represented by the following diagram:
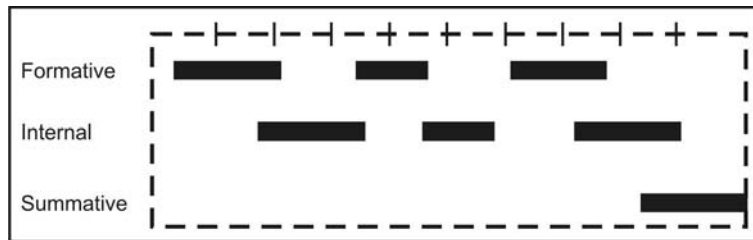
Having discussed some of the points regarding assessment, the next question that we are posed with is how to assess? Should it be a paper consisting of either MCQ or essay type questions; should it concentrate more on practical aspects; should it have a varying proportion of the two? The answer to this question is provided by the objectives that we have set for a given course. For a medical student, simply knowing about a disease is not enough—he should be adept at not only performing practical procedures but also to relate to the patient and his family members. You will recall the discussion we had in the chapter, **Educational Objectives.** It is thus imperative that a medical student is assessed on all the 3 domains of learning viz. knowledge, practical and communication skills. Here we will like you to recall one more term, i.e. Table of specifications. Essentially, a table of specifications is a grid which lists subject matter on one axis and the weightage given to various domains on the other axis. This makes it very easy for the teacher to decide the percentage of total marks which have to be alloted to knowledge, practical and communication skills.

You will appreciate that the percentage alloted to various components will vary with the subject area under consideration. For example, while assessing the student on antibiotics, knowledge and practical skills are

Abilities to be Assessed

importance while for evaluating him on history taking, practical and communication skills need to be given more weightage. You should not go with the idea that this table of specifications is arbitarily prepared - rather it requires a lot of effort and discussion amongst subject experts to arrive at a consensus; however, the advantages it offer are more worthy than efforts involved. You can also initiate discussions in your own departments to reach at this consensus.

Weightage to Abilities

Assessment is not the end-rather it is the means to further the effectiveness of an educational programme. To make full use of the intended purpose of assessment, it should be undertaken after careful planning, specially keeping the educational objectives in mind. The assessment tools should be appropriate for the learning outcomes to be assessed. An appropriate assessment tool has the following characteristics:

a. *Validity:* A tool is valid if it measures what it purports to measure. Thus, using a weighing scale for taking weight or a ruler for measuring length are examples of valid tools.

In terms of educational assessment, we are concerned about the following aspects of validity:

Characteristics

  i. *Content validity:* This is an important criterion for the usefulness of a test. It indicates synchronisation between the contents of a test and content of teaching. For obvious reasons, you cannot include all that is taught into a question paper. Sampling of questions is the key to build content validity in a test—more representative the sample, more content validity a test has. The easiest and most efficient way to build in content validity is to prepare a table of specifications and then choose questions accordingly. Take a look at the following example:

Topic	Weightage
A	15%
B	10%
C	5%
D	20%
E	30%
F	20%
Total	**100**

Aspects of Validity

If we intend to give a test paper of say 100 marks, then 15 marks should be alloted to questions from topic A, 10 to topic B and so on.

ii. *Criterion related validity* refers to validity in relation to an external criterion. This criterion may be a set of concurrent data or a future performance. Let us take an example. A group of students have been rated "excellent" by the class teacher. If we administer them a test and they score well on this also, then this test has a high concurrent validity. On the other hand, if we use a test to select house doctors and those performing well also turn out to be efficient house doctors, then this test has a high predictive validity. You should be aware that unlike content validity, criterion validity can be calculated and numerically expressed.

| Valid and reliable | Reliable but not valid | Neither valid nor reliable |
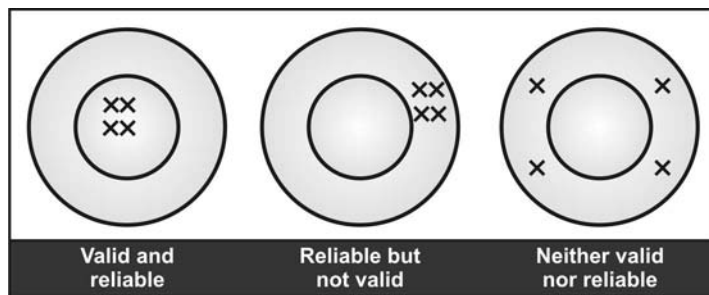
Inter-relationship of validity and reliability

iii. *Construct validity:* This is considered as the most important aspect of validity. A construct can be seen as a collection of various inter-related attributes. Honesty or beauty for example is not a single entity but is made of a number of inter-related attributes. What we are trying to assess by our tests is educational attainment, which can be seen as construct, made up of a number of attributes like knowledge, understanding, application, interpretation, communication, literature search, expression, *etc.* A valid tool should give us information about educational attainment and not about isolated aspects like knowledge alone. When a tool tests factors other than educational attainment, for example, an essay being marked on the basis of handwriting or good presentation then, the tool is low in construct validity.

iv. *Educational impact of assessment* also contributes to validity evidence for a given tool. A valid test should stimulate the students to change their study habits to become a self-directed learner in pursuit of knowledge for the sake of its application. However, it a test induces the students to adopt 'short cuts' in learning, then it has low validity. Most of the entrance examinations in our country would score low on validity because of this aspect.

Before moving further on, we will like to emphasize that current thinking is to see validity as 'unitary' concept, i.e. a tool has varying

degrees of validity based on various aspects enumerated above—we no longer talk of types of validity, which implied that tool can have good content validity but be low on construct validity. It should also be understood that a tool is not valid or invalid – it is the interpretation that we draw from the results is valid or invalid. In other words, a tool may be valid in one situation but not in other (a heavy weighing scale may be a valid tool for weighing wood but not for weighing gold!). The context of testing has an important bearing on validity or otherwise of a tool.

We shall now proceed to look at another equally important attribute of a test, i.e. reliability.

b. *Reliability* refers to consistency of measurement. The degree of reproducibility determines the reliability of an evaluation tool. Unlike validity, where some subjective judgement may be involved, reliability is strictly a mathematical concept and is numerically expressed.

There are various measures of reliability, some of which include:

i. *Test-retest reliability:* This is the degree of consistency in the results of a test which is administered twice to the same group of students, provided no additional learning has taken place. You would appreciate that in practice, it is a difficult condition. Moreover, the practice effect may distort the results.

ii. *Equivalent-forms* means consistency of results when two tests of same content and difficulty level are administered to the same group of students.

Types of Reliability

iii. *Split halves reliability* is a measure of internal consistency or stability of a test. The entire test is divided into two parts (first half/second half or odd/even items) and correlation between scores obtained on two parts is calculated.

iv. *Marker reliability* is the degree of consistency when a test paper is independently marked by two different examiners.

There are different methods of calculation of reliability and you can go to the listed resources to read more about them.

c. *Feasibility* is the third important characteristic of a test. Take the example of a practical test. The ideal situation would be to actually observe a student doing a lumbar puncture or putting an IV drip but that may not be feasible in actual practice.

Before we conclude the discussion, let us introduce you to yet another important concept related to student assessment. Miller's pyramid proposes clinical competence in various levels. A student has to first 'know' (factual knowledge) before he can 'know how' (concept building and understanding). He then 'shows how' (competence to perform) and

at the highest level 'does' (actually performs). This concept is closely related to Bloom's taxonomy of learning – although, you can see its inclination towards clinical competence.

How do you use this knowledge to plan assessment? Well, it is important because each assessment tool varies in its ability to assess a particular level of learning. You get the best result, when you match the tool with the level being assessed. Yes, you are right—it helps us to build validity in the assessment process. Let us illustrate it by this diagram:

Level	Assessment tools
Does	Mini CEX, Direct observation, Logbook, Portfolios, 360° feedback
Shows How	OSCE, Long case
Knows How	Problem-based MCQ, Essays, Viva voce
Knows	Essay questions, SAQ, MCQ, MEQ, Oral examinations
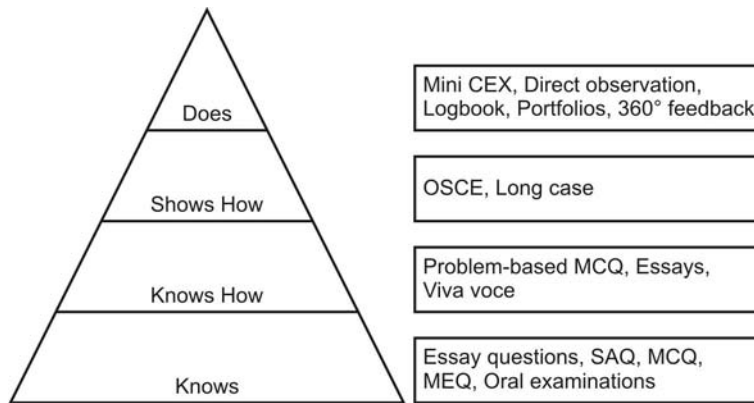
Miller's pyramid

Sounds confusing? Well, we must admit it does. However, after you have read and understood the chapter on **Test and item analysis** and done some of the practical exercises yourself, things would become more clear and manageable. All the best!

9 *Assessment of Knowledge*

Learning Objectives

❒ Discuss advantages and disadvantages of essay questions.

❒ Enumerate various modifications of essay questions with their advantages.

❒ Frame different varieties of good essay questions.

We discussed the basic assumptions underlying student assessment in the previous chapter. With this basic knowledge, you are ready to go on to assessment of specific learning outcomes. You will be in a better position to understand this chapter, if you quickly revise the chapter on **Educational Objectives.**

You may be remembering that learning outcomes are presented hierarchically so that an increasingly complex learning demand is made out of the student in the context of cognitive skills. The sequence is represented as Factual knowledge, Understanding, Application, Synthesis, Analysis, Assessment. Thus, whichever assessment tool we design, it has to be in line with the sequence designed above. As a general rule, early in the course, factual knowledge is presented to the student and as the course develops, higher domains of learning come into picture.

The commonest tool used for assessment of knowledge is the **traditional essay question.** Let us discuss the various advantages and disadvantages of using essay questions. The most widely used form of an essay question in most Indian Universities is what can be called an unstructured essay question. These questions are worded in such a way that the student has the freedom, within the subject context, to determine the nature and scope of the answer. Look at the following examples:

• *Write an essay on Protein Energy Malnutrition.*
• *Discuss the Universal Immunisation Programme.*

You will appreciate that different students will write different answers to these questions-hence these questions are also known as free response questions. These questions are specially useful for evaluating the higher

Essay Questions

domains of learning and comprehension of the student but since a great deal of subjectivity is involved in evaluation of these questions, the marks are often criticised as being unreliable. Did you note that we have not labelled essay questions as unreliable-rather, we have said that it is the marking which is unreliable. In other words, with deliberate effort, an examiner can build reliability into his marking of essay questions. We shall discuss this aspect a little later.

Bloom's cognitive levels	
1. **Knowledge:** memorise and recall information	Define, label, list, name, repeat, order, arrange, memorise
2. **Comprehension:** interpret information in one's own words	Describe, indicate, restate, explain, review, summarise, classify
3. **Application:** apply knowledge to new situations	Apply, illustrate, prepare, solve, use, sketch, operate, practice, calculate
4. **Analysis:** breakdown know ledge into parts and show relationship among parts	Analyse, categorise, compare, test, distinguish, examine
5. **Synthesis:** bring together parts of knowledge to form a whole ; build relationships for new situations	Arrange, compose, formulate, organise, plan, assemble, construct
6. **Evaluation:** make judgements on basis of criteria	Appraise, evaluate, conclude, judge, predict, compare, score

The second type of essay questions that are used can be called **structured essay question** (SEQ). They differ from unstructured questions in the freedom regarding scope and nature of the answer. They are framed in such a way that the student is provided considerable guidance regarding points to be included in the answer—hence they are also called restricted response questions. The restriction can be improved by the examiner either in terms of length of expected answer or in terms of points to be included in the answer. Take a look at the following examples:

Modifications of Essay Questions

- *Write an essay on protein energy malnutrition covering the causes, classification, clinical diagnosis and initial management in the hospital.*
- *Discuss the Universal Immunisation Programme in the context of its objectives, operationalisation, targets and limitations.*

Limitations of traditional essay	Solution
Low reliability	Structure the essay
Low validity	Include more short structured essays
Low objectivity	Make SEQs with checklists
Does not test problem solving ability	Make problem-based SEQs

	Modified essay question (MEQ) is yet another type of essay question. MEQ is basically a problem solving type of question, wherein a short history is given to the student, based on which questions are asked. This requires the student to apply what he has learnt, in the context of a given situation. The following example will illustrate this point.
Example	*A 3 days old neonate presents with history of jaundice noted at 48 hours of age. Baby is full term and weighs 3 Kg. On examination, he looks very pale and has a palpable spleen. Rest of the examination is normal.* • *What are the possible causes of this type of presentation?* • *Which investigations will you order to arrive at a diagnosis?* • *The bilirubin has been reported as 20 mg%. What would be your next line of action?* • *If this baby is not properly managed, what can be the long-term sequelae?*

You will note that these questions are mutually exclusive, i.e. answer to a subsequent question does not depend on the previous question nor do the subsequent questions provide any clue regarding possible answers to the preceding questions.

You must remember that proper construction of essay type questions is important to give clear unambiguous directions to the student so that the answer is marked with minimum of subjectivity. Here are some simple guidelines which will help you in writing better essay questions. This will also help in improving their reliability.

Guidelines

a. Match the question to specific learning outcome. In other words, the objective of learning and objective of testing should be the same. If the learning objective was that the student should be able to enumerate 10 common toxic effects of a particular drug, then a matching essay question would be—Enumerate the common toxic effects of this drug. This indirectly means that the more precise and clearer we are with our learning objectives, the easier and better it will become to formulate good essay questions.

b. The question should clearly specify to the student as to what is expected of him. Recall the question on protein energy malnutrition—one student can write about epidemiology, another about clinical features, yet another about domiciliary management and be technically correct. Further, different students may be marked on different abilities and still score equal marks.

c. Phrase the question in a simple, clear and straight-forward language, avoiding what is called window-dressing. Remember that your aim is to assess the student's ability to interpret the scientific data and not literary comprehension.

Drawbacks

d. Where necessary, provide reference points or supplemental information. (For example, management of haemolytic jaundice in a neonate and in an adult is totally different.

e. Indicate the weightage to different parts of the question. This helps the student to effectively plan his answer and avoid spending too much time on trivia.

Essay questions have the inherent drawback of a high degree of subjectivity involved in marking. Inspite of best of efforts, extraneous factors like hand writing, grammar, diagrams, underlinings and use of pens are all likely to influence the marks awarded. In addition, the examiner may be biased towards a particular point of view. Response to first question-well written or otherwise, is also likely to have effect on subsequent answers. It has also been seen that there is a significant inter-rater difference between marks. In other words, student's luck plays a major role in determining his marks-depending on whether the examiner is tough or lenient. Even a student can sometimes exploit these drawbacks and bluff the examiner. Many of these problems can be eliminated if we follow the following simple rules.

Ways to Improve

a. Always keep the specific learning outcome in mind. While marking, you should use this outcome as the sole criteria and not be distracted by other factors. You have to filter out irrelevant information and ignore it.

b. You should prepare a checklist and allot marks to different points to be included in the answer. This helps to reduce subjectivity to a great extent. Let us illustrate this by taking the question on protein energy malnutrition, assuming that the question carries 10 marks.

Introduction	0.5
Epidemiology	1.0
Symptoms	1.5
Signs	1.5
Clinical diagnosis	1.0
Biochemical results	0.5
Medical management	2.0
Rehabilitation	0.5
Prevention	1.0
Conclusion	0.5

c. You should mark essays question-by question rather than student-by student. Thus, you will be comparing the performance of each student on that particular question and not as a whole.

d. It is a good idea to have the essay questions marked by more than one examiner and then take the average marks.

e. You can resort to grading instead of marking to further narrow down the variation observed between examiners. You will learn more about grading in a later chapter.

Many universities in the West are now coming back to essay type questions as a tool to assess knowledge. You too can use this tool effectively in your assessment, if you include the above guidelines in framing and marking essay questions.

10 *Short Answer Questions*

Learning Objectives
- ❒ Enumerate various types of short answer questions.
- ❒ Critically analyse a given short answer question.
- ❒ Frame good short answer questions for various levels of learning.

In the previous chapter, we discussed about advantages and disadvantages of using essay type questions for assessment of knowledge. You will appreciate that literary presentation, style and similar other factors can influence the marks obtained by two different students who may have the same amount of knowledge. To obviate such a problem, the trend is now changing in favour of what can be called short answer questions (SAQs). At the outset, we must make it very clear that they are *not* synonymous with short notes, so commonly used in our examination system.

SAQs generally test lower domains of learning, although with practice, it should be possible for you to include assessment of problem solving skills also. In their simplest form, they require the student to write a word, phrase, number or sentence to complete a statement or a diagram (hence they are sometimes called 'supply type' tests also, as compared to MCQs, which are called 'selection type' tests).

Properly constructed, they allow themselves to be marked fairly objectively, although on certain occasions, some subjective decision about the correctness of the answer may be required. As a general rule, it can be said that the longer the expected answer, more is the subjectivity involved. Look at the following questions:

Example

- *How many mEq of sodium is contained in 1 litre of WHO ORS?*
- *How will you prepare ORS if readymade packets are not available?*

In the first question, the expected answer is 90 and all examiners will mark it similarly. On the other hand, in the second question, the examiner may be required to decide if two finger scoops of sugar or

40 gm of sucrose can be accepted as a correct answer. As a corollary, it may be said that the question should be framed in such a way that options available to the student are limited.

SAQs can be presented in many forms. Some of the commonly used formats have been presented below:

a. *Completion type:* These are probably the simplest questions to frame for testing factual recall. Select a sample of facts which should be essentially known to the students and write it in the form of a statement. Then block out a crucial word or phase from it, which the students is required to supply. See the following examples.

Example

Fact	: A baby born before 37 weeks of gestation is called preterm.
Question	: A preterm is a baby born before _____weeks of gestation.
Fact	: Infant mortality rate is expressed as number of infant deaths per 1000 live births.
Question	: Infant mortality rate is number of infant deaths per _____.

(You may recall having answered some such questions in your school examination like 'Name of capital of India is _____')

Completion type of items can be modified to evaluate slightly higher domains of learning by building them around diagrams, sequential reactions, drawings and formulae. Take a look at some of these.

*Complete the sequence given below by supplying the missing links:

Example

B Thalassaemia
Decreased B chain production
Excess of _____

Precipitation inside RBCs   Anaemia
                                             _____

Bone marrow expansion   _____

* Label the following diagram.

b. Another type of SAQs can be called unique or one best response types. As with completion type of items, these questions also allow themselves to be marked fairly objectively. They can include a variety of learning outcomes as illustrated below:

- Draw the structure of cholesterol.

- Write the dose of Isoniazid (in mg) for a 1 year old child weighing 10 kg.
  (Please note that in order to cut down on the options available, the question had to be made longer. Simply asking what is the dose of isoniazid would have made it subjective. We shall discuss this aspect later on.)

- The formula to calculate the dose of iron is:

  wt x _____ x _____

- Arrange the following antibiotics into bactericidal and bacteriostatic groups.

  Penicillin, choloramphenicol, cephalosporins, tetracyclines, rifampicin.

- A 1-year-old child weighing 6 kg is brought with pedal edema and anemia.

  His weight deficit is -%.

  His nutritional status, as per IAP classification will be graded as ____.

  Another anthropometric measurement likely to be abnormal in this child is _____.

- A 5-year-old child with family history of seizure disorder is brought with momentary lapse of consciousness.

  What is the most likely diagnosis?

  What will the EEG show?

  What is the drug of choice for this disorder?

  Write the close of this drug in mg/kg.

  You will see that the last two examples test something beyond simple factual recall. They require the student to know certain facts, select the best option out of many, analyse the facts available and then write an answer. However, that adds a problem. You will find that the answers to 2nd and 3rd part in the last question depend on the correctness of the first. If the answer to first part is written as petit mal epilepsy then later parts are likely to be answered as per the key but if

a student writes the answer as vaso-vagal syncope, the later two answers may vary from the key. This may, thus, require some subjective interpretation regarding correctness of the first answer.

c. Yet another type of SAQs which may be used are called open SAQs. They are called open because they provide some option to the student regarding correct answer. The following questions will illustrate this fact.

Example

- Enumerate three side effects of streptomycin.
- Enumerate three causes of massive splenomegaly.
- What is the cause of hemolysis in G 6PD deficiency?
- How will you prevent typhoid in the sibling of a patient suffering from it?

The first two questions require the students to choose three options out of the many available while the latter two require him to offer an answer in his own words, based on his understanding. What becomes the issue here is to decide on the priority selected by the student. A student who writes a rare cause of splenomegaly will get the same ranking as one writing say, kala-azar and malaria.

Framing

To ensure that we do not get ambiguous responses and off the mark answers to SAQs, the wording of the questions should be unambiguous so that the moment a student reads the question, an answer flashes in his mind. He should not be required to go into the linguistic aspects of it to interpret what is being actually asked. The question should require a well defined task from the student, leaving very little subjective interpretation. For example, the following completion responses can be marked in a variety of ways, all of which may be technically correct:

Example

- A neonate is ——— (possible answers: male, female, live baby, preterm, post-term, pink, 2.5 kg, etc.)
  The question can be better framed as following to prevent such ambiguous responses.
- A baby is called neonate upto ——— of age.

Look at another example.
- IMR of India according to 1996 estimates is _____.

Setting a Paper

You will appreciate that as illustrated in the above example, a point of reference should always be provided in the questions requiring a numerical answer. This avoids any misinterpretation of the question and therefore of the answer by the examiner as well as the student. Another

Setting a Paper

Disadvantages

effective way to restrict the answer to the point is to provide a limit for the expected answer (e.g. 'write in about 10 words' or 'write in not more than 2-3 lines'). In case the answer is to be written on the question paper itself, the space provided to write the answer can be used as an effective indicator of how long an answer is expected. As far as possible, the question should be positively worded ('What should be the drug for use in' rather than what should not be used). If however, a negative question is unavoidable (e.g. which drugs should be avoided in a patient with hepatitis), the negative word should be emphasised by writing it in capitals/italics or by underlining it so that the student will not miss it. You should also try to avoid unintentional clues in the form of 'a' or 'an' or answer space which is too proportional to the length of the answer. And lastly, do not forget to indicate the marks alloted to each question or each subpart of a question so that the student knows how much time should be spent on it.

It is a good idea to have the questions validated before using them for actual testing situations. One way for this is to request your colleagues and other subject experts to go through the paper to see if questions sound alright and suggest modifications if any. It has been time and again seen that such peer review helps to raise the quality of questions to a significant extent. Another method is to use new SAQs for formative evaluation and then discuss the questions and their answers with the class. This ensures that the students are not penalised on the basis of poor questions.

When SAQs are used in actual practice, they should be subjected to test and item analysis. Briefly, test and item analysis means calculation of 'facility value' and 'discrimination index' of each question and reliability of the whole test. You will learn about methods of calculation and utility of the indices in a later chapter.

Before concluding, let us introduce you to certain disadvantages inherent in using SAQs. It has been shown that a student has to spend 3-4 times more time in answering a SAQ as compared to a MCQ. This reduces the number of questions that can be put in a paper of a given standard time. Reliability of a test paper is directly proportional to the number of questions in the paper. Thus, by being able to include less number of questions, the reliability of an SAQ paper is always less than that of an MCQ paper. Moreover, marking of open SAQs always involves some degree of subjectivity and hence marking has to be done by the subject experts.

We can, however, turn some of the disadvantages of SAQs to our advantage. In our opinion, the most important use of SAQs in every teaching situation is to create a data bank of distractors for framing good MCQs. They provide a rich source of information on possible misconceptions that the students have.

11 *Objective Type Questions*

Learning Objectives

❐ Enumerate various types of multiple choice questions, with their advantages and limitations.

❐ Critically analyse a given multiple choice question (MCQ).

❐ Frame 'good' quality MCQs

During your students days, you must have felt a lot of dissatisfaction over the marks awarded to you in essay type questions. Most of the times, it is that the marks do not reflect the true capability. Some studies conducted to assess the marking of essay type questions have shown that there may be a difference of as much as 35% marks between two examiners—which in effect means that the same candidate may be failed by one examiner and awarded distinction by another. There are ways and means to check this kind of discrepancy, however, they are time consuming and given the constraints of time, very few teachers would be willing to assess essay type questions using the accepted methodology. Even if the essay type questions were to be evaluated by the suggested methodology, it would take a long time to rebuild the faith of the students as well as the society in such a system of examination.

Besides being liable to subjective marking, essay type questions also have another limitation and that is the number of questions that can be given within the alloted time. As you will learn in the chapter on **Test and item analysis** the reliability of a test and standard error of measurement are directly proportional to the length of the given test. Thus, even with very careful and planned marking, essay questions are bound to have a low reliability.

Against this background, multiple choice questions offer a distinct advantage of being more reliable-not only because of a pre-determined correct answer but also because of the length of the test. They are easy to mark and can be used on repeated occasions. They provide a wider sampling of subject matter. There are many varieties of objective questions, which can be used for student assessment. Broadly, they can be classified as selection type (i.e. where the student has to select a correct answer out

of the list provided) and supply type (i.e. where the correct answer has to be supplied by the student). The selection type of questions can be further subdivided into the following types:

- Constant alternatives
- Multiple choice
- Multiple facet
- Matching and extended matching
- Relation-assertion
- Rearrangement
- Key feature test

Before proceeding further, let us make it clear that the only thing objective about these questions is that they can be marked objectively-otherwise they are as prone to subjective errors as any other test. It is therefore important that due care and attention is given while formulating and writing these questions (they are conventionally called 'items'-in our subsequent discussions, we shall also use the same terminology).

Multiple Choice Questions (MCQs): We are all familiar with this format of question and they are being increasingly used in almost every kind of examination. A common notion exists that it is difficult to write good MCQs, however, this is not true and the technique of writing a good MCQ is easier to master than the technique of writing a good essay question.

Let us first look at the basic terminology used in relation to an MCQ. This has been illustrated in the following example:

The drug of choice for treatment of congestive cardiac failure is:

			STEM
(a)	Propranolol		DISTRACTOR
(b)	Aminophylline		DISTRACTOR
(c)	Isoptin		DISTRACTOR
(d)	Digitalis		KEY

Example

The question part of the item is called 'stem'; correct answer is called the 'key' while rest of the options are called the 'distractors'. It is worth mentioning here that the quality of an MCQ depends on the stem and the distractors—that is, how far they are able to distract the student who doesn't know the correct answer. Thus, a thoughtful deliberate attempt has to be made to provide effective distractors.

You may be wondering, how to write a good MCQ. Let us take you through the following steps, essential for writing a good item. Happy reading!

- Select a specific learning objective which you want to test.
- Write a stem to include a question or a problem to be solved by the

student.

- Write the correct answer to this stem. Be sure to cross-check the correctness of the answer. It should be unambiguous and unarguably the correct answer.
- Recall the common mistakes that the students make about this in your day-to-day teaching. If you have given a short answer question formative test, it provides you with a rich source of such mistakes.
- Select the most plausible alternatives and arrange them in the form of options.

Steps in Writing

- Read the item yourself for any possible corrections. One of the best ways of improving the quality of your items is to have them read by your colleagues. Experience has shown that on an average, half of the items are discarded as 'not good' by this method.
- Try the item on a group of students during class tests and from the number of students answering it correctly, calculate the facility value and discrimination index of each item. Only those items which have these indices within the acceptable limits should be retained for further use. We shall be talking about these indices in a later chapter.

   These are the standard steps to write an item. Let us now tell you some 'tricks of the trade' to further improve the quality of your items.

A. Each item should test an important learning outcome. Avoid trivia and using statements from books as such for writing the item. Do you recall the term 'Table of Specifications'? It gives you the relative weight that you should allot to different subject areas in setting a question paper.

B. Each item, as far as possible, should be complete and independent. If a subsequent item is dependent on the previous one, then the student may be penalised twice for one wrong answer. Look at the following items:

Building Quality

Scurvy is caused by deficiency of which vitamin?
(a) A
(b) B
(c) C
(d) K

Example

Key: c

Example	The commonest source of this vitamin is: (a) Banana (b) Lemon (c) Carrots (d) Wheat Key:b The second item could have been framed differently to ask the source of a particular vitamin.

C. The items should be written in a standard format. It means writing the stem on top and beginning the options from the next line, one option in one line. The options can be numbered as 1, 2, 3, 4 or as a, b, c, d. Traditionally, the latter is preferred as using numerals may confuse the student with serial number of the item. Format on right is easy to understand.

Example	(a) Thyrotoxicosis
	(b) Basal ganglion lesion
	(c) Cerebellar lesions
	(d) Motor neurone disease
	    is associated with
	    intention tremors.

This could have been better written as follows:
Which of the following is associated with intention tremors
 (a) Thyrotoxicosis
 (b) Basal ganglion lesion
 (c) Cerebellar lesions
 (d) Motor neurone disease

D. Each item should be based on a single central theme. e.g.

Example	In case of sunstroke, the victim: (a) Should have head lowered (b) Has a weak pulse (c) Should be given a stimulant (d) Should have cold sponging

In this example, the options include symptoms, signs and treatment. It could have been better written as:

Example	The commonest feature of sunstroke is: (a) Weak pulse (b) Pale face (c) High temperature (d) Excessive perspiration

E. On the same premise, an item should not become a series of true/false statements.

Which of the following is true about measles:
(a)   Koplik's spots precede the rash
(b)   Tuberculin test becomes positive
(c)   Pancreatitis is a common complication
(d)   Prodrome lasts for 1-2 days.

Example

In a good MCQ, as soon as the student reads the stem, the correct answer should flash in his mind and all has to do is to compare the correct answer with the options provided. In the preceding example, he has to read each option and then decide if it is true. Since time constraint is always there in an MCQ test, we are being unfair to the student by adopting such a format.

F. The stem of the item should be a clearly formulated problem rather than a single word or a passive phrase. Do not write an item like this:

The mandibular nerve:
(a)   Is sensory
(b)   Supplies Buccinator
(c)   Is a branch of vagus nerve
(d)   Enters through foramen magnum

Example

G. The statement should be qualified wherever necessary.

The infant mortality rate is.
(a)   40
(b)   80
(c)   95
(d)   120

Example

Here, neither the denominator has been provided (per 1000 live births) nor it has been stated whether the IMR of urban or rural areas is required. The year under reference has also to be mentioned since figure of IMR is different for different years.

H. The stem should be complete in itself and should not be dependent on the options. If there are certain common elements in the options, they should be included in the stem. Look at the following two items:

Example	Protein requirement of Indian reference man is: (a) 1 gm per kg body weight (b) 2 gm per kg body weight (c) 5 gm per kg body weight (d) 10 gm per kg body weight Key: a
Example	Protein requirement (gm per kg body weight) of Indian reference man is: (a) 1 (b) 2 (c) 5 (d) 10 Key: a

I.   As far as possible, negative words should be avoided from the stem. If they are inevitable, then they should be highlighted by writing them in capitals, italics or by underlying them.

<table>
<tr><td rowspan="2">Example</td><td>Clubbing of nails is NOT associated with:
(a)   Chronic lung disease
(b)   Cyanotic heart disease
(c)   Ulcerative colitis
(d)   Bronchial asthma
Key:d</td></tr>
<tr><td>Double negatives should be avoided at any cost. Following items illustrate this:

Which of the following is a loop diuretics except:
(a)   Frusemide
(b)   Chlorthalidone
(c)   Aldactone
(d)   Dytide
Key: a

Which of the following is loop diuretic:
(a) Frusemide
(b) Chlorthalidone
(c) Aldactone
(d) Dytide
Key: a</td></tr>
</table>

J. Abbreviations should be avoided in the stem. This is specially true of non-standard terms.

K. Avoid 'window-dressing' of the statement. This means writing extraneous and unnecessary words which tend to confuse the student. This point has been illustrated in the following items.

Example

With advancement of statistical methods, there has been concurrently paradoxical simplification of diagrammatic representations. A suitable diagram for depicting continuous quantitative data like monthly hospital admission rate would be:
(a) Histogram
(b) Pie diagram
(c) Simple bar diagram
(d) Scatter diagram
Key: c

Example

A suitable diagram for depicting monthly hospital admission rate is:
(a) Histogram
(b) Pie diagram
(c) Simple bar diagram
(d) Scatter diagram
Key: c

L. Expressions like fairly high, considerable, majority, etc. should be avoided. Similarly, words like never, always, usually, sometimes should be avoided. These terms are more likely to confuse a brighter student rather than an average student.

M. The options should be parallel in content and have same relation to the stem. They should also be grammatically parallel.

Example

Hemolytic anaemia is suggested by:
(a) High alkaline phosphatase
(b) Reticulocyte count is high
(c) Only jaundice
(d) Platelet count low.
Key: b

Example

This item could have been better framed as follows:
Which of the following suggests a haemolytic picture:
(a) Jaundice
(b) Low platelet court
(c) High alkaline phosphatase level
(d) High reticulocyte count
Key: d

N The key should clearly be the best choice and subject experts should agree on the same. If there is a subjective element involved, the item may become confusing, specially for the brighter student. Look at some of the examples, where different students can give different answers and yet be correct.

Example

The treatment of bronchogenic carcinoma is:
(a) Radiotherapy
(b) Chemotherapy
(c) Surgery
(d) Immunotherapy

Example

What fraction of chronic active hepatitis patients will develop cirrhosis:
(a) 1%
(b) 2%
(c) 5%
(d) 10%

Example

The commonest cause of abdominal distension is:
(a) Flatulence
(b) Electrolyte imbalance
(c) Intestinal obstruction
(d) Paralytic ileus

O The distractors should be such that only lower ability students should be distracted by them. Avoid using 'bogey' just to create four alternatives. If you cannot think of any effective distractor, leave the alternatives at 3 rather than using a distractor which will not distract anyone. The option 'd' in the following 2 items illustrates this:
Integrated child development program provides service till the age of:
(a) 1 year
(b)   3 years

(c)   5 years
(d)   Life long
Key: c

The average weight of a normal adult kidney (in gm) is:
(a)   50
(b)   100
(c)   500
(d)   1000
Key: c

On the other hand, a good distractor will be attractive to the lower ability student. Look at distractors in the following item.

Double contour shadow on right lower heart border on X-ray chest is suggestive of enlargement of:
(a)   Right atrium
(b)   Left atrium
(c)   Right ventricle
(d)   Right pulmonary vein
Key: b

P.   When writing options, try to avoid duplications or making options all inclusive.

Children of what age are covered under universal immunisation programme?
(a)   Under 5 years
(b)   0-1 years
(c)   0-3 years
(d)   0-5 years
Key: b

What percentage of Indian children are malnourished?
(a)   Less than 20%
(b)   Less than 40%
(c)   More than 40%
(d)   More than 60%

Similarly, do not make the options mutually exclusive, which in effect means that now the student is left with only two options rather than four.

Example

Which of the following change occur in bronchial asthma?
(a) VC is increased
(b) VC is decreased
(c) FEV is increased
(d) FEV is decreased

Q. The language used should be appropriate to the level and vocabulary of the students. Look at the following item and its modified version:

Example

Cholera is spread by:
(a) Tiny molecules in the air
(b) Contamination of the food with infected excreta
(c) Administration of blood from a patient
(d) Sex with an infected person

Example

Cholera is spread by:
(a) Droplet infection
(b) Orofecal route
(c) Blood transfusion
(d) Sexual contact

R. The options should be arranged in rank order so that the student does not have to hop through the options to spot the correct answer. Will you like the following sequence?

The average duration of human pregnancy (in days) is:
(a) 258
(b) 280
(c) 266
(d) 290

Example

Key: b

S. As far as possible, 'all of the above' should be avoided as an option, more so if it also happens to be the correct option. If a student can recognise two correct options, he can safely tick 'all of the above' without even reading the third.

Which of the following are diuretics?
(a) Frusemide
(b) Digoxin
(c) Aminophylline
(d) All of the above

Example

Key: d

Example

Similarly, 'none of the above' should not be used as a dummy option. Even if it is the correct alternative, it does not ensure that the student knows the right answer or the reason behind it:

The dose of BCG vaccine is:
(a) 0.2 ml
(b) 0.3 ml
(c) 0.4 ml
(d) None of the above
Key: d

'None of the above' should definitely be avoided with negative stems.

Example

Following contrast media are used for IVP *except:*
(a) Conray
(b) Urograffin
(c) Dianosil
(d) None of the above
Key: d

In some of the situations, particularly those requiring mathematical calculations, 'none of the above' may be an acceptable option.

Example

Replacement fluid for a 1 year old weighing 10 kg with moderate dehydration will be:
(a) 200 ml
(b) 300 ml
(c) 500 ml
(d) None of the above
Key: d

T. We tend to provide clues by way of either singular/plural expressions or by use of a/an, as illustrated by following.

Example

Imipramine is an:
(a) Anti-depressant
(b) Bronchodilator
(c) Sedative
(d) Stimulant
Key: a

Example

Length or precision of the key is another factor which may help the students to make a guess, without actually knowing the answer.

Water hammer pulse is characterised by:
(a) High volume
(b) Rapid upstroke and descent of pulse wave
(c) Very rapid rate
(d) Low pulse pressure
Key: b

Example

Protein content of 100 ml of buffalo milk is:
(a) 1 gm
(b) 2 gm
(c) 3 gm
(d) 4.3 gm
Key: d

Example

In which of the following conditions does hemolysis play an important role in pathophysiology?
(a) Albers-Schonberg disease
(b) Megaloblastic anemia
(c) Henoch-Schönlein purpura
(d) Hemolytic-uremic syndrome

Yes, you are right. The correct answer is d.

Another inadvertent clue may come from subconscious preference to a particular option or by adopting a well defined sequence to a particular option as shown below:

| 1. b | 2. c | 3. b | 4. b | 5. d | 6. b |
| 7. b | 8. b | 9. b | 10. b | 11. b | 12. b |

Choice of b

| 1. d | 2. a | 3. b | 4. d | 5. a | 6. b |
| 7. d | 8. a | 9. b | 10. d | 11. a | 12. b |

Sequence of d-a-b

U. Often a question is raised regarding number of distractors in a good item. Generally speaking, lesser the number of distractors, higher is the scope for guessing. However, at the same time, poor distractors should not be used just to maintain uniformity. Four options (i.e. one key and three distractors) are generally considered satisfactory.

Checklist for good items

Checklist for Making MCQs:

- Does the item deal with one or more important **aspects of the subject?** The minutiae of knowledge are to be avoided.
- Does the item call for **information** which any **physician should know without consulting a reference source?** Drug dosage, limits of normal values, and other numerical data are to be included only if they deal with information that should be within the daily working knowledge of the physician.
- Is the item **appropriate for the level of knowledge expected of the examinee?** The item should be neither too difficult nor too easy.
- Is the **central problem stated clearly and accurately?** Wording that is ambiguous or fuzzy may mislead the examinee and lower the validity of the item.
- Is the item **written with as few words as possible to make it clear and complete?** Unnecessary words increase reading time; the examination is intended to test medical knowledge, not reading speed.
- Is the **item type the best one for the particular point or problem?** A topic difficult to test by one type of item may be tested without difficulty be another type.
- Are **negatives avoided?** An item involving a double negative is usually improved by rewording to a positive form or by changing to a different type.
- Is the **item written in conformity with the designated format?** For example, in open best response type of question, the proper number of choice (distractors) must be grammatically consistent with the main statement (the stem).
- **Is each alternative** (distractor) **a plausible response?** Silly or irrelevant wrong answers fool nobody and have the effect of reducing the multiplicity of choice.

Although the discussion has been rather long, we have tried to show you some of the common pitfalls that can creep in while writing a good item. It is worth emphasising that the time and effort spent in writing a good item is more than repaid in the long run.

One of the common criticisms that is often levelled against MCQs is that they test only simple recall and do not require the student to reason out, analyse or synthesise the facts. This criticism is not valid, specially when we introduce you to certain other types of MCQs, which test the higher abilities of the student. These questions can test a wider range of abilities but require a lot more effort and ingenuity in framing.

Multiple Approach: These items are a variation of traditional MCQs and allow objective marking. However, they have the advantage that a student with partial knowledge does not get credit and guess work is reduced to a minimum.

These questions require a variation of the key and out of many formats possible, one is illustrated below:

(a) If only I is correct
(b) If only II is correct
(c) If only II and IV are correct
(d) If all are correct

Look at some of the questions below.

Example

Vaccines given in the neonatal period include —
I   Tetanus
II   Polio
III   Pertussis
IV   hepatitis B
Key-c

Example

Which of the following foods contain proteins?
I   Cereals
II   Pulses
III   Green leafy vegetables
IV   Eggs
Key-d

Example

Which organisms cause meningitis beyond neonatal period?
I *Streptococcus*
II *Pneumococcus*
III *E.coli*
IV *meningococcus*
Key-c

As you would have noted, these items do not give any credit for partial knowledge and are therefore specially suited for higher levels of learning.

Analysis of Relationship

A. First has a beneficial effect on the second.
B. First has a detrimental effect on the second.
C. First has no effect on the second.

	Key
1. Administration of calcium.	
Administration of digoxin.	B
2. Administration of folic acid.	
Weight of the neonate.	A
3. Female literacy rate.	
Infant mortality rate.	A
4. Vaccination with Tetanus toxoid.	
Herd immunity.	C

Example

A variation of this type of format can be used to assess the ability to analyse the evidence. The student is given certain facts and later certain conclusions. He has to indicate the facts which support those particular conclusions.

Facts

	Human milk	*Cow's milk*
(a) Proteins (gm/dl)	1.1	3.5
(b) Carbohydrates (gm/dl)	7.0	3.7
(c) Calcium (mg/dl)	37	111
(d) Phosphorus (mg/dl)	17	94
(e) Lactose content	High	Low
(f) Antibodies	++	–
(g) Iron (mg/dl)	0.1	0.1

Conclusions

In breast-fed babies —

Infections are less	f, e
Hypocalcemia is less	c, d, e,
Biovailability of iron is better	e

We hope, you have understood the technique of writing good items. To confirm it, why don't you try writing few MCQs and discuss it with your peers. Even if some items are rejected, don't feel disheartened, it is only practice which will make you perfect.

Extended Matching Questions: Here we are introducing yet another type of objective questions, which are called Extended matching questions (EMQs). They are called 'extended' because like MCQs, they do not have one best answer but can have a number of correct answers and therefore, force the students to think beyond an obviously correct answer. They avoid recognition effect of MCQs.

Remembering that the aim of testing for knowledge is to get the students to apply knowledge rather than simply recall isolated facts, the format of the question then takes the form of a small problem. Such problems are given as short cases called *vignettes*. In few sentences, a medical case is described giving various details such as the patient's symptoms, the results of lab tests, etc, and the student is asked to arrive at a diagnosis. This will then be chosen from a long list rather than four or five choices.

An EMQ contains a list of options. Some options may be used once, more than once or not at all. They can effectively test the problem solving ability of the students. Take a look at the following example-

(a) *C jejuni*	(b) *C albicans*	(c) *G lamblia*
(d) *Rotavirus*	(e) *S typhi*	(f) *Y enterocolitica*
(g) *P aeruginosa*	(h) *E coli*	(i) *H pylori*
(j) *M tuberculosis*	(k) *S flexneri*	(l) *V cholerae*
(m) *P mirabilis*		

For each of the following cases, select the micro-organism most likely to be responsible-

• A six months old malnourished child with history of recurrent loose watery stools. Stoll examination shows 2-3 pus cells/HPF. Stool culture of previous 3 occasions has been negative.

• A 3 years old child presenting with fever of 7 days duration and hepatosplenomegaly. Child has a heart rate of 140/min and a grade 4/6 systolic murmur at apex.

As you would realize, some choices are being used more than once and a students who does not know about all the choices, will not be able to score in this type of questions. The EMQ format retains many of the advantages of MCQ tests (objectivity, computer marking) but transforms the questions into items that can ask students to solve problems rather than recall isolated pieces of information. They can also help to prevent students answering by elimination rather than actually knowing the answer.

Key feature questions (KFQ): These are yet another type of short answer objective questions, which assess knowledge in the clinical context. The questions give description of a realistic case followed by a number of questions requiring only essential decisions. Take a look at the following example-

You are posted at a primary health centre and have just seen a 2 years old child with loose stools. He is conscious but lethargic, eyes are

sunken and skin pinch goes back slowly. His respiratory rate is 40 and there is no chest in drawing. The best course of action will be—

- Refer urgently to district hospital
- Rehydrate and then assess
- Prescribe ORS and antibiotics
- Investigate for sepsis and meningitis

You will appreciate that construction of these questions is relatively difficult and allows only one aspect of the situation to be tested. Compared to these, MCQs are relatively easy to construct for the same number of marks. However, as we gain more experience in the construction of these questions, we are likely to be seeing more and more of such questions being used.

12   *Test and Item Analysis*

Learning Objectives
- ❐ State importance of test and item analysis.
- ❐ Define Facility Value (FV), Discrimination Index (DI) and Distractor efficiency.
- ❐ Calculate FV and DI of a given item.
- ❐ Calculate internal consistency of a given test paper.

When you go to the market to purchase a commodity, which shop will you have more faith on-one that uses stones as weight measures or the one which uses certified weights? Obviously the latter, because you do not want to get cheated. Something similar is the case with examinations. The questions and tests that we use are like measures with which we compare the knowledge possessed by the students. What will happen if this measure is not standardised—a student will get either more or less marks than he actually deserves. This harms the cause of learning in more than one ways—on one hand, we are eroding the faith of the society in the system and on the other, we may be producing incompetent doctors. One of the ways to overcome this problem is to use standardised tests by undertaking what is called *test and item analysis.*

Test and item analysis consists of two distinct sets of activities viz. analysis of the *individual questions* and analysis of the *test as a whole*. This is easier and precise for objective type questions, although with modifications, it can be used for essay type questions also. In the subsequent discussions, we will first learn about item analysis of both objectives and essay type questions and then about test analysis.

Item Analysis: Under this category, we include questions which have only one pre-determined correct answer—in other words, where the student can be marked either right or wrong. Let us introduce to you the technique of item analysis.

The first step in performing item analysis is to mark the papers and then arrange them in rank order, with student scoring highest marks at the top.

The next step is to break this distribution in two groups, i.e. higher ability group (HAG) and lower ability group (LAG). If the number of students is upto 50, the groups will include 25 students each but if it is large, say 200, then you should include 30% top and 30% bottom students respectively in the two groups.

Now, for each question, count the number of students ticking option a, b, c or d as the case may be, in each of these two groups. For example, a test was administered to a group of 50 students and divided into HAG and LAG. For question no. 1, the distribution of options could be something like this:

		a	*b**	*c*	*d*
1.	HAG (25)	1	20	4	0
	LAG (25)	13	5	1	6

(b is correct answer)

Once we have this information available about all questions, we proceed further to calculate the indices related to each.

Facility Value (FV): Simple stated, FV means, number in the group answering a question right. If 60% of the group answers the question correctly, then FV will be 60%. FV can be calculated by the formula:

$$FV = \frac{HAG + LAG}{N} \times 100$$

Coming to the previous example, FV will be:

$$\frac{20 + 5}{50} \times 100 = 50\%$$

FV is a measure of how easy or how difficult a question is. Higher the FV, easier is the question.

Discrimination Index (DI): This index indicates the ability of a question to discriminate between a higher and a lower ability student. This is calculated by the formula:

$$DI = \frac{2 \times (HAG - LAG)}{Total\ number}$$

Using the figures from the previous example:

$$DI = \frac{2(20 - 5)}{50} = \frac{30}{50} = 0.6$$

You would have noticed that while FV is expressed as percentage, DI is indicated as a fraction. The maximum value for DI is 1.0, which indicates an ideal question with perfect discrimination between HAG and LAG.
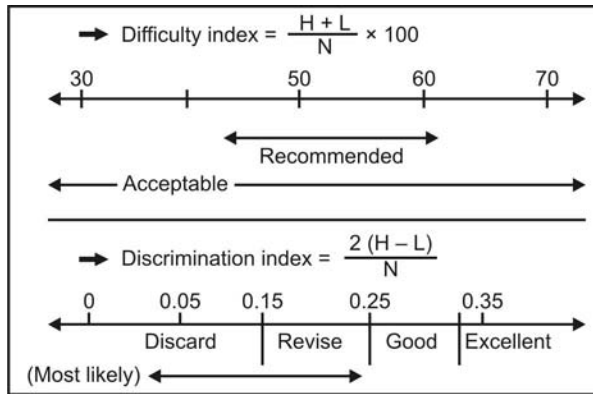
Adapted from JJ Guilbert, 1992

At this, stage we would also like to introduce you to another term, which is called *negative discrimination.* Simply stated it means that more LAG students are answering the question right as compared to HAG students.

Look at the following distribution:

	a*	*b*	*c*	*d*	
HAG (25)	3	15	1	6	Key: a
LAG (25)	7	14	1	3	

$$DI = \frac{2 \times (HAG - LAG)}{Total\ number}$$

$$\frac{2(3-7)}{50} = \frac{-8}{50} = -0.16$$

We shall revert to negative discrimination, when we talk about uses of item analysis.

Distractor Efficiency: Do you recall our discussion on distractors in the chapter on **Objective type questions?** It was very strongly emphasised that distractors should not be 'bogey' and they should attract only lower ability students. Look at our first example. Distractor 'd' is a good distractor because it has not attracted any of the higher ability students and only lower ability student have been attracted towards it. On the other hand, if you look at 'c' you find that more students in the upper group have been attracted towards it than the lower group. Numerically speaking, any distractor which is not picked by at least 5% of the students is not considered a good distractor.

You may be wondering as to what purpose is being served by undertaking these calculations. Item analysis helps in detecting specific technical flaws in the question and provides information for improvement. It increases the skill of examiners in item writing. It provides information for class discussion of results. It helps students to improve their learning and teachers to know about common misconceptions of the class. Let us elaborate on some of these points.

(a) A good item is one, which approximately half the class can answer (i.e. FV of 50%). If we select an item which too low an FV, then students tend to answer that item more from guess work than from actual knowledge. Knowledge of FV for a particular question also aids in better design of the question paper. As a general rule, the paper should begin with easy questions and then progress on to difficult ones. Adopting a reverse sequence may demotivate the students right from the beginning.

(b) For testing the adequacy of classroom teaching, calculation of FV is a fairly useful tool. Look at some of the following examples:

Question No.

Students	1 a	1 b	2 a	2 b	3 a	3 b	4 a	4 b
1.	+	+	-	+	+	-	+	+
2.	+	+	-	+	+	-	+	+
3.	+	+	+	+	-	-	-	-
4.	+	+	-	-	+	-	-	-
5.	+	+	-	+	+	+	+	+

a: Before teaching b: After teaching
   + Right answer   – Wrong answer

This indicates that the subject area related to objective of item 1 is well known to the students and does not need too much time. Subject related to item 2 has been well taught and has been understood by most of the students. On the other hand, students were rightly answering item three before teaching but after teaching, they have given wrong answers. This indicates that either the question has not been properly worded or else the teaching has not been able to convey the right information.

(c) For tests which are employed for the purpose of selection, we prefer items with a high DI. As already stated, an item can have a maximum DI of 1.0 but this is difficult to attain. For practical purposes, an item with a DI of 0.35 or more is considered good while DI between 0.2 to 0.34 can be considered acceptable. Items with DI less than 0.2 need to be revised.

(d) We had referred to a term called *negative discrimination*, which indicates that more students in the lower group are answering that item right than students in the higher group. There are two possible reasons for this. The first is ambiguous framing of the question, which forces the brighter student to read more into it than what is intended. A wrong answer key can also create havoc with the apparent result.

For example, look at the following question.

The infant mortality rate of India is:
(a) 30
(b) 45
(c) 56
(d) None of the above

This question was given to a group of 20 students and the following distribution was obtained:

	a	*b*	*c*	*d*
HAG	1	0	8	1
LAG	4	3	3	0

The DI for the question will be:

$$\frac{8-3}{10} = \frac{5}{10} = 0.5$$

Now suppose, by mistake, the key is marked as 'a' in place of 'c'. In that case, the DI will become:

$$\frac{1-4}{10} = \frac{-3}{10} = -0.3$$

Also, a brilliant student who may have read a very recent reference quoting a figure of say 52, will tick option 'd'. Thus, test and item analysis will give a clue to a wrong key and prevent injustice to many deserving students.

Reliability of the Test: Do you recall our discussions on reliability? We had discussed about the various types of reliability. The one we are going to discuss here in detail in the *internal consistency of the test.* The internal consistency is calculated by dividing the whole test into odd and even numbered items and hence the method is also called *split half method.* The following example will illustrate, how we calculate the reliability.

Suppose a test of 10 items was given to a group of students, and we calculated the scores obtained by the whole class. We are using the following terminology:

X: Scores on odd numbered items
Y: Scores on even numbered items

Arrange the scores as following:

X	Y	X²	Y²	XY
60	72	3600	5184	4320
65	73	4225	5329	4745
70	79	4900	6241	5330
85	77	7225	5929	6545
55	74	3025	5476	4070

$\Sigma X = 335$ $\Sigma Y = 375$ $\Sigma X^2 = 22975$ $\Sigma Y^2 = 28159$ $\Sigma XY = 25010$

(Σ indicates summation)

Applying the formula

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

Split-half Method

$$= \frac{5(25010) - (335)(375)}{\sqrt{5(22975) - (335)^2}\sqrt{5(28159) - (375)^2}}$$

$$= \frac{125050 - 125025}{\sqrt{114875 - 112225}\sqrt{140795 - 140625}}$$

$$= \frac{25}{\sqrt{2650 \times 170}} = \frac{25}{51.47 \times 13.03} = \frac{25}{670.7} = 0.03$$

This gives the reliability of half test as 0.03, which can be converted to reliability of the full test by using the Spearman formula.

$$r = \frac{2r}{1 + r}$$

Spearman Formula

$$= \frac{2 \times 0.03}{1 + 0.03} = \frac{0.06}{1.03} = 0.05$$

This indicates that the reliability of the test is poor. One of the prime reasons for getting such a low reliability is the less number of items on the test.

From standard statistical tables, you can find the figure of reliability which would be statistical acceptable. For a group of 100 students, this value is 0.27. How do you attain this—by increasing the length of the test. Use the following formula:

*Building
Internal
Consistency*

$$\frac{(r \text{ you want}) \times (1 - r \text{ you got})}{(r \text{ you got}) \times (1 - r \text{ you want})}$$

$$\frac{0.27 \times (1 - 0.05)}{0.05 \times (1 - 0.27)} = \frac{0.256}{0.036} = 7.11$$

It means that to have an acceptable reliability, you should have a test 7 times longer or in other words, of 70 items of similar level of FV.

You can also calculate Cronbach alpha of the test, which gives values for internal consistency without the need to divide the test into two halves. It may also be helpful to know, which items are lowering the internal consistency of the test. This information can be derived by calculating point biserial correlation—a method of correlating the score on that item with rest of the test minus that item. Values less than 0.15 indicate that the particular item is testing a different dimension of knowledge and needs to be replaced.

Standard Error of Measurement (SEM): It is a concept related to reliability of test. SEM depends on the number of items in a test and is calculated by the formula.

$$\text{SEM} = .4\sqrt{n}$$

Where n is the number of items in a test. For example, SEM for a test of 20 items would be:

$$= .4\sqrt{20} \quad = 1.78$$

SEM for a test of 100 items will be:

$$= .4\sqrt{100} \quad = 4.0$$

SEM

Does it sound odd that longer a test, higher is the SEM? But if you look at it this way that for 20 items, of 1 mark each, SEM represents approximately 9% while for 100 items of 1 mark each, SEM represents only 4%. What do these figures mean—it means that just like standard deviation, 2/3rd of the students would have got 1 mark higher or lower than they actually deserved and 95% of the marks would fall between + 2 SEM.

From the above, it would have become clear that reliability and SEM vary inversely with the length of the test-longer the rest, more reliable are the results. This is another indirect pointer to the fact that an MCQ of 100 items would have a far better reliability than howsoever carefully framed essay paper of five questions.

Most of the foregoing discussion has been centered around objective type questions. It does not, however, mean that reliability of essay questions can't be calculated. There are tests and formulae available for this also but these are generally more difficult and require elaborate

New-items

statistical treatment. For those of you who are interested in knowing about them a few references have been listed at the end of the book.

We have already emphasised that before we actually use a test, we must have the date related to each item available. You may be wondering, if you have written a few new items, how will you have these figures. Well, one of the ways to calculate various indices related to these questions is to give them a trial run. Thus, in an actual test situation, the first 20 questions can be new questions. The students answer them, they are marked on them but scores obtained on these 20 questions are not used for computing the results. They are used only for calculating the FV and DI and only when a question has been found to have a satisfactory level of FV and DI, is is used in the actual test situation.

13   *Question Banking*

Learning Objectives

☐ Explain the concept of question banking

☐ Enumerate the steps in question banking

☐ Set up a question bank

Concept

We have all heard of banks, eye banks, blood banks etc. but question banks? They can be considered a revolutionary idea in contemporary educational technology. Let us tell you something about them.

Most teachers and educational institutions claim to have a question bank which in effect means collection of few hundred questions in a file (or may be in a computer). This is what exactly a question bank is *not* about. Just as simply by keeping a large amount of money at home, you do not create a bank—similarly by collecting a large number of questions, you do not create a question bank.

True that a question bank has to contain a large number of question, but it also has to have specific set of information pertaining to each question. Thus, the *primary* purpose of a question bank is to provide specific information about a question to teachers, administrators, students and society in general. Coming back to the example of a weight measures, question bank provides information regarding actual use of weight measure in the past.

Let us now introduce you to the information that is required for each question stored in the question bank. This includes:

- The content area covered.
- The specific learning outcome tested by the question.
- Time required for answering the question.
- Marks alloted.
- Facility value.
- Discrimination index.
- Reference form where the item has been taken.

Process

To collect this set of information, the following general guidelines are useful. The first step in this direction is to collect a large number of questions/items for the bank. The questions can be picked up from previous examination papers of your college/University or even other colleges. Teachers of a particular department can also be requested to contribute at least one question a day for the bank. Another good source of questions is the training workshops/sessions organised for teachers. Once a large base of questions has been created, the next step is to screen the questions. Peer review remains the best means of screening questions. Questions which are ambiguous, stereotypes, incorrect or repetitive should be discarded. Experience has shown that approximately half the questions are likely to be discarded in this manner.

Once the initial screening has been complete, the next step is to classify the questions. The classification has to be done in 2 ways–the first is according to the type of question (*viz.* MCQ, true/false, Multiple facet, Short Answer, Matching *etc.*) and second is according to outcome of learning tested (*viz.* factual recall, understanding, analysis, problem solving *etc.*).

The questions so sorted are put to trial. As already stated, they should be appended at the beginning or end of an actual question paper. After the students have answered them, FV and DI are calculated as described before. Questions with an acceptable FV and DI are retained for final inclusion in the question bank.

Sorting the Question: One of the essential features of a question bank is the easy retrievability of the questions. To facilitate this, the questions are written/typed on 8" x 5" cards, just similar to those used in a library catalogue. Side A of the card contains the subject matter, objective tested, question, key and reference while side B contains information about the use of the question and its FV/DI for that particular examination. Every time the question is used, this data is updated. It can be easily appreciated that although the process appears tedious but once it has been completed, the task of setting an examination paper becomes extremely easy.

Side A

Chapter	:	Infectious diseases/poliomyelitis
Level tested	:	Factual recall-application.
Stem	:	Albumino-cytological dissociation in CSF may be seen in cases of :
Options	:	(a) Poliomyelitis.
		(b) Purulent meningitis
		(c) Tubercular meningitis
		(d) Post-infective polyneuritis
Key	:	(d)
Reference	:	Nelson's Textbooks of Pediatrics, 15th Edition 1996

Side B

Year	Class	No.	Options				FV	DI
			a	b	c	d		
2005	2nd. Prof	60	11	16	6	27	45	0.34
2006	2nd. Prof	50	5	6	9	30	60	0.29

Uses

Using the Question Bank: Once again, we will take you back to the table of specifications. Do you recall, that it gives you a blue print of weightage to be attached to different subject areas and different objectives within these subject areas. Thus, it tells you that out of subject area A, what precentage of questions have to test problem solving. With this information available at the back of the cards, all that one has to do is to pull out cards of desired objectives of known FV/DI and arrange them to form a question paper.

Question banking will increase the skills of teachers as writers/reviewers of questions. There is no doubt that this will add to the process of learning. To be able to ask the right kind of question requires a thorough understanding of the subject matter, which can be developed only if teachers are well versed with the process of writing questions to test particular outcomes of learning. It will also ensure using the right kind of

Advantages

questions for right kind of examinations-using a question with FV of 100% for a selection test is obviously going to be a futile exercise.

Question banks have been shown to be useful for student learning also. If the question bank is fairly large-meaning about 1000 times the number of questions usually given in a test paper—it can even be left open for the students. Doubts have been raised that it may short circuit the

process of learning. This certainly is not correct—after all, a student who knows correct answers to over 100000 questions deserves credit for it!

There would be another advantage too. Creating question banks will bring transparency into the evaluation process and make inter college/university comparisons easier. This will help to build the faith of the society in examination systems and maintain uniform standards of teaching.

14   *Assessment of Practical Skills*

Learning Objectives

❒ Explain the basis rationale of objective structured clinical examination (OSCE).

❒ Write OSCE stations for different practical settings.

❒ Conduct an OSCE in actual clinical setting.

❒ Use a mini CEX encounter to provide formative feedback.

❒ Evaluate a case presentation objectively.

Concept

One of the most important aspects of training of a doctor is acquisition of practical skills - after all, patients do not come to quiz their doctor on the differential diagnosis or management of their problem. Yet, objective assessment of practical (or psychomotor, as they are called) skills poses a formidable challenge for an examiner. Have you ever wondered during a practical examination regarding points to discriminate between good and not - so - good students? Often, the evaluation is so subjective that different examiners grade the students on their own criteria. For a minute, recall one of the basic purposes of evaluation—yes, you are right- providing feedback to the student. Unfortunately, our conventional examinations do not provide any feedback except saying pass or fail and thus do not provide any opportunity to the student to improve.

There have been many innovations to overcome this problem but the one that we are going to discuss with you is called OSCE. Sounds like a French name ? Well, OSCE stands for Objective Structured Clinical Examination and has been designed for objective assessment of bedside clinical competence. Let you may have doubts about this mode of examination, let us weigh OSCE in the desirable qualities of an assessment instrument viz. validity, reliability and feasibility. Later, we will also discuss another tool called mini CEX.

Attributes of OSCE

Validity, you will recall is the ability to measure, what is intended to be measured. A practical examination should evaluate the ability of a candidate to obtain relevant history, perform a physical examination, reach a probable diagnosis, interpret laboratory reports and recommend a management protocol. As we shall discuss with you a little later, all these can be assessed by OSCE. The conventional examination, on the

other hand focusses on reporting of abnormal findings only, ignoring the 'doing' part of it.

Reliability as you have learnt, refers to consistency of measurement. In an OSCE, all students examine the same patient and are marked on predetermined 'checklists' with the results that inter- observer variation is reduced to a minimum. Thus, any difference in marks is more directly attributable to the ability of the students, rather than to extraneous factors.

Process

By now you must be wondering about what exactly OSCE is. Let us now describe it for you. As the name indicates, it is a form of practical examination which is objective and which owes its objectivity to a structured marking scheme. Let us elaborate further. Suppose a patient has an enlarged liver, 4 cm below the costal margin. In a conventional examination, the student will tell the examiner 'liver is 4 cm' and get credit for it, although he may have palpated it standing on the left side of the patient ! On the other hand, if he is given a mark for each of the following points - makes the patient comfortable, warms hands, stands on the right side of the patient, palpates gently and so on, then the assessment is likely to be not only objective but also more valid.

This is the key concept of OSCE viz. to break a procedure into its component skills and assess them individually. If we represent the whole process, it will appear like this :

Clinical Competence

History taking	Physical examination	Investigations
Present	General	Urine
Past	Systemic	Stool
Birth	CNS	Blood
Family	Heart	X-ray
Nutrition	Lungs	
Development	Abdomen	

Stations

Each task assigned to the student is called a **station.** Thus, depending on the situation, a number of stations are set up and students rotate on them, spending a specified time on each one of them (usually between 3-5 min). It means that the task presented at each a station should be within this time range. If it is felt that longer time is required, then, the task should be subdivided into 2 stations (e.g. Superficial reflexes are elicited on one station while DTR on next).

Design

Don't be afraid of designing the stations - they are easy to design if you understand the basics of it. Generally stations are of two types— procedure station and question station. As the name implies, at procedure station

can be further subdivided into observed and unobserved. An example of each of these type of stations will make the difference clear.

Unobserved procedure station :
Record the weight of the infant.

Observed procedure station :
Record the weight of the infant.

Checklist for examiner :

Checks Zero level of weighing machine	2
Removes extra clothing from baby	2
Handles the baby gently	2
Removes parallax while taking reading	2
Records the weight to an error of ±50 gm.	2

Checklist

You have rightly noted that on observed procedure station, the student is being observed by an observer on the basis of a checklist and it would be no exaggeration to say that checklists are the 'heart' of OSCE. To prepare a checklist, you have to list all the acts that go into making a complete procedure. Once you are ready with this list, a differential weightage is assigned to each of the acts. Thus, in the above example, if checking the zero - level is considered to be more important than the others, then it is given 2 marks while the rest of the points are given 1 each so that a student who performs all the acts correctly is given 6 marks for this station.

Versatile

It is obvious from the above that any range of competencies can be tested by OSCE. Competencies like history taking, physical examination or bed-side lab procedures require an observed procedure station while
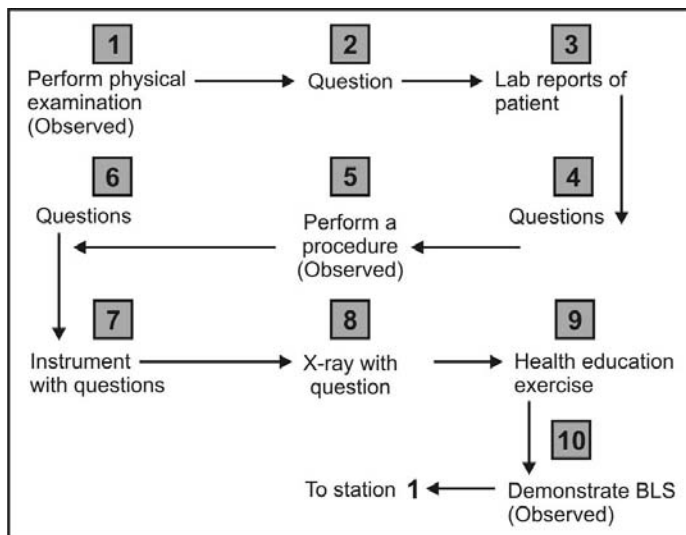
Example of a 10 station OSCE

interpretation of lab reports, X-rays, ECGs, pictures etc. can be done by unobserved procedure stations.

You should not go with the idea that OSCE tests only the 'doing' part but ignores the 'what' part of clinical competence. The question stations are meant exactly for this purpose - to test the results arrived at the previous stations. The following examples will make it clear.

Procedure station:
Perform the general physical examination of this child.

Checklist for observer:
Looks for :

Ant. Fontanel	Teeth
Pallor	Hair
Jaundice	Lymph nodes
Throat	Respiratory rate
Skin	

Example

Question station:
Regarding the case that you have just examined, write True or False.
- The child has minimal jaundice   T / F
- The child has axillary lymphadenopathy   T / F
- The child has 20 teeth   T / F
- There is no pallor   T / F

Procedure station:

Read the given chest X- ray. (Do not write anything)

Question station:
In the X- ray you have just seen -
- Trachea is shifted to right   Yes / No
- There is minimal fluid in pleural cavity.   Yes / No
- Bones show early changes of rickets.   Yes / No
- There is a primary complex.   Yes / No

Example

Both these examples would have made it clear that OSCE prompts the student to perform the complete procedure at one go - if he has not palpated axillary nodes or looked for evidence of rickets, he cannot go back to review his findings.

Coming to the actual planning of OSCE, it is better to decide before hand the competencies to be tested and weightage to be given to each. Look at the following example :

Planning

Competencies Evaluated

History taking	30%
Physical examination	30%
Common procedures 20%	
Interpretation of reports	20%

In effect, it could mean that there will be 3 stations on history taking (of 10 marks each), 3 on physical examination and so on. Let us make it clear that these are only recommendations and depending on individual requirements, a variation can be made. Thus, for junior students, more emphasis may be laid on history taking and physical examination while interpretation can be given more emphasis in later years. Once this decision has been made, the whole examination will look like a circuit of stations, though which all students rotate. For a 20 stations OSCE, the total time required, assuming a time of 5 min per station, will be approximately 2 hours. You will agree that objectively examining 50 students in 2 hours will never be possible by a conventional examination.

We hope, by now you are clear about what OSCE is. Can you list some of the competencies which you can evaluate using OSCE ? Let us also do it for you. These include :

(a) *History taking:* The student takes history at an observed or unobserved station. At observed station, he is marked by an examiner while unobserved stations are followed by a question station.

(b) *Physical examination:* The student is asked to perform physical examination and is marked on a checklist. Competencies ranging from a simple inspection (for spot diagnosis) to neurological examination can be tested in this way. If the desired physical examination is likely to take more than 3-4 mins, then the station should be split into two. For example, at one station the students tests for sensations while at the next, he elicits the tendon reflexes.

(c) *Charts and photographs:* A strip of ECG, or reports of blood gas analysis or photographs of congenital defects can be exhibited to represent cases which may be difficult to get at examination time.

(d) *Laboratory data interpretation:* Hematology, biochemistry and radiology reports can be objectively tested.

(e) *Communication Skills:* The student can be asked to explain to the patient the dose of drugs, or diet to the mother of a malnourished child or importance of immunisation and so on. By use of appropriate checklists, these skills can be objectively evaluated in a very short time.

(f) *Instruments:* The indications for use and handling of common instruments can be evaluated.

(g) *Bedside lab tests:* Actual procedure of urine, stool, blood examination etc.

(h) *Practical procedures* like giving an injection or passing a nasogastric tube using models.

We have given here a few more OSCE stations as illustrations. You can also make your own stations, using them as guidelines.

Observed procedure station: Explain the method of preparing home - made ORS to the mother

Checklist for examiner: This station is for assessment of communication skills and attitudes of the student

	Score
Introduces himself	1
Intrudes the topic	1
Talks slowly and clearly	2
Invites clarifications	2
Remains patient and calm	1
Confirms that mother has understood	3

Observed procedure station: Determine the immunisation status of the child.

Checklist examiner: Enquires specifically regarding following vaccinations

	Score
BCG	0.5
Oral Polio - Zero, I, II, III, Booster doses	1.5
DPT - I, II, III booster doses	1
Measles	0.5
MMR	0.5
Typhoid	0.5
Hepatitis B I, II, III	0.5
Any other vaccination	0.5
Asks regarding	
Place of vaccination	0.5
Time schedule of vaccination	0.5
Any documentation or card	0.5
Looks for BCG scar	2

Interpretation station: A 3-year-old child has the following anthropometric measurements.

Weight	11 kg
Height	76 cm
Head circumference	49 cm

Example

Example

	Mid-arm circumference 13 cm
	US : LS ratio 1.6 : 1

Use the percentile charts and write True or False for the following statements :

*   The child is a dwarf.   T / F
*   The head circumference is normal.   T / F
*   The measurements signify chronic malnutrition.   T / F
*   The weight is at 50th percentile.   T / F

Unobserved procedure station Perform the abdominal examination of this child.

Question question Write true or false regarding the child you have just examined.

*   The upper border of the liver is in the 6th intercostal space.   T / F
*   The liver is firm in consistency   T / F
*   The spleen tip is palpable   T / F
*   Free fluid is present   T / F
*   There is tenderness in the right iliac fossa   T / F

Note:

1. Negative marking is mandatory in T / F questions.
2. In situations where the examination may be uncomfortable, multiple alternative cases may be used for the station depending on the number of students. But you should be careful that the question station pertains to the particular case used.

Observed procedure station Take the natal history of this baby. Take the natal history of this baby.

Checklist for examiner

Enquires regarding	:	Score
Place of delivery		1
Type of delivery and indication		2
Duration of rupture of membranes		1
Meconium staining of liquor		1
Duration of labour		2
Time of cry		2
Method of cutting of umbilical cord		1

(Left margin labels: Example, Example, Feedback)

From the above, it would have become clear to you that OSCE makes practical examination not only more valid but also more reliable. It can be used for a large number of students in a relatively lesser time. Moreover,

by analysing the checklists, feedback can be provided to teachers as well as the students regarding efficiency of teaching. For example, if in the palpation of liver station, it is found that most of the students are not percussing the upper border of liver, then in subsequent teachings, this point can be made more explicit.

It is not that OSCE does not have its critics and the major criticism is that it tends to segregate the patient's problems into components rather than testing him as a whole. This may be true to some extent but most often, it is the design of stations that is at fault rather than the examination itself. This drawback can also be overcome by combining OSCE with a traditional clinical case presentation.

**Suggested format of UG practical examination
in final professional examination**

	Case	*OSCE*	*Viva voce*
1. Medicine and allied subjects	Long case (one in medicine)	Medicine, dermatology and psychiatry	±
2. Surgery and allied subjects	Long case (one in surgery)	Surgery, orthopaedics, ophthalmology, ENT	±
3. Obstetrics and gynaecology	Short case (one in obstetrics)	Obstetrics and gynaecology	±
4. Pediatrics	Short case (one in general pediatrics)	Neonatology, emer- gencies, procedures, etc.	±

Mini-CEX: Let us take you through the basic principles of yet another useful method of assessing the clinical competence. This is called mini clinical examination, often abbreviated as mini–CEX. It is called mini, because it takes comparatively less time as compared to conventional case presentation. However, the bigger advantage with mini-CEX is the structured feedback that it provides to the students as well as the faculty, thus helping them to make better decisions.

Mini-CEX is a 15 minute snapshot of doctor/patient interaction. It is designed to assess the clinical skills, attitudes and behaviors of students essential to providing high quality care. Students are asked to undertake four to six observed encounters during the year with a different observer for each encounter. Each of these encounters represent a different clinical problem and trainees should sample from each of the core problem groups identified as important (for example, history taking, physical examination, diagnosis, communication, counseling etc.). However, not all elements need to be assessed at each encounter. Each encounter takes about 20

minutes, with first 15 minutes for the encounter and last 5 minutes for feedback. Immediate feedback is provided after each encounter by the person assessing the performance. Strengths, areas for development and agreed action points should be identified following each mini-CEX encounter. You must have noticed that this form of examination is more suitable for postgraduates, although with modifications, even under-graduates can benefit from it.

Different Universities and Institutions have different types of recording forms for use with mini CEX-most of them however; have a component of essential skills from the curriculum built into them. Here is a generic form which is most commonly used.

Mini-Clinical Evaluation Exercise (CEX)

Evaluator:_____Date:_____

Resident:_____ O R-1   O R-2   O R-3

Patient Problem/Dx:_____

| Setting: | O Ambulatory | O In-patient | O ED | O Other_____ |

| Patient: | Age:_____ | Sex:_____ | O New | O Follow-up |

| Complexity: | O Low | O Moderate | O High |

| Focus: | O Data Gathering | O Diagnosis | O Therapy | O Counseling |

---

1. **Medical Interviewing Skills** (O   Not Observed)

| 1   2   3 | 4   5   6 | 7   8   9 |
| Unsatisfactory | Satisfactory | Superior |

2. **Physical Examination Skills** (O   Not Observed)

| 1   2   3 | 4   5   6 | 7   8   9 |
| Unsatisfactory | Satisfactory | Superior |

3. **Humanistic Qualities/Professionalism**

| 1   2   3 | 4   5   6 | 7   8   9 |
| Unsatisfactory | Satisfactory | Superior |

4. **Clinical Judgment** (O Not Observed)

| 1   2   3 | 4   5   6 | 7   8   9 |
| Unsatisfactory | Satisfactory | Superior |

Contd...

5. Counseling Skills (O Not Observed)

1	2	3	4	5	6	7	8	9
Unsatisfactory			Satisfactory			Superior		

6. Organization/Efficiency (O Not Observed)

1	2	3	4	5	6	7	8	9
Unsatisfactory			Satisfactory			Superior		

7. Overall Clinical Competence (O Not Observed)

1	2	3	4	5	6	7	8	9
Unsatisfactory			Satisfactory			Superior		

Mini-CEX Time: Observing _____Mins   **Providing Feedback:**
                                                              _____Mins

Evaluator Satisfaction with Mini-CEX

Low	1	2	3	4	5	6	7	8	9 HIGH

Resident Satisfaction with Mini-CEX

Low	1	2	3	4	5	6	7	8	9 HIGH

Comments:

_____   _____

Resident Signature   Evaluator Signature

DESCRIPTORS OF COMPETENCIES DEMONSTRATED DURING THE MINI-CEX

Medical Interviewing Skills: Facilitates patient's telling of story; effectively uses questions/directions to obtain accurate, adequate information needed; responds appropriately to affected, non-verbal cues.

Physical Examination Skills: Follows efficient, logical sequence; balances screening/diagnostic steps for problem; informs patient; sensitive to patient's comfort, modesty.

Humanistic Qualities/Professionalism: Shows respect, compassion, empathy, establishes trust; attends to patient's needs of comfort, modesty, confidentiality, information.

Clinical Judgment: Selectively orders/performs appropriate diagnostic studies, considers risks, benefits.

Counseling Skills: Explains rationale for test/treatment, obtains patient's consent, educates/counsels regarding management.

Organization/Efficiency: Prioritizes; is timely; succinct.

Overall Clinical Competence: Demonstrates judgement, synthesis, caring, effectiveness, efficiency.

From: Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (Clinical Evaluation Exercise): A preliminary investigation. Ann Intern Med 1995; 123:795-9.

Mini-CEX is considered a very useful way of providing feedback and therefore improving the clinical skills of the students.

You can download a sample clip of a mini CEX session from http://www.mmc.nhs.uk/pages/assessment/minicex.

Clinical case presentation is liable to be influenced by a number of factors including language, dress, sex, poise and confidence of the student. Also, often more time happens to be given to the students at the begining of the examination as compared to the latter part of it.

Traditional Long Case

Could clinical case presentation be modified to make it less subjective? It is difficult to conceive a great deal of objectivity within the traditional system, but attempts can certainly be made. One method would be to make a checklist of important desired points in history and examination including accuracy of clinical findings. The desired weightage for each component would of course have to be predetermined. Certainly it would be an exhaustive exercise and needs a thorough study of the case prior to the actual evaluation. While some senior and experienced examiners may frown at the idea, the fact remains that many examinations follow a haphazard pattern like sailing an uncharted sea. Would it not be fair to the student that evaluation is systematic and organised? Look at the guidelines given below , being followed by University of Limburg. You will appreciate that by using such a checklist, the objectivity of case presentation can be significantly improved.

Objective Structured Case Record
History taking:
Pace/Clarity
Communication Process
Systematic presentation
Correct facts established
Physical examination:
Systematic
Techniques
Correct findings established
Management:
Appropriate investigations
Logical sequence
Appropriate management
Clinical acumen:
Problem identification
Problem solving

If we put it little more bluntly, it can be said that whether it is evaluation of clinical skills or evaluation of clinical acumen, the onus of being objective rests on you. If you are clear and consistent on how you are going to mark. You will be fair to the students and also help them in learning better. Remember the age old dictum that justice should not only be done but it should also appear to be done. It is only by using these kind of tools that you can rebuild the faith in the examination system.

Before we conclude this discussion, let us remind you that any innovation in education requires time and effort. The time involved in setting an OSCE is definitely more than that required for a traditional examination - however, the increased reliability more than compensates for it. Further, once a bank of OSCE stations is built up, subsequent examinations become much easier to conduct and take considerably less time.

15

One Minute Preceptor

Learning Objectives
- ❒ Discuss the rationale of using OMP model
- ❒ Enumerate the microskills required for using the model
- ❒ State the components of the microskills
- ❒ Use the model in day-to-day clinical teaching

Clinical teaching is often considered unsatisfactory by teachers and learners alike. The reasons are not difficult to seek. Consider the following:
- Lack of clear objectives and expectation
- Focus on factual recall rather than on problem solving
- Teaching at a wrong level (usually too high)
- Little opportunity for reflection and discussion
- Teaching by 'humiliation'

In addition, most of us have multiple tasks to perform (patient care, administration etc.) in addition to teaching. No wonder than that we often feel constrained for time and are not able to do justice to clinical teaching.

Cognitive theories argue that new knowledge is built on what the learner already knows because the interplay between what is known and what is new is important. Unless the prior knowledge is activated, new learning may not take place. In fact, more the activation of prior knowledge more is the likelihood of new knowledge being used in future.

One minute preceptor or OMP as it is commonly called, can come in very handy to impart clinical reasoning skills to both, undergraduate as well as postgraduate students.

OMP model was first described by Neher et al from the University of Washington in the year 1992 and since then has been extensively used for clinical teaching in many Universities across the World. You may be wondering, why is it called the one minute model. It is based on the experience of clinical teachers regarding spending time during a clinical encounter.
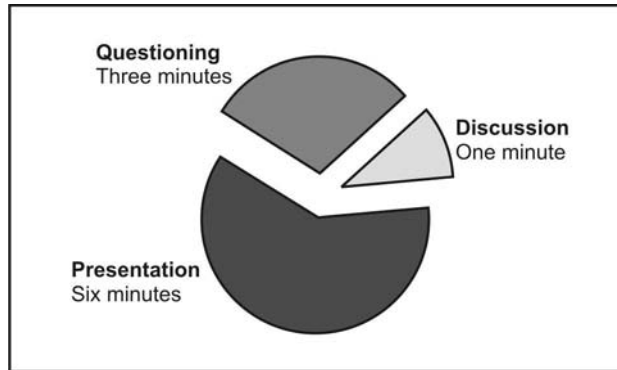
A 'typical' clinical encounter

This model focuses on the last one minute, which is crucial from the learning point of view and hence its name. Let us now describe the model for you.

During the process of traditional case presentation, most of us focus on the diagnosis of the patient. However, a particularly important area, i.e. the diagnosis of learning needs and teaching in the *context of those* learning needs goes untouched. In the OMP model, the teacher first focuses on diagnosis of the patient, then on diagnosing the learning needs of the students and finally provides targeted instruction in the context of his diagnosis. To attain this objective, the teacher has to use five 'micro skills' (they are called micro skills because they are very simple and easy to learn). These microskills include-

1. Get a commitment
2. Probe for underlying reasoning
3. Teach general rules
4. Re-enforce what was right
5. Correct mistakes

Out of these 5 microskills, the first two diagnose learner's knowledge and reasoning and the last three offer tailored instruction. Let us now discuss each of the microskill and how you can use it.

Get a Commitment

After presenting the history and examination, the learner often waits for your guidance to proceed further. He does not offer any interpretation of the facts that he has presented. Often, there is a tendency for us to step in and help the learner by providing unintended clues. Sometimes, we tend to take over the case so much so that we are doing most of the talking and the learner is simply listening or shaking his head. This shuts the thinking process in learner's mind. Instead, you should ask him to state his interpretation of the data presented. It could be asking what he

Components

Skill 1

thinks is going on; seeking more data, proposing a hypothesis or what else it could be other than what he has stated. The learner may hesitate to make a commitment or conversely a bright learner may do it too easily. Always challenge the learner to make an intellectual commitment beyond his level of comfort. Asking learner how he interprets the data is first step towards diagnosing his learning needs. Without this information, the teaching might be either misdirected or be unhelpful.

Some of the examples of the statements that you should make include:

What do you think is going on with this patient?

What other history might be helpful to come to a diagnosis?

However, you should avoid offering your opinion, or simply keep on asking 'what else?'

Probe for Supporting Evidence

Skill 2

You must have experienced that after presenting the history and diagnosis, the learners often stop and look to you to get verbal or non-verbal clues regarding correctness or otherwise of their diagnosis. Often, the tendency of the teacher is to confirm the opinion or suggest an alternative diagnosis. However, a better way is to ask for the facts, which support his line of thinking. You could also ask him, what other alternatives are possible and which facts in the history and examination support or refute those alternatives. Learners proceed to make a diagnosis based on what they know and in this micro skill, you are trying to find out, what they or they do not know. In fact, this step is similar to making a mind map of the learner and tells you how has he connected the knowledge of basic subjects with his clinical reasoning. Without this information, you may presume that a learner knows something, which in fact he may not, and your instruction will not be targeted. For example, a learner may make a diagnosis of hepatitis in a child presenting with jaundice and list blood culture as one on the investigations, without actually knowing that enteric fever can also cause hepatitis. Sometimes giving an alternative situation can help the thought process to be stimulated (e.g. if this patient also had a palpable gallbladder, what would you have thought?)

Some of the examples of statements that help you in this skill include:

What is your reason for making this diagnosis?

What other diseases could have caused similar presentations? Why you did not consider them?

However, you should avoid being judgmental at this stage, like saying 'you are right' or 'you are wrong'. Similarly you should avoid asking about general information like 'what are the causes of jaundice in a 3 years old child?' It is also not the time to seek any additional data than what was presented initially.

Teach General Rules

By your interaction till now, you have made an assessment of what the learner needs to know about a particular case. Now is the time to provide general rules, concepts and principles, targeted to the level of learner's understanding. Notice that in the previous two skills, you were talking about *the* case—now you are talking in terms of general concepts. If you teach in the context of the case, you run the risk of making new knowledge too specialized and it may not be applicable to other situations which are at variance from this case. For example, you may suggest using CT scan in a child with seizure disorder because a bony abnormality is more likely but in another case with structural brain abnormality, you may like to go in for MRI. Talking only in the context of that case may make the learner believe that CT is the gold standard for all seizure disorders. Remember that any instruction is likely to be more transferable if taught as a general rule. You should however, avoid the temptation of teaching everything in a single case. Most learners will not be able to learn more than a few general rules per case. Do not teach what you know best—rather teach what the learner needs to know.

Avoid giving answer to a problem (this patient may have a clear CSF because he received antibiotics—rather say, in general, antibiotics tend to make CSF clear making diagnosis of meningitis difficult). Also avoid giving unsupported personal opinions (I find good response to one dose of steroids in bronchiolitis).

Tell Him, What He did Right?

Sometimes, a learner may make a guess to come out with correct diagnosis or he may ask some questions, which are very useful in arriving at a diagnosis. He may, however, not be aware of the impact of his action. You should make it a point to re-enforce what was done right. Without re-enforcement, behaviors do not become permanent. For example, telling him that he considered the financial status in deciding a particular investigation or treatment approach which will improve compliance, is more likely to make him take this factor into consideration in future. However, any praise has to be specific to be effective. Simply saying that you presented the case well does not help but saying that you took residential history in a child with splenomegaly is an obvious help.
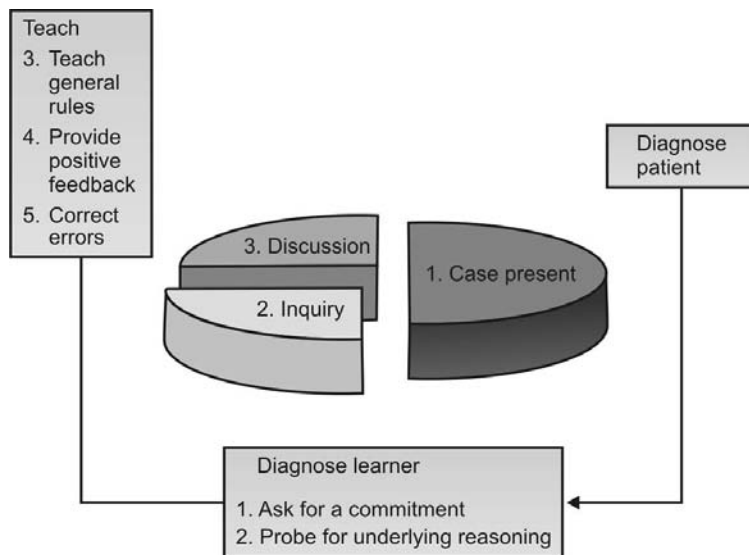
Skill 3

Skill 4

Skill 5

Correct Mistakes

Not everything will go well during a case presentation. This opportunity should be used to correct the mistakes that the learner may have made during history taking, examination or discussion. It is a good idea to let the learner critique his performance himself first. Mistakes not corrected tend to repeat them subsequently. Asking the learner to think, what mistakes he made and how he can do differently next time is more likely to help him get rid of those mistakes. We all learn best from mistakes that we identify ourselves. In fact, at this time, the learners are in a mindset, where they are more likely to accept corrective action. However, to be effective, you should use feedback which is case specific, focused and descriptive (not evaluative) (Fig. 15.2).

A learner may have diagnosed upper respiratory infection, without looking at the ears of the child. Telling him that it is difficult to rule out ottitis media without looking at the ears is more likely to be remembered for a longer period of time.

Let us now come to using these microskills in actual situations. As already discussed, this model is not useful for very junior students, because learner should have an adequate knowledge base before he can commit something. Similarly, it is not useful for teaching clinical skills. The main use of this model is to enhance the clinical reasoning process of the learner. Final year students and postgraduates are most likely to benefit from the use of this model.

One minute preceptor model

Advantages

The sequence of microskills suggested here has been shown to improve the ownership of learning by the learner and diagnosis of learning problem by the teacher. The skills are easy to learn (that is why they called microskills). The simplest way of learning them for you is to focus on one skill at one clinical encounter so that over a period of few weeks, you can learn to effectively use all the skills. Once learnt, you can use your discretion and either change or the order or use only those skills which fit into the situation.

One minute preceptor model provides guidelines which are useful to sequence a clinical conversation. It is not 'static and rigid' but flexible and pliable (as Neher et al describe it) based on the teaching situation. It provides the teacher with an array of clinical skills, which have proven teaching value. The skills are simple and easy to acquire.

We hope, you enjoyed reading about the model. Next time, you are teaching a clinical student, try using some of these microskills!

| 16 | *Oral Examination (Viva Voce)* |

Learning Objectives
- ❐ Discuss advantages and disadvantages of oral examination.
- ❐ Suggest ways and means to overcome some of the limitations of oral examination.
- ❐ Conduct an objective oral examination.

Concept

We all have own feelings and impressions about the viva voce examination and some of us might have enjoyed the same on either side of the table! We all would agree that viva voce is an important and significant part of an examination and therefore knowing more about it would seem worthwhile.

Oral tests are used for assessing the students, both in theory and at the end of every practical. Let us consider the merits and demerits of oral examination.

Merits of Oral Examination

The main advantages of an oral test are in :
- Providing a direct personal contact with the student during which his attitude and personality can be assessed.
- Providing an opportunity to take into account circumstantial factors, if any, affecting his performance.
- Providing flexibility to move from strong to weak areas and vice versa.
- Providing an opportunity to find out how the candidate arrives at a conclusion and therefore his analytical skills and judgement.
- Sampling a wider area of knowledge, although only limited information is sought on each topic and sub-topic.
- Improving the ability of students to express themselves effectively and refine their communication skills through repeated oral examinations.

Demerits of Oral Examinations

Students often have a feeling that the marks obtained in oral examination depend at best on luck factor and at worst on the sex and dress of the candidate ! Do you agree ? Well, some iota of truth may be there in such feelings.

The major drawbacks of an oral examination are considered to be the following :

Disadvantages

- It lacks standardization.
- It lacks objectivity and reliability.
- It suffers from possible abuse of personal influence.
- It suffers from undue influence of irrelevant factors.
- Examiners may not give enough thought to framing of the questions and may not organise different questions in a methodical order. Sometimes, a very different questions is asked in the very beginning and then the student is unable to answer later easy questions. Frequently the same questions are asked repeatedly and this benefits those candidates who take the test later. A candidate unable to answer well may be ridiculed before putting the next questions or he may be asked irrelevent information before deciding to award good marks.
- It is a time and energy consuming process and in limited time only little information can be obtained. For most of the average students in a class, the oral examination may be only a farce with awarding of just necessary pass marks. It may, however, be a worthwhile effort for deciding about the result for border line cases or to award distinctions.
- Viva voce is a subjective evaluation, with all its associated drawbacks.
- Some students may not be able to perform very well due to a language barrier. Conversely, a false impression may be created by a student with fluency and style.

Conducting Oral Examination

It may be good to consider all these aspects and the organise an oral examination in a relaxed atmosphere. Asking proper questions is most important. In general, you should begin with simple short question and then proceed to more and more difficult ones. The evaluation can be based on the difficulty levels crossed satisfactorily by the candidate. For this purpose a system of different coloured cards with questions of graded difficulty index has been proposed and used by some teachers. This may also reduce the subjectivity of oral examination.

Conducted properly, the oral examinations are a useful component of assessment. They inculcate the faculties of fast thinking and clear

Training the Students

expression. They have a special place in medical education because the competence of a physician is judged very commonly by the patients on the effectiveness of communication.

A medical student should be informed about the importance of viva voce examination in the medical curriculum and an awareness created on the following points may be beneficial to him:

- As a student, the main intention should be to convey to the examiner the fullest possible extent of your understanding of the subject.
- Personality difference cannot be completely overcome, and it is better to behave normally and not attempt to act out a part which will probably be detected.
- A determined effort to be composed is always worthwhile (but definitely not with the help of any drug !).
- The moment of face to face contact between the examiner and student is important and the first impressions can make a difference.
- The initial question is usually to give you time to settle down and to develop a rapport, At this stage it is most important for you not to repeat the question while you think out the answer. This is a most irritating habit, and remember that the examiner will be listening to numerous candidates. It is better for you to start talking about the subject and if possible go on until the examiner either indicates satisfaction or moves on to another question.

In the event that you do not understand the question, ask for it to be repeated or say that you don't understand the question. If you really don't know anything about the subject in question, then better say no, because this fact will eventually be deduced but valuable time will have been lost.

Testing your ability to communicate is a main purpose of the viva voce examination. Always avoid vagueness or using unnecessary words to make up time—no credit is given for this. If valuable time is lost in thinking or in posing to think, you would lose marks also.

At the end of a viva always leave graciously (however disagreeable it may have been !) as this leaves a good impression and in borderline circumstances may make a positive difference.

Lastly, a word about distinction vivas. These are a battle of wits and knowledge between an above-average candidate and the examiner. The questions are certain to stretch the candidate's knowledge to the utmost. The process of determining the extent of your knowledge may be long or short, so remember that the length of time spent in the process is of little importance.

17 *Assessment of Non-scholastic Abilities*

Learning Objectives

❒ Discuss the importance of assessing non-scholastic abilities.

❒ Enumerate non-scholastic abilities relevant to your subject.

❒ Design checklists and rating scales for assessment of these abilities.

Scope

For a minute, think from the view point of a patient. You go to a doctor who does not listen to you properly, is rough in his examination and hands out the prescription to you saying 'ask the chemist'. When you try to clarify certain doubts, he shuts you down saying he is too busy and you have already taken too much of his time. Would you ever like to go back to him ? Probably not. For precisely this reason it has been said that it is not the drug that works but how and by whom it is given that makes all the difference.

Now, come back to your role as a teacher. Have we ever tried to assess this aspect in medical education? The answer would be a 'No'. And it goes without saying that what is not assessed is not learnt. Thus, we leave it to chance or take it for granted that a student who has passed the final MBBS examination has also learnt how to effectively communicate with a patient. Nothing can be farther from the truth.

You may argue that present examinations do not provide a scope for this. However, the latest guidelines of MCI have put a great emphasis on this aspect. There is a potent area where such assessment can and must be done, i. e. internal assessment. Since internal assessment is carried out on a continuous basis, you are in a better position to assess non-scholastic abilities of the student. Implicit in this is the provision for providing feedback to the student so that he can improve. Non-scholastic abilities can be grouped into one of the categories given below. You will notice that this list is only illustrative and not exhaustive.

Study related	*Social*	*Communication*	*Interdisciplinary*
Knowledge	Team work	Peers	Sexuality
Comprehension	Leadership	Teachers	Grief
Application	Hard work	Patients	Suicide
Drawing	Punctuality	Assertion	Poverty
Originality			Ethics
Initiative			Terminal-
Scientific-			Illness
Attitude			Breaking
Creativity			bad news

Abilities

You would appreciate that while social and communication skills are being talked about for many years now, interdisciplinary skills are a relatively new addition to the field. It would be right to assume that as more and more psycho-social emphasis is given to medical problems, this list is likely to expand. We will like to point at this juncture that while many of these areas require deliberate training, others are picked up by observing teachers and peers. It is also possible that teaching and training in one area, say ethics, may have a generalising effect on others.

Process

Let us now come down to the brass tacks. How do we assess, for example, creativity or communication skills ? One of the problems that you may be facing is that creativity or originality is not directly observable and one is likely to draw subjective interpretations in this regard. However, you can assess skills or knowledge that may be based on the above attributes. We must confess that this is a tough area and each one of us may have our own ideas. Association of Indian Universities has attempted to provide some guidelines for this. Have a look at the following example:

Example

	Quite a lot	*A lot*	*Just little*	*Very little*
– Reads literature in the subject other than books.				
– Associates with students who are good in the subject.				
– Takes pleasure in solving problems.				
– Discusses problems in the subject with peers and teachers.				
– Brings problem to the teacher for clarification.				
– Solves problems himself/herself				

This type of evaluation tool is called a rating scale. This can be completed by the teachers or even by peers. What you should remember is that these attributes are not constant and can change for the better or

whose with passage of time - hence you need to evaluate a student repeatedly (e.g. once in 3 months) for better results. Here is another rating scale for scientific attitudes:

Example

	Always	Mostly	Average	Rarely	Never
Admires good teachers and literature in the subject.					
Reads to undertake tasks related to subject					
Does not accept any proposition unless logically established.					
Reports observations without cooking up.					
Accepts mistakes without reservations.					
Tries to understand other person's point of view.					

'Communication skills' is the other important area which needs to be evaluated during undergraduate studies. At many medical schools abroad, audio and video recordings of a student's interaction with patients and observation across a one way glass are commonly used. However, in our kind of setting. This may not yet be possible. You may consider using one the following methodologies depending upon the situation and your requirements.

Other Tools

a. *OSCE Station:* Recall that OSCE provides a useful and reliable method for assessment of skills. The history-taking station, for example, can be modified in such a way that in addition to conventional points on history, the student is also being evaluated on communication ability. Alternatively, an exclusive station can be devoted to communication skills. Look at the following example :

Task: Explain the dosage form of drugs to the mother, whose baby is suffering from throat infection.

Checklist:

Example

	Score
Explains the drugs in a language comprehensible to the mother. Does not get annoyed by repeated questions.	+2
Explains but does not cover everything. Gets annoyed by repeated queries	+1
Explains without bothering to ensure if the mother has understood.	0
Hands over and explains in a language incomprehensible to the mother.	-1
Hands over without explaining anything.	-2

<table>
<tr><td rowspan="20">*Example*</td></tr>
</table>

The example you saw just now represents a negative marking scheme which penalises the student for not performing an important act. There can be another way of this, without involving negative marks. Look at the following example :

Task: Explain to the mother, how to prepare and administer ORS.

Checklist:

	Score
• Explains the importance of handwashing	1
• Explains importance of fluid replacement	2
• Stresses the need for fluid replacement even before medical help.	2
• Explains the need for clean water	1
• Uses a language comprehensible to the mother	2
• Answers all her queries	1
• Asks mother to recall the procedure	1

In this scheme, a student gets credit for such actions which the actually performs. It may not be out or place to mention here that in both the schemes, some element of subjectivity cannot be ruled out.

b. *Peer ratings:* This type of evaluation is being increasingly used at many medical school abroad. The rationale of using this approach is simple—a student is more natural in presence of his friends rather than his teachers. The experience with this mode in India is almost nil. However, you can still think of some ways by which this important modality can be put to use.

You will agree with us that we do not evaluate these aspects because we are afraid of subjectivity. However, if we look at it like this, that anything which is evaluated will be learnt by the students, we are likely to induce a positive attitudinal change in them by evaluating these abilities.

18 | *Continuous Internal Assessment*

Learning Objectives

❐ Differentiate internal assessment from other types of assessment.

❐ Enumerate abilities to be included for internal assessment.

❐ Design a system of continuous internal assessment.

Learning Outcomes

Have you ever thought that most examinations in our country fit well in the rational and impersonal ethos nurtured by bureaucracy and industrialization, where the candidate is merely reduced to a number? The marking is done impersonally in accordance with prearranged criteria of relevance and correctness. Over the years, many improvements have been made and our examinations now assess a wider range of abilities like recall of facts, recall of principles, use of numerical data, construction and testing of hypotheses, coherent communication and so on.

However, the outcome of a course consists of more than the ability to recall and use information. It also involves acquisition of a range of abilities and skills and development of certain desirable behaviours. Thus, development of disciplined working habits, acquisition of study skills, establishment of interests, development of aesthetic tastes, social sensitivity and social attitudes are all part of the educational process.

Feedback to Students

Before proceeding further, recall that we have been placing a great emphasis on feedback as a means of improving learning as well as teaching. This diagnostic teaching facilitates constant improvement of teaching learning system. However, this mechanism will be full operational only when this feedback is of a continuous nature. This is in line with the current thinking of placing emphasis on the individual student.

In professional courses, especially medicine, psychomotor and affective skills are very important. Acquisition and evaluation of these skills will undoubtedly be more valid, if based on frequent, if not continuous, observation during the course rather than at the end of the course. The continuous observation enables us to assess the student as a whole rather

than assessing individual skills here and there. Further, there are many skills like giving injections, responding to patient queries and educating patients which do not lend themselves to assessment in a term end examination.

Advantages

Thus, continuous internal assessment (CIA) can be viewed as an attempt to gain more and better information about the ability of the student and use it as the course develops. Traditionally you have been arbitrarily classifying students as good or bad. CIA tries to replace that arbitrary classification by systematic means. Essentially. CIA is characterised by the following:

- It represents a continuous awareness by the teachers, of the knowledge and development of his students.
- It emphasises observation of growth of various abilities thereby enabling the teacher to take corrective action as and when required.
- It provides knowledge, not only of achievement but also of progression towards it - not merely of *where* he has got but also of *how* he got there.

Process

Designing a system of CIA will require that different outcomes of learning are identified and recorded. Some possible outcomes can be identified as follows:

Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation, Drawing Skills, Ability to handle instruments, Communication skills, Social skills (team work, leadership), Personal skills (regularity, hard work, originality, initiative), Interest, Scientific attitudes, Appreciation, Creativity etc.

It is possible to break these into precise behavioural terms. Some such examples can be—

Learning Outcomes

- Read literature other than textbooks.
- Join/associate/participate in activities related to subject, *e.g.* professional association, debates, trips, etc.
- Visit places of interest.
- Seek to identify and solve challenging problems.
- Seek fresh clues beyond those already known.
- Accept errors in arguments.
- Have emotional maturity.
- Exhibit good manners and social graces.
- Demonstrate ability to get along well with others.
- Search/locate material from reference sources.
- Communicate well with the patients and colleagues.
- Convince the patient regarding desirability of an action.

How do we carry out the process of internal assessment?

Often, a few class tests are held and the marks obtained in these tests are taken to represent the internal assessment. It is pertinent at this point to make a distinction between various types of evaluation that can be employed. You have already learnt about them. To recall, these are:

Examples

a. *Formative assessment:* It refers to a diagnostic evaluation with the purpose to provide feedback to the students and teachers regarding adequacy of teaching. However, the performance in formative evaluation should never be taken for a final pass/fail decision.

b. *Summative assessment:* It is the end of the term examination which takes into consideration the knowledge and skills acquired during the entire course. The professional university examinations fall under this category.

c. *Internal assessment:* It refers to frequent observation of the student by the teacher to know the acquisition of predetermined desirable behaviours and deals more with those abilities which cannot be tested in a summative evaluation.

CIA tends to augment and not replace the present examination system and is an important step towards integration of all 3 curricular components, i.e. objectives, methodology and evaluation. At the same time, CIA does not mean a few mid-term examinations in place of or in addition to final examination. This is a very important distinction and should always be kept in mind.

Peculiarities

The main purpose of CIA is to test those abilities which cannot be tested by term end examination. For this, teachers must identify the abilities they want to develop in the student in their own subject and allocate weightage to these selected abilities. Meaningful, valid and reliable tools of evaluation should then be used to evaluate these abilities.

For an effective feedback function, it is imperative that marks obtained by students are open and made known to them immediately. A provision must also be kept for discussing the results with individual students.

The question of giving weightage of CIA is important. Medical Council of India in its recent recommendations has given a weightage of 20%; however, many authorities in the field suggest a weightage of up to 50%. More important than weightage is the fact that evaluation of these abilities will promote their active learning by the students.

Design

Designing a System of CIA: The MCI guidelines on Graduate Medical Education have rightly pointed out that the focus of CIA should be on the process of learning rather than on the product. In essence, it means that during internal assessment, we should concentrate more on how the learner learnt. You may perhaps like to read the chapter on Assessment of Non-scholastic abilities before you proceed further.

The plan of CIA that we are discussing here has been formulated after a great deal of discussion and deliberations with over 100 teachers from all disciplines, however, you can devise your own plan as long as it meets the following criteria:

• It focusses on the process of learning
• It gives priority to psychomotor and affective skills
• It involves all faculty members of a department, and
• Its results are immediately made known to the learner and discussed with him to make the process of learning better.

The plan proposed by us allocates 100 marks to CIA, which can be converted to desired marks at the end of the session. Out of these, 50 marks are alloted to theory and 50 to practicals. To relatively increase the weightage to practical skills, affective skills have been clubbed with theory.

Theory: Periodical tests have been alloted 30 marks. You should be careful in distinguishing formative evaluation from internal assessment. This means that each and every test administered to students should not be counted towards internal assessment. You should inform the students well in advance that such and such test will be used for internal assessment - please ensure that not more than one or two tests per semester is earmarked for this purpose.

Theory

The remaining 20 marks will go towards assessment of the following points. We want you to understand that there may be some subjectivity involved in this process, hence this marking must be done by all faculty members. The process of calculating average will iron out any biases that may have crept in.

Let us now elaborate more on these points :

a. Interest in the subject (asking questions in the class, reading beyond textbooks, interaction with teachers and peers).
b. Active participation (volunteering for presentation, performance during discussions).
c. Scientific attitudes (rational thinking, curiosity to clarify doubts, ability to draw conclusions, sincerity in reporting observations).
d. Interpersonal skills (accepting mistakes , understanding others' view point, non-argumentative and respectful behaviour)

Each of these points will be alloted 5 marks each, making a total of 20.

Practicals: These skills also need to be assessed by means of periodical assessments, specially at the end of the posting or at the end of a semester. You should follow the same guidelines as discussed for theory. These tests should carry 40 marks. The remaining 10 marks should be for record books.

You would have noticed that in this system, we are making multiple observations using multiple examiners and the marking scheme is transparent. This makes it more objective and more reliable as compared to the present system. You are also providing ample opportunities to the learner to improve his performance, which in fact, is the true purpose of assessment.

Documentation: We will like to remind you again that as per MCI guidelines, a student can be detained if he fails in internal assessment. It is therefore mandatory that meticulous record keeping is done so that the marks are available for inspection by anyone. The proforma used by us is reproduced here, however, you can think of more innovative ways to record the results.

We hope you will appreciate the role of internal assessment in giving a desired direction to learning. It is better if all the faculty members of your department, discuss this scheme and come out with appropriate modifications to suit your academic milieu.

Internal Assessment Sheet

Name : _____

Roll No : _____

Theory	MM	T1	T2	T3	T4	T5	T6	Avg.
(a) Interest In Subject	10							
(b) Active Participation	10							
(c) Scientific Attitude	10							
(d) Interpersonal Skills	10							
Attitudes	40							
Theory Tests	60							TM1
Practicals	80							
Record Book	20							PM1

Attendance	Actual	Percentage
Theory		
Practicals		

Signature of the HOD		Date
Signature of the Student		Date

T = Teacher TM = Theory Marks

  PM = Practical Marks

From Marks to Grades

Learning Objectives

❒ Discuss advantages of using grades in place of marks.

❒ Differentiate between relative and absolute grading.

❒ Use grades in your day-to-day work.

Problem

The convention in most examinations has been to allot a maximum of 100 marks to a question paper and then award marks to each student based on his performance. Thus, we create 101 points (0 to 100) and try to mark the student with the precision that is never attainable. Often, there are examiners, who would make even a further finer subdivision and allot say 57½ or 60¾ marks to a student ! Research on marking patterns has shown a variation ranging between 10 - 35% among different examiners or even in case of same examiners when remarking the script after a certain interval of time. In other words, it means that 3 students who obtain 55, 60 and 65 marks may be in the same band of achievement. What then, is the rationale for awarding 57½ marks?

There is another common tendency among examiners to cluster their marks around the pass marks. If pass marks are 35, many students will receive 35 marks. : If pass marks are fixed at 50, the cluster of students receiving 50 marks will increase. Further in certain subjects, a student can get very high marks, while in others, the maximum obtained by a student may never exceed say 70. Thus, we tend to shrink or expand the scale depending on the subject matter. These factors make the true comparison of students' abilities difficult. The problem is further compounded when comparisons have to be made between colleges or universities.

Grades

One of the ways to overcome this problem is to change from marks to grades. In the subsequent discussion, we will try to tell you about mechanics of grading. There is a great flexibility in the number of grades that one can adopt - from 3 to 11. While adopting a 3 point scale may not truly differentiate between students of different abilities, a 11 point scale

may make distinctions too fine and introduce arbitrariness. UGC has suggested a 7 point grading scheme as being satisfactory. This has the advantage of being applicable to different subjects.

The 7 points of the grading scale are designated as follows:

O   Outstanding
A   Very good
B   Good
C   Average
D   Below average
E   Poor
F   Very poor

You may be wondering that this type of classification is again arbitrary and biased - in fact it is not. A student is awarded one of these grades based on a scientific method. How is it actually done ?

Types of Grading: Grading can be either absolute or relative. When we grade a student based on his performance alone, we call it absolute grading. Some people also call it criterion referenced grading. On the other hand, when we grade him in comparison to performance of other students, it is called relative grading or norm referenced grading.

Process

For adopting absolute grading, the following procedure can be adopted. The marks obtained by the students during previous 3 years are compiled and arranged as follows, after emperically determining the cut-off points. One such distribution can be :

Absolute Grading

S. No.	Grade	Range of marks	Points
1.	O	79 and above	6
2.	A	73 - 78	5
3.	B	65 - 72	4
4.	C	53 - 64	3
5.	D	40 - 52	2
6.	E	32 - 39	1
7.	F	Less than 30	0

Thus, grades as indicated can be assigned depending on the range in which marks of the candidate fall. In this type of distribution, possibly all candidates can get 'O' or all of them could get 'F'. A student obtaining at least 'C' is considered pass. For obtaining overall grades of a student, the points obtained by him in all the subjects are added and a grade point average is calculated. For example, a student obtained A in Anatomy. O in Physiology and B in Biochemistry. His grade point average will be :

$$\frac{A + O + B}{3} = \frac{5 + 6 + 4}{3} = \frac{15}{3} = 5 = A$$

The process of relative grading is slightly different. Here statistical methods are employed to obtain a distribution of various grades in a given student population. The distribution for a 7 point scale has been worked out as follows :

Relative Grading

S. No	Percentage of students	Letter grade	Points
1.	3	O	6
2.	7	A	5
3.	22	B	4
4.	36	C	3
5.	22	D	2
6.	7	E	1
7.	3	F	0

In this method, top 3% of the students will get O grade, next 7% will get A grade and so on. This method compares performance of one student against the other. As you would appreciate, relative grading will be more useful for selection type of tests while for certifying examinations and class tests, absolute grading will be more useful.

Whichever method you may decide to adopt, the grading can be done directly or the students are first assigned marks, which are later converted to grades as per the scheme given above. Direct grading is specially useful for practical and laboratory work.

Advantages

Grading makes only 7 divisions to which a student's performance can be assigned as compared to 101 division adopted by conventional marking. Thus, chances of error are considerably minimised. Examiners have been found to be more consistent in awarding grades than they have been in awarding marks. Comparability of performance over different subject areas and different colleges is more likely to be possible with grades than with marks.

20 | *Academic Counselling*

Learning Objectives
- ❏ Explain the concept of academic counselling.
- ❏ Enumerate skills of a counsellor.
- ❏ Identify steps in a counselling session.
- ❏ Conduct a counselling session.

Concept

You must have experienced that in any learning situation, students need some kind of help and support other than mere transmission of knowledge. They want to know about dates of examination, about topics they have not understood, about reference books and journals, about ways to study, about career options available to them and so on. Basically, these activities can be divided into one of the three categories:
- Giving appropriate and correct information to the students
- Suggesting appropriate course of action, and
- Helping students to clarify their needs, feelings and motivations.

These 3 groups constitute, what is called ' Counselling ' and includes information, advise and counselling as its components (you may have noticed that counselling appears twice—this is something like Russia, which described a union of states, one of which was independently called Russia). Let us take a more closer look at these terms.

Information is about knowledge, which is largely independent of the student. Rules, regulations, and similar things need to be informed. You need appropriate knowledge and communicating ability to be able to inform.

Counselling is letting the student decide for himself as to what is best for him regarding choice of courses, career, and other points which need one path to choose out of many available. This is an entirely student dependent activity.

Advising is a mixture of the two—after clarifying the need, you offer several options, but recommend only one, specially for that particular student.

The classification proposed above is not very watertight. A request from a student may need to be dealt with at more than one level. Take an example - 'Can you suggest a way for me to improve my power of concentration' looks like an information request but it requires more exploration of why in the first place a student is finding it difficult to concentrate. Is he trying to mug up without understanding?

A good teacher is always a good counsellor and counselling is an integral part of teaching activities. As a teacher, you are required to be a good talker as most of the communication is from you to the student. As a counsellor, however, the communication is predominantly in the reverse direction and you need to be a good listener.

Can you recall your experience and think of the situations when students approached you for counselling? You may have thought of some of these situations:

Timing

- At the beginning of a course.
- Deciding about books.
- Before class tests.
- Before tutorials.
- Before professional examinations.
- Knowing ways to study better.
- Making notes in the class.

Many more situations can be added to this list. These activities can be broadly classified as developmental and problem solving.

You may also have noticed that many a time, students may be approaching you with personal problems (failed love affair, for instance) and in such a case, you may have to refer that problem to someone better skilled.

Practical Hints

Two other practical tips may be of use to you. If students come with problems stating that they do not remember or they do not understand, you must check whether they are using appropriate study skills. If yes, then it may be basically anxiety which is interfering with learning or understanding. For your convenience, we have added an appendix on study skills at the end of the book.

Secondly, if they come with time related problems, e.g. not getting enough time or staying behind schedule, then they may be suffering from lack of motivation. Management of time is an important aspect of study skills. After going through the appendix, you will be in a position to teach time management to your students also.

You must have realised that counselling is not synonymous with giving directions. In fact, what we have discussed that students are helped

Qualities of a Counsellor

to talk about and find their own solutions to their problems. To be able to do so, you require certain skills and qualities, Let us enumerate these for you:

- **Warmth** or making the students feel welcome and valued as individuals. Simply stated it means saying, 'Hello, how can I help you?' rather than 'I am busy, so come straight to the point.'
- **Acceptance** of students and their feelings without criticising them. If a student is poor in spoken English, criticising him for that is not going to improve the situation.
- **Genuineness** means being naturally yourself, open, friendly and undefensive, you have to be honest with yourself about your own feelings.
- **Empathy** is the ability to sense the feelings of your students. However, it is different from sympathy, in which you take over the feelings yourself.

Most of you would already possess these qualities to a high degree. At times, we fail to demonstrate them. Can you think of some reasons? You are right - they are overwork, tiredness, status consciousness and own feeling of inadequacy. Being aware of these is the first step to overcome them. Once you recognise the importance of these interpersonal qualities, you can give yourself permission to express them professionally.

Process

Let us now come to actually conducting a counselling session. Obviously, we have to classify the request (information, advice or counselling), make the student comfortable and let him talk about the problem with the intention of solving it. This basic process can be sequentially represented as follows :

(a) **Selecting:** It is deciding the part of counselling to which the request belongs. It is important to decide whether it is an information, advice or counselling request as giving information, when actually counselling may be needed, is not conducive to a satisfactory session.

(b) **Listing:** You would recall that one of the qualities of a counsellor is to be a good listener. In fact, intelligent active listing is the key to a counselling session. Here are some ways to be an active listener:
  - Open ended questions encourage the student to talk about his problem rather than saying just yes or no to a query.
  - Acknowledgement by nodding or saying ah - ah, maintaining eye contact and using positive body language.
  - Reflecting or saying back to the student something which he has already said with a view to clarify it. As far as possible, the sentence used by the student should be rephrased (After listening

to a statement, this is just like saying. 'You mean to say that....').
- Silence in itself can promote speaking from the other party.
- This gives the student space to think about his next sentence.

(c) **Structuring** is to know the right moment to stop counselling and give advice. To do this, you may have to go through the following sequence of activities:
- Clarification of the basic problem or issue by having a dialogue with the student.
- Checking by going back to the student to ensure that the issue is now completely clear. If not so, you may need a few more clarifications.
- Consequences is the final yet most important part of counselling interview. It is mutually agreeing to what the student will do as a result of this interaction.

We have presented the philosophy and process of counselling in a very simplified format. Next time a student approaches you for help, try to figure out the spectrum of counselling you are using. Once you are clear about it, you will be able to structure your responses more effectively.

Teacher Evaluation

Learning Objectives
- ❒ State importance of teacher evaluation.
- ❒ Use an appropriate tool to evaluate own teaching.
- ❒ Develop an attitude to accept critical feedback for self-improvement.

Need

Electronic Feedback

'Assume all teaching to be ineffective till there is evidence to contrary'. This statement by Mager may sound too harsh to many of us but it is a stark reality ! Gone are the days when one could give a scholarly lecture and feel satisfied. It would not be wrong to say that the age old dictum of 'consumer is always right' applies to a great extent to teaching also. This view point is going to have its own share of supporters as well as critics. However, there is no disagreement over the point that obtaining feedback about your own teaching is an inexpensive and invaluable way of improving the quality of your teaching. Recall for a minute the discussion we had in the chapter on Assessment— the whole concept of assessment is based on feedback to improve the quality of final product. There is no reason, why we teachers should keep ourselves out of bounds from feedback about our teaching.

Teacher evaluation has come to be known all over the world as a useful input to improve the quality of teaching. This belief stems from the fact that learning is largely dependent on the attitude of the learners. If they are not favourably predisposed towards the teacher, they are not likely to learn. By obtaining feedback, you can identify areas to improve your acceptability as a teacher.

Who should give this feedback? This is a difficult question to answer since our ego prevents us from accepting critical feedback from just anyone. Tape and video recordings viewed by self could be a possible answer. In many developed countries, teachers use these electronic devices to monitor their own teaching. Since they are not viewed by

anybody else, they can be quite non-threatening. In addition, they have the advantage of providing good review. Teacher's contribution, quality of student comments and questions, student enthusiasm or hostility (tone of voice, shuffling of feet etc.) can all be evaluated by these means. Though useful, these technological aids are unlikely to be freely available to most of us for many years to come.

Peer-review

Another helpful means of obtaining feedback could be peer evaluation. You could request a senior colleague to sit in your class, observe your teaching and later provide you feedback. You are thinking right - this is somewhat similar to what we discussed under microteaching. The only difference is that in this case, you are being observed during an actual class rather than during a mock session. Sound in theory, this method may pose certain practical difficulties. Finding a colleague willing to spare one full hour may be difficult. Further, sitting at the back, he may be unable to observe the reaction of the students. Presence of an observer may make you also conscious and induce artificiality in your teaching behaviour.

Self-evaluation

You can also/resort to self-evaluation. This introspection has its own value and supplements other forms of teacher evaluation. At times, there may be a conflict between what you feel and what students think; however, by adopting a balanced path, you can get useful feedback for self-improvement. A number of self-check scales have been published and we don't intend to go into all of them. However, by selecting important points from many of them. It is possible to draw a scale which is brief yet fairly wide in its coverage. Look at the following points:

- I know the underlying educational philosophy of the institution where I teach.
- I select objectives for my teaching based on this philosophy.
- I use principles of learning to plan my classroom and clinical teaching.
- I provide opportunities for students to select their own learning experiences.
- I provide opportunities for student opinion on content and teaching method to improve my teaching.
- I provide learning experiences which offer challenges to students and stimulate them for further study.
- I use audio-visual media to make instructions more meaningful.
- I recognise the principle of individual differences and therefore realise that some of my students will need more input than others.
- I provide learning experiences to develop practical and affective skills

in addition to imparting knowledge.
- I encourage students to practice self-activity in learning.
- I encourage students to draw on supplemental material from various sources.
- I select learning experiences which enable students to integrate theory into practice.
- I have a good rapport with my students.
- I have an objective attitude towards teaching and hence a willingness to change.
- I participate in educational research.

Self-improvement

How many points are applicable in your case? We are sure many but there is still a possibility of improvement. This kind of self-evaluation is non-threatening but at the same time can be deceptive, if we have few peculiar personality traits. Even though you may be rating yourself poorly on some of these points, by may be rating yourself, you are likely to induce a positive change in yourself (this is what psychologists call Hawthorne effect).

Student Feedback

The last but not the least important source of obtaining feedback are the students. While it can be said that students are immature, likely to indulge in flattery, likely to rate strict teachers poorly and so on, it has been seen that it is not so, After all, who can tell the taste of the pudding better than the dinner guests? Increasingly greater attention is now being given to student feedback. Research has shown that students are consistent with those given by more experienced colleagues. In many institutions abroad, promotions and career advancements have student ratings as one of the criteria.

The student ratings are directed towards course objectives, organisation of the course, teaching techniques and procedures, assignments and examinations. Various types of questionnaires have been reported in literature but the one that we are telling you here is the one that we have extensively used for our own evaluation and found it to be satisfactory.

While the current opinion is in favour of using student feedback, you should exercise caution in its use. Students should be asked to support their opinion with reasons. This is more so if you are new to the profession of teaching and lack self-confidence.

Teacher Evaluation Questionnaire

During all teaching sessions for the course the teacher was able to :

Please tick the appropriate column	*Very skillfully*	*Satisfactorily*	*Poorly*
1. Create and maintain an atmosphere for learning			
2. Speak with loud and clear voice			
3. Explain relevance of the matter taught			
4. Arouse interest / curiosity			
5. Explain clearly			
6. Provide examples			
7. Summarise issues before moving on			
8. Pose thought - provoking questions			
9. Encourage students to share ideas			
10. Detect confusion and misconcepts in the class			
11. Provide relevant notes			
12. Guide for further learning			

22 *Managing the Learning Needs*

Learning Objectives
- ❑ Discuss the need for a change in the role of teachers.
- ❑ Explain theories of motivation in own words.
- ❑ Apply these concepts in classroom setting.

Historical Perspective

The contemporary concept of teaching has radically changed the role of a teacher—you are no longer seen as a dispenser of information, rather your prime responsibility now is to manage the learning needs of your students. Sounds odd, may be, but after you go through the subsequent discussion, you would agree with the need to change your orientation and your role.

Over the past several centuries the education systems in India have changed periodically, because of socio-political changes. Changes in education system are naturally affected by societal necessity. An analysis of the different educational patterns of India fairly well illustrates this point.

The earliest pattern was in pastoral India which was a *Guru–Shishya Parampara*. Learner's urge to learn was the starting point of this pattern. With the passage of time, the pastoral society transformed into a feudal society. This marked the setting up of Universities like Nalanda and Takshashila, to which aspirants of higher education travelled over long distances. Learner motivation was again a strong point here. The Muslim influence led to appearance of two parallel streams of education, the Pathshala and Madarsa. During this period, desire for social mobility became a recognisable factor in learner motivation. With the arrival of the British, the system of education underwent a major change - the teacher became a paid agent of the educating agency and the learner's objective changed to obtain a certificate. The prospect of social mobility became so strong that education came to be seen as a commodity that would pay dividends in the long run. The rigorous stands and discipline of the past gradually gave way to mediocrity.

After independence, India announced universalisation of education and equal opportunities for all as the basic principles of educational policy. This induced a sea change in the educational pattern, as the state took the responsibility of educating citizens, irrespective of social or economic status, motivation or aptitude.

Context and Linkage of Education

The gradual growth of commercialisation became more apparent, governed by the law of supply and demand. With the growth in the supply of certified job seekers, the rush for certificates of 'higher levels' was triggered. However, this rush was not for imbibing higher education *per se,* but for certificates thereof. The aquisition of knowledge had taken a back seat. Whereas, the earlier systems of education aimed at mastery learning, today it is the certification and not learning that really matters.

Motivation

The industrial revolution, which was going on side by side during this period, also faced similar problems The liberal industrialisation in free India especially during last decade forced the industry from operating in a seller's market to a buyer's market. This prompted a search for cost effectiveness, economy and conservation, Machines could produce more, provided the operators were willing to operate them for longer periods. This brought to the forefront, the importance of motivation as a single factor in influencing productivity. A lot of research was done to this end with the result that the principles of motivation are now thoroughly tested and well accepted. This changed the entire outlook and spectrum of manages who made increasing use of these principles to increase productivity.

Let us try to extrapolate some of these principles to the management of learning, keeping medical education in mind. First, we shall look at some general principles of motivation and then examine how these can be applied to medical education.

Motivation can be defined as the willingness to exert high levels of effort towards goals, conditioned by the ability to satisfy some individual needs. Thus, it is not a personal trait, but is the result of interaction of an individual and the situation. One may find it difficult to stay with a text-book for more than 10 minutes, yet read a complete novel at one sitting! The three key elements in this concept are effort, goal and need.

The effort element is a measure of intensity, but high levels of effort alone are unlikely to lead to a favourable result, unless the effort is channelled in a particular direction. Therefore, the quality of effort is also very important. Effort that is directed towards and consistent with goals is the kind one should be seeking. Need, in this terminology, means some internal state which makes certain outcomes appear attractive.

A large number of theories have been advanced to explain the concept of motivation. We will not confuse you with all these details but discuss only those which are relevant to your role as a teacher - manager.

A. Expectancy Theory: This is one of the most widely accepted contemporary explanations of motivation. It argues that strength of a tendency to act in a certain way depends on the strength of an expectation that the act will be followed by a given outcome and on the attractiveness of that outcome to the individual. Thus, it takes into consideration attractiveness, performance - reward linkage and effort - performance linkage.

Let us view the classroom as an organisation and try to apply this concept to the student's behaviour.

Most students will prefer a teacher, who will tell them what is expected of them in the course. They want to know what the assignments and examinations will be like and how much weightage they will carry in the final examination. They also expect that the amount of effort they exert in the class and study will be reasonable related to the final grades.

Example

Let us illustrate this further. Suppose a student who has been scoring 80% marks in the unit tests, gets only 50% in the term examination. His immediate reaction will be - how can I score so poorly when I had prepared in the same way as I used to do before? Certain changes may be immediately apparent in his behaviour. He is no longer driven to attend the class regularly; when he attends, he dreams a lot, resulting in an empty notebook instead of several pages of notes. One can describe this as lacking motivation. However, let us try to explain this phenomenon in the expectancy terms.

Studying and preparation (effort) is conditioned by it resulting in answering the questions correctly (performance) which will produce a high grade (reward), which he believes will lead to prestige and other benefits (individual goal.)

The attractiveness of the outcome, which in this case a good grade, is high. But what about the performance - reward linkage? Did he feel that the grade truly reflected his knowledge ? Did the test fairly measure what he knew? If the answer is 'yes' the linkage is strong. If it is 'no' then at least part of the reason for reduced motivation is his belief that the test was not a fair measure of his performance. May be the grading method was poor, may be too much weightage was given to trivial matters ; may be the teacher was biased—these are examples of perception that influence the performance–reward linkage, and thereby the level of motivation.

Another possible demotivating force may be the effort— performance relationship. If the student believes that he cannot pass the examination

regardless of the preparation, then the desire to study will drop. He places a low value on his efforts leading to answering question correctly and therefore, lessens his efforts.

Application

Based on these considerations, a strong case is made out for improving the objectivity of examinations. Concepts of validity, reliability, difficulty level, etc. have to be religiously incorporated in our examination system. You can say with confidence that if examinations test what they should (valid), are free from examiner bias (reliable) and neither too difficult nor too easy, they can exert a potent motivating influence on the student. We also like to make a passing reference to Thorndike's law of success, which states that behaviors associated with success tend to be repeated. The corollary of this is that if examinations pose question which demand "rote memory", the students will become memorisers. On the other hand, if they demand critical thinking, them students will learn that way.

A strong case is also made out for formative assessment to strengthen the performance—reward linkage of the student. He should see for himself that his efforts succeed in getting him a good grade.

Like most other theories, expectancy theory also has its own critics. Suffice it to say that if students are actually rewarded for performance, rather than on extraneous factors, validity of expectancy theory is high. This can also explain why a large number of medical students exert a minimal level of effort on learning and rely on 'non-academic' methods to make good grades. This model, if adopted, will encourage teachers to design a motivational climate that will increase the probability of effective learning.

B. Goal Setting Theory: Propounded in 1960, it states that the intention to work towards a goal is a source of work motivation. Enough evidence has accumulated to support this theory. Specific goals increase performance, difficult goals when accepted increase performance and feedback leads to better performance.

Application

Specific goals produce a higher output than does a generalised goal of 'do your best'. An in-built feature of this theory is the provision of feedback which helps to identify the discrepancies between what they want and what they have done—it acts as a guide behaviour. Self-generated feedback is considered a more powerful motivator than externally generated feedback.

This brings us to the process of setting objectives, i.e. behaviours which we expect the student to acquire at the end of a course. Learning is likely to be easier and better, if a student knows that after learning a chapter on hematinics, he should be able to calculate the dose of iron in a one year old

child with moderate anaemia. Objectives also give evaluation a result oriented emphasis.

A related concept of this theory is the approach of management by objectives (MBO) which illustrates the path goal model of leadership. Let us explain it a bit more in the context of management. MBO changes the role relationships of subordinates and managers. Employees are given more responsibility for determining objectives and encouraged to take initiative to plan their methods and pace of work. The role of management also changes. After reaching a consensus on the goals, managerial role because a supporting one. Thus, a manager says 'how can I help' more often than 'here's how you should do it.'

The best illustration of the concept of MBO can be seen in problem-based learning. When students set their own objectives, and in effect construct their own curricula, learning is stimulated. This also takes care of obsolescence of knowledge by promoting independent study habits that can be a basis of life long learning (or 'learning to learn' as it is called in management training). Even more important than this is the attitudinal change, which allows the student to view colleagues as co-operators rather than competitors. In a subsequent chapter, we have discussed about PBL, which will give you a clearer understanding of application of these management principles in class room situations.

C. Core-dimensions of jobs: It has been postulated that every job has certain facets, which can be called as core-dimensions. Five aspects are now widely recognised and include—task identity, task variety, task significance, autonomy and knowledge of results. Let us take a quick look on these aspects, as viewed from the point of view of learning.

(i) Task-identity: When the role of an effort can be understood in terms of final outcome, identity is said to be high. This can be illustrated by a simple example. A laboratory technician who pours only boiling carbolfuschin on a sputum smear and then passes it on to the next will have a low identity compared to one who does the complete Z. N. staining and then looks for AFB.

As managers of learning, task identity is very important to us. Since we have to operate within a structured curriculum, task variety and task-significance can't be manipulated easily. However, task identity can and must be untilised to maximum advantage.

In our present system of medical education, no effort has been made to bring task identity to a high level. The student is taught elaborate biochemical steps but he does not know as to what use the knowledge of Kreb's cycle will be in the clinical setting. He is taught on bioavailability

Application

of drugs. but he is not told the importance of this when confronted with a patient. Task identity or what we can call as learning in context is very important for the students to organise their long-term memory. This supports the logic of integrating basic and clinical sciences throughout the medical course.

(ii) Autonomy: People need autonomy at work because it enhances satisfaction and increases productivity. Autonomy however, is not independence or freedom; rather, it means either absence of constraints or presence of facilitators. It means absence of supervision as a control. In another sense, it could mean organisation of autonomous work groups, peer relationships which foster understanding and open dialogue. It places value on internal rewards as a major source of satisfaction.

From our point of view, we can view autonomy as freedom to decide the means to reach the objective, increased discretion regarding time span and the effort required to achieve the objective.

Granting autonomy to medical students will require that most of us will have to change our faith from pedagogy (learner is dependent person, whose experience is mainly to be built on) to androgogy (learner is a rich resource for self-directed learning who is motivated by internal incentives). The learner will have to be delegated increased responsibility for initiating, defining and researching his own learning.

(iii) Knowledge of results or feedback has been discussed earlier under the goal setting theory. What needs to be mentioned here is that the concept of autonomy cannot succeed without an in-built system of feedback, for it would then become anarchy. However, care has to be taken to ensure that feedback itself is not used by the teachers as a controlling device. Feedback must not only be available but also immediate. It should be descriptive rather than evaluate ; facilitating rather than controlling.

Motivating Potential Score

The core dimensions viz. task, autonomy and feedback can be used for calculating an index, which is called the motivating potential score (MPS) and is represented by the formula, MPS = Task x Autonomy x Knowledge of results. If we grade the three components on a scale ranging from 0-1, a fairly comprehensive idea about the motivating potential of that particular subject can be obtained. More than figures, this formula makes an important point - that all three components are essential if we have to motivate the students to devote maximum efforts towards learning. If the subject is very interesting and important, if regular class tests are held, but if there is no autonomy to study, the net score would still be zero !

You must have enjoyed reading an entirely new kind of symbiosis between teaching and management. More and more educational

psychologists are favouring this kind of approach because of its beneficial effect on learning. You may be feeling that in our kind of set up, it may be difficult to apply this concept. To some extent you are right but when you go through the next chapter, you will appreciate the changing trends in the educational scenario. You will also appreciate that both the methodologies discussed in chapter 24 use many of these principles liberally.

23 *Media in Medical Education*

Learning Objectives

❐ Enumerate the most widely used methods/tools to facilitate medical education.

❐ Define CAL (computer assisted learning) and discuss its components, advantages and limitations.

❐ Enumerate the major elements that should form the backbone of a presentation.

❐ State and apply the basic principles of creating and delivering good PowerPoint slide presentations.

❐ List some practical tips to preparation of transparencies and their presentation using an overhead projector.

❐ Familiarize yourself with salient features of web based learning including Internet, e-mail, listserv and world wide web (*www*).

Media consists of tools and technology that facilitate the teaching-learning process. What we are going to discuss now is not a comprehensive list of all the techniques that are available for medical education. It is a brief account of some tested and widely used methods in medical education. The classification of the methods should also not be taken in its rigid form. A medical educationist can improvise some and can also develop some innovative methods, which are best suited for his local reality. Two or more methods can also be utilized at the same time if situation demands.

Medical education has not remained unscathed by the technological advances of 20th century. We have come a long way from a pencil and paper to chalk and a blackboard to overhead projectors to a computer and an LCD projector. Computer, CD ROM/DVD, overhead projection, 35 mm slides, and Internet are some of the more important media used in medical education today, other than the traditional chalk and board. We will outline their attributes and describe their applications.

CAL

1. Computer-Assisted Learning (CAL): Computer has become an integral part of our personal and professional lives. It consists of hardware and software. Hardware is the machine itself. For a personal computer, it consists of a monitor, a keyboard, a central processing unit and a mouse. It may also be a multimedia kit consisting of CD - ROM disc, speakers, microphone etc. The software is the electronic information that drives the hardware itself or runs the applications (such as text, graphics, data handling, statistics, simulation, communication and so on).

Definition: Computer-assisted learning (CAL) is defined as using the computer technology to assist with, augment or deliver part or all of the instruction or course and also to evaluate the student progress.

The process: PowerPoint slide presentations with the help of a computer and LCD projector have now almost replaced the other methods of teaching including the traditional slideshow with a conventional projector, overhead transparencies with a OHP projector, and the chalk and blackboard.

Multimedia

Two other modes of CAL are learning through multimedia and the Internet. Multimedia simply means software comprising of variety of media together. This can be text, sound, and still or videos that can be easily stored and carried in CD format. What all one needs is a computer with CD drive and the application software. For example, a student can learn about various cardiac murmurs from related software. Multimedia instructions can simulate a real life experience, such as decision-making on the job. Interactive multimedia allows the participated to interact with the computer by following instructions, completing exercises, answering questions and solving problems. Computers are excellent tools for providing simulated situations. Using the digital video disc (DVD), it is becoming possible to combine the best attributes of video with that of computers. DVD technology is fast replacing the CDs.

CAL is an excellent method to train the students in problem solving ability. It can train a novice to think and decide like an expert. The CAL packages are computer software meant primarily for education. Most CAL packages are run through CD-ROM (Compact disc-read only memory) system. Each CD-ROM stores enormous information, often in multimedia format, that can be read, displayed or unloaded on to a printer. Interactive CD ROMs/DVDs can substitute for the bulky models and non-interactive videos. Well-designed discs can be specially used for conceptually difficult topics through the use of interactive animation, video and simulations.

Online Learning

The other dimension of CAL, i.e. learning through Internet is tricky. A load of information is available on the net that may or may not take the student to the right path. Here, the facilitators can direct the learner to the

websites providing evidence-based material. Evaluation on use of interactive educational websites has revealed that it is a valuable educational tool, especially when used in conjunction with other teaching techniques. The stages of competence in online learning include:

   i. gaining access,
  ii. gradually becoming familiar with online environment,
 iii. seeking and giving information; and
  iv. ultimately taking responsibility for own continuing development in online learning.

Limitations: The cost of hardware, software and the telephone line charges are the major hurdles in initiating or augmenting computer-assisted learning. Students may have that initial fear or hiccup about the machine and the technology. Developing computer-assisted learning application is a lengthy and skilled process; and acquiring readymade application is a very costly affair. However, innovators within the traditional courses can embrace the concept and have often produced creative and high quality material to supplement their existing courses. The focus should be to identify these resource persons and make them and their innovation visible to those who are computer savvy. Medical Education Units in individual institutions can serve to develop mechanisms to allow exchange of skills, resources and ideas between institutions and put them into practice.

Introduction to PowerPoint

2. PowerPoint Presentations: Microsoft® PowerPoint® software is a component of Microsoft Office® package that combines text, images, drawing features, and other objects to create self-running or interactive displays to support or enhance formal lectures. The software offers ideal opportunities to create dynamic and innovative presentations. Each file created by PowerPoint is called a presentation and each presentation is made up of slides.

The slides improve the delivery of the spoken message by visual reinforcement of the key points. They are particularly suited to large audiences. Good slides enhance the range, the speed and the depth of presentation. Slides can bring the remote and inaccessible to classroom. Full colour capability makes the slide presentations highly absorbing.

Not only does this software simplify the once tedious process of making slides for a lecture/presentation by photographing them and then developing them as 35 mm projection slides, it also has provisions for incorporating audio and video clips so that the presentation can even be made in the absence of the speaker itself!

The 5 Step Approach for Creating Presentations

This approach is depicted diagrammatically in the following figure.
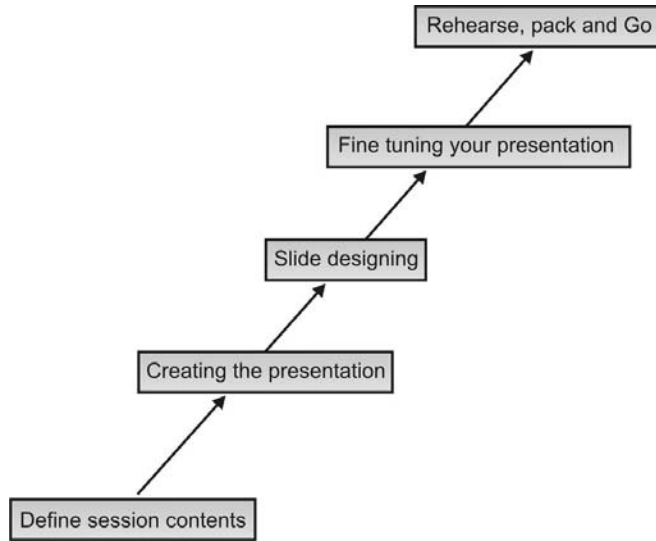
A five step approach to prepare a PowerPoint presentation

Step 1: Define Session Content

Decide the topic, learning goals, and specific learning objectives of your presentation. Organise your thoughts and arrange the matter you have in an orderly and logical sequence. The logical flow of content material includes the title, introduction, aims and objectives, the body of presentation, and finally the summary and/or conclusions. This framework devoid of colour, text, pictures, audio/video etc. is to be followed by storyboarding, i.e. to create a paper presentation. Storyboarding is a preclude to building the PowerPoint presentation and provides a clear understanding of the overall content and its arrangement. Also decide whether the presentation is going to have text only, or text and pictures interspersed, and whether any sound or video clip needs to be added. For a presentation to be effective, the content should be dictated by five major elements (Table 1).

Story-boarding

Table 1: Designing presentation content: Major elements

1. *Novelty:* A presentation commands attention only if it offers something new.
2. *Utility:* Make sure the presentation provides relevant 'learning cues'; something that can be used right away or it gives an appropriate take-home message.

Contd...

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3. *Conversational value:* The contents should deal with topics of interest likely to generate debate.
4. *Emotional value:* A presentation should strike a chord with audience by captivating them on the emotional front.
5. *Entertainment value:* The presentation should not bore the audience and douse any sparks of interest.

Create Slides

Step 2: Creating a Presentation

Once the content and other material is ready, start off by opening the PowerPoint software. It will open a file tentatively named 'Presentation 1' (which may later be renamed as per user's choice) and ask the user about the type of presentation to be made through an Opening Dialog Box, which shows three options:

- 'Auto Content Wizard' (automatically guides the user through pre-designed background and placeholder settings and content suggestions),
- 'Design Template' (providing a selection of pre-designed backgrounds and placeholder settings without content suggestions), and
- 'Blank Presentation' (allows total freedom to the user to choose various parameters).

Choose a Layout: For a beginner, it is advisable to use the autocontent wizard. Placeholder settings are already decided as per the user's requirement and one just has to keep on inserting text/picture at the desired place. However, it has got its own limitations and cannot hold a creative user for long.

Using the Blank presentation mode, the user has to choose the desired layout of the slides depending on the type of presentation. The layout can be changed with each new slide that is added to the presentation as prompted by the PowerPoint software. Various types of slide layouts are available; few are listed below:

- *Blank*: text and/or pictures can be added according to one's own specifications.
- *Title slide*: there are two lines of text for creating headings/titles.
- *Title only*: a similar format which has one line for title only.
- *Bulleted list*: a title bar with a box for adding text in points.
- *Two-column text*: a title bar with two columns of text.
- *Text with table/chart/clip-art*: allows insertion of these along with text on one side.
- *Flow charts*

To create another slide, click on the 'New Slide' button on the Standard Toolbar or click on 'Insert' and then on the 'New Slide' option in the drop-down menu that appears.

Add text	*Adding Text:* To add text to a blank slide, click on the 'Text Box' option at the lower toolbar followed by a click on the part of the slide where the text is to be inserted. In certain slide layouts (autolayouts), the position of the text box is already decided and the user simply has to fill in the text at the appropriate places. The font style, size, and other enhancements like bold, italics, shadowing or underlining can also be added from the main toolbar. The alignment (center, left or right) of the text can also be specified from the main toolbar, keeping center alignment for the main headings and titles and a left alignment for rest of the text.
Correct Font	*Use 'Sans Serif' Fonts:* The fonts are of two types, serif and sans serif. Serif type is preferred for the printed word while the other for electronic media. The serif is a small tail added to the ends of letter strokes as a decoration and helps to guide the vision of the reader along the line (e.g. *'Times New Roman'*, *'Book Antiqua'* and *'Centaur'*). The sans serif type (which means 'without' serif) being of a uniform thickness throughout is much easier to read when projected on a screen (e.g. *'Arial'*, *'Helvetica'* and *'Tahoma'*).
	Limit to Two Font Types: Stick to a maximum of two different clear and reasonably bold fonts during the entire presentation, one for the headings and the other for the remaining text, rather than trying to create a spectrum of fancy yet illegible fonts on the slides.
	Use Minimum 24 Point Size Font: The size and amount of text per slide should be dictated by the size of the venue. Font size should be no less than 24 point for the main text and 36 point for titles. Changes in font type and size may be resorted to when one wants to emphasize main points or key words in the presentation but they should preferably be used as sparingly as possible.
	Avoid CAPS: Use upper case letters judiciously. Choose predominantly lower case letters for obtaining maximum presentation effect, and improved reader comprehension. When a word is in capitals, the eye is presented with a rectangular shape that is more difficult to read and less intuitive. It is also not a must that the titles be in capitals. They also look better when presented in 'title case' i.e. a mix of upper/lower case letters.
Rule of 6	*Follow the Rule of Six:* Rule of Six', i.e., six lines per visual and six words per line, ensures that the audience is not bombarded with too much at a time and is able to retain more data.
	Do not Clutter the Slide: Present only one idea or concept per slide. Everything that needs to be spoken need not be included in the presented text. Combine the visual cues provided by the slide with verbal explanations to improve understanding and attentiveness. Example of a good and a bad presentation is given in the next page.

Examples of bad (left hand side slides) and good (right hand side slides) presentation: (A) too much use of capitals, use of serif type *(Times New Roman)* font and fancy backgrounds; corrected in (B); (C) too small font size (20), too many words in a single line, too much text in one slide and everything that needs to be spoken is written on the slide; corrected in (D); (E) use of fancy fonts and too many types (4) in a single slide; corrected in (F)

Pictures

Headers, Footers, and Comments: These can be added *(See* under 'View' button) to carry the date, time, slide number, and/or additional text. Comments (under the 'Insert' button) may be added to each slide just as a notepaper pasted on a slide, acting as reminders and suggestions for the speaker. These may be hidden during a presentation and revealed as needed (using 'Show/Hide Comments' button on the Reviewing Toolbar).

Tables: Tables can be created on slides using these options from the Formatting toolbar. There are two features to create tables; 'Insert Table', which creates charts with a preset number of columns and rows, and 'Draw Table' feature, which requires manual creation of the tables. The size of the text in the tables remains unchanged even if the size of the tables is altered.

Flowcharts: These may be created using the 'Organization Chart' tool (under the 'Insert' menu, go to 'Pictures' and then select 'Organization Charts'), which guides the user through its creation in a separate window. Once the flowchart is complete, go to 'File' button on the main menu, then click 'Close and Return to Presentation' and a dialog box asking whether one has to update before closing the chart. Click on 'Yes' to insert the chart into the presentation.

Adding Pictures: Pictures and graphics may be incorporated into presentations to make them more lively and interesting. However, they should be relevant and not mere decorations. To add pictures onto a slide, click on the 'Insert' button on the main toolbar and go to pictures menu to specify the source (either from clipart, file, scanner, or a digital camera). Symbols should better be avoided, as these are likely to change with the computer. Cliparts are better in that respect. While adding pictures, it is prudent to use the format that takes less disc space (e.g. jpeg and .gif) and avoid those taking more space (e.g. bmp) so that the presentations could be easily copied. The size and magnification of the image should preferably be edited in an image editing software before bringing it into the Power Point file. The position, size and magnification of the picture can be changed by dragging and using the arrows at the corners of the picture. It is essential to make sure that the picture is clearly visible even to the last row of the audience. Some of the details may not be legible when they are magnified too much or contain too small a text font.

Graphs and Charts: Bar diagrams, pie charts, and line graphs are effective tools to show trends and statistics. The impression received from such figures seems to be more vivid and lasts longer than the impression from numeric data. Use 'Insert' menu from the toolbar to inset the desired graph. Use contrasting, bright colors to delineate between categories. Do not include too many bars in one chart. Simplify the graphs and show more of them.

Once a portion of the presentation has been created and its various settings made, it is important to save the changes to the hard disk so that the material is not lost in case of a malfunction and these may be edited and updated later.

Step 3: Slide Design

One may also make a choice of the Backgrounds, Color Schemes, Design Templates and Fonts (all are placed under the 'Format' drop-down menu) to further enhance the look of the presentation but it is important to retain the emphasis on simplicity and clarity of content rather than going overboard and ending up creating unnecessarily decorated slides. Follow the acronym KISS (Keep It Simple Stupid), when designing a slide.

Backgrounds: Design templates are pre-designed presentations that contain a wide variety of styles and designs, such as coordinating backgrounds, fonts, colours, objects, etc. which allow the presenter to focus more on content than on design while preparing the presentation. A design template may also be changed for a particular presentation or even for individual slides. Similarly, backgrounds and color schemes may also be changed individually but it is always better to maintain uniformity throughout the presentation and follow one particular format.

Colours: Use a uniform colour scheme throughout the presentation. Limit the number of colour regions on any one slide to a maximum of four. The changing colours should arouse interest towards the key concepts and not distract the reader from it. Avoid busy and confusing backgrounds. A dark background (e.g. blue) with a light color of text (e.g. white or yellow) should be used. A white background with dark colours (e.g. green, blue) remains equally effective. Colours have important psychological effects with blue and green being more 'cool', while orange and red being more 'hot' and white being more cheerful. Red colour should be used as sparingly as possible. The colours that may appear on the monitor of your computer may not appear in the same hue on the screen and so it is imperative that the text colour should be easily distinguishable from the background. The colours used in the slides may create difficulties if one has used exotic shades because most computers can provide millions of shades but most projection systems provide a limited array of colours (about 256). When projected in large theatres, the colours usually appear darker than they are, with the opposite being true for smaller venues.

Blank Screen: While speaking along with the presentation, it is important to hold the attention of the audience on the speaker and not on the images. Therefore, when you share an example that does not need a visual or when, during your talk, the audience members have a long

Layout

Colours

Slide-master

Video

discussion among themselves; the screen should be turned blank. This can be conveniently done by pressing the key 'B' to make a blank black screen or 'W' to make the screen white so that the audience remains focused on the content.

Making a Global Change: Slide Master is a helpful tool that allows the user to make a global change to all the slides, both existing and new ones that may be created in the future (except the title slide). This may be done in the form of adding a picture or logo (say, your institution's logo), changing the background, or font size/style etc. Decide whether a common theme is going to run through the presentation. For example, a presentation on breastfeeding may carry a logo of mother feeding the child as background or in a corner on each slide.

Change the Order of the Slides: Slide Sorter shows all the slides lined up on the screen as thumb-nails. In case one wants to change the order of the slides, one has to drag the slide number up or down the list in the Outline view to do so. However, one should be careful as dragging it sideways will delete the slide.

Sound Files: Sound files may be incorporated into the presentation at appropriate points (e.g. to demonstrate a cardiac murmur. However, most ordinary sound cards cannot satisfactorily reproduce the sound right up to the rear end of a large venue, so either avoid it or have some amplification.

Video: Videos can also be incorporated in the show: for example, to demonstrate a procedure. Video depicts pictures as well as sound. Unlike stationary slides it displays movement and is therefore a live medium. Real life situation can easily captured, played and replayed. The remote (an experiment in Antarctica), the inaccessible (an endoscopic visual of the duodenum), the delicate (care of a tiny baby in an intensive care) are demonstrated best by the video. Unlike most other media, video can be used to change the attitude of the audience (e. g. by showing the dedicated care of the sick children by Missionaries of Charity) and motivate them for a cause. Video is highly effective in explaining procedures.

Step 4: Fine-Tuning Your Presentation
Effects: Once the material assimilation is complete, it is important to give it the finishing touches to make it more refined. The various size parameters may be changed and the slides modified for any type of presentation. The default orientation of the slides is the Landscape (horizontal) mode but it may be changed to Portrait (vertical) if necessary. If a 'vertical' slide is used in the presentation, the entire presentation will need to be 'zoomed'

Effect

down in order to fit on to the projection screen. Avoid vertical format slides whenever possible.

Transition Effects: Transition is the term used to describe how a slide is introduced onto the screen. The images can fade on and off, slide or drop, or be built up in different ways. The user has to define the various parameters of Slide Transition by clicking 'Slide Show' followed by 'Slide transition' on the drop-down menu. The slides may be changed by the user himself or at preset times during the presentation with or without accompanying sounds. In addition, various special effects in moving from one slide to the next may be added and its speed controlled. However, one should avoid repetitive changes in the transition effect. It may be distracting to have the slides popping in from different sides of the screen and in different manners.

Animation: The option of animating objects on the slides can also be used to make things livelier, using 'Preset Animation' and 'Custom Animation'. This overcomes the major drawback of 35 mm slide projection, i.e. its static nature; as all the information present on the slide is presented instantaneously. In contrast, a PowerPoint slide can begin with a simple framework that subsequently grows in detail with sequentially added data and/or superimposition.

Animation

Animation should only be used sparingly and one should not try to incorporate every feature on offer as it may distract the audience rather than reinforce the message. It is also to be noted that animation takes its own time and thus increases total presentation time. The Preset Animation function animates the appearance of specified objects and text from among 14 types of settings. With this, one can reveal each point in the bulleted list one by one as one goes through discussing them and not all at the same time, so that the more impatient ones among the audience don't wander off to the next point while you're still discussing the previous one. This results in poor synchronization of the projected material with what is being said.

Custom Animation gives the user more control over how, when, and in what order objects and text will be animated on a slide. All this can also help create interesting visual effects (like a bulleted point flying in from the left or dissolving etc.) to keep the audience hooked onto what's coming next. The type of animation that is used is also important, e.g. wipe right for text (as natural for eyes) and wipe top for bars etc. Another option is to dim the previous points so that the point under discussion only is highlighted.

Pack and Go

Step 5: Rehearse, Pack, and Go
Print the Draft: Once the presentation is complete, print a rough draft and proof-read it for errors and readability. To print a rough draft of all the slides, select the 'Print" command under the 'File" menu and choose the 'handouts' and 'slides per page:6' and check the 'pure black and white' and 'scale to the paper' check boxes.

Pack and Go: If the user is not aware of the specifications of the projection system at the venue, it is best to use the 'Pack and Go' wizard. This allows the user to pack together a number of PowerPoint files with all linked files (clipart, sounds etc.) along with all the TrueType fonts in case it is not available at the venue. It also has the PowerPoint Viewer application, which enables presentations to be viewed on computers that do not have PowerPoint 2000 installed.

Carrying your Presentation: Once the packing is complete, it may be carried to the venue on a CD, pen drive or stored on a laptop. In spite of all preparations, snags can appear at any stage. To be safe, keep a printout of the slides at hand, which may be referred to while speaking. Another option is to use overhead projection by photocopying or printing the contents of slides on transparencies as a back up. If all else fails, one can just provide handouts to the audience in case there are major technical difficulties at the venue like electricity failure.

Avoid Timed Slides: Timed slides (i.e. slides with automatically timed transition) should preferably be avoided. If at all used, it should be tested in advance to ensure that the timing of the transition is appropriate and the audience finds it comfortable to follow the presentation.

Prepare to Present

Have an Idea of the Venue: One should have a fair idea of the size of the venue and of the audience as well while deciding the size of the Fonts so that the presentation material is legible for the whole audience and not just the first few rows of people. The distance of the projector from the projection screen will alter the size of the text and therefore it is important to rehearse with respect to visibility of the slides from the last row of the venue. Do not forget to test for appropriate lighting in the room. It is important to be able to see your audience to gauge their reaction. The lights close to the screen may be switched off and those towards the back rows are turned on.

To Sum Up
Multimedia applications for slide production and presentation such as PowerPoint can improve attention levels, learning capacity and retention rates. In the long run, it appears to be more cost-effective than traditional 35 mm slide presentations. Although it does require initial effort but the learners find it to be an efficient and effective method that enriches their

studying experience. Moreover, computer generated presentations are amenable to last minute changes unlike the earlier methods where, an error, if committed, remained an error throughout.

PowerPoint slides: Key messages

- Use a simple dark background with light lettering or white background with dark lettering
- Use a uniform colour and font scheme throughout the presentation
- Use san-serif type of fonts (e.g. *'Arial'*, *'Helvetica'* and *'Tahoma'*)
- Use a font size large enough to be seen from the back of the room (at least 24 for main text and 36 for titles)
- Do not include more than six text lines per visual and six words per line.
- It may be a good idea to follow the rule of 10/20/30; i.e. a PowerPoint presentation should have 10 slides, last no more than 20 minutes, and contain no font smaller than 30 points. A little flexibility is allowed. But you should never create more than one slide for every minute of your presentation.
- Always have a back-up plan (adequate copies of presentation, transparencies, handouts etc.)

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3. Projection Slides

35 mm Slides

Projection slides (35 mm) used to be a popular media among medical scientists and teachers. Now it has been overtaken by the PowerPoint presentations. All the technical details that have been discussed above apply equally to 35 mm projection slides. However, the process of making 35 mm slides is more tedious, costly and time consuming. The steps include (i) preparing the slide on paper (text by typing, and pictures/photos by drawing/actuals); (ii) transferring this to the 35 mm film (by exposing through a camera); (iii) developing the film; and (iv) mounting the slides on frames.

Preparing the Slide on Paper: In a typical text slide the typed area should not exceed 17 mm x 21 mm, number of words should not exceed 36, and number of lines should not exceed 6. Capital letters should be used sparingly. The text should be printed bold and clear. Remember, a large number of intelligent persons will be scrutinizing your presentation.

Preferably use a laser printer for obtaining the output. If routine typewriters are employed, use a good quality ribbon. Placing a reversed sheet of carbon behind the typing paper produces a denser image, which is more suited for a slide.

Exposing: Use a high speed/resolution film, especially if photographs/pictures are incorporated. Check thoroughly for spelling mistakes or factual errors before exposing the printout. Unlike PowerPoint presentations, mistakes made at this stage are not rectifiable.

Mounting. Slides should be properly mounted. Mounting in the portrait mode should be avoided; as such a slide when projected would invariably go beyond the screen top. Worn out slides should be discarded.

Double Projection

This means running two sets of slides run concurrently on two different screens by two projectors. This can be very tricky and you need very good planning and several rehearsals. Double projection is useful when description in the two concurrent projections is either complimentary or in contrast. For example you may show the list of radiological manifestations of hyaline membrane disease on one screen while a slide of the actual X-ray in the other. An example of contrasting information may be clinical pictures of a patient before and after surgery. Double projection should not be used for sequential information that is read from one screen and then the other. Double projection allows more information to be shown in the given time and gives a better impact, if effectively employed.

Practical tips: 35 mm slides

- Mark the lower right corner of the mounting frame with a dot.
- Arrange your slides before hand. It may be a good idea to write the title of the slide on the frame and number them serially so that even if the slide bunch falls and gets disorganized, it can be rearranged easily.
- Arrange the slides on the slide tray of the projector carefully. Have a trial run in the preview room.
- Avoid double projection unless adds to talk and is well rehearsed.
- To engage the audience in an interactive discussion, you may stop the slide presentation for some time, ask for lights, and re-establish eye and verbal contact with the audience. This will break the monotony and help rejuvenate the talk.

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4. Overhead Projection (OHP): The overhead projection (OHP) is a versatile instructional medium designed primarily for teaching. It is not an alternative to the chalk-board, but has its own unique features, capabilities and merits. Overhead projector entered the classroom in the 1970s, and emerged as the most popular medium in education, before computerized presentations threatened its existence. The most significant attribute of overhead projection is that it can be used with the room lights on. This enables the teacher to maintain eye contact with audience and thereby ensure an interactive learning environment. OHP is also a very user-friendly system. The presenter can easily make her/his own transparencies using colour pens (and not depending on the audiovisual units) at an affordable cost.

Preparing Transparencies: Size and covered area: Transparencies are either square or rectangular in shape. Regardless of the shape, the visual information should occupy only the central area not exceeding 18 cm vertically and 24 horizontally.

Typing Text

Letter Size: Legibility is an important consideration of any visual presentation. The audience should be able to read the information on the screen, from every corner of the room. For most situations, the vertical height of the letters on the transparency should be at least 1 to 1.5 cm. In the case of printed matter, the letter size should at least be 18 points.

Handwritten or Typed: One feature of the overhead projection system that makes it the most practical of all instructional media is that the transparencies can be easily handwritten. You do not have to depend on the illustration units to prepare the material.

While making a handwritten transparency, it is a good idea to place a ruled paper underneath. This helps in writing in straight lines, which may not be otherwise easy for many of us. Overhead transparencies can also be conveniently prepared using the electrostatic photocopier machines, even in colour. However, only polyester transparencies with thickness of at least 100 micron can be used for this process.

Storing: If a transparency is likely to be used again and again, it is wise to mount it on a cardboard frame or store in a plastic folder for better storage. Framed transparencies also make it convenient to use overhead and masking techniques. Such frames are available commercially.

Show it Effectively

Masking: How do we carry out masking? A simple and practical method of masking is to place a paper or a card on the transparency and move it gradually as the presentation progresses. Some presents find it difficult to control the masking in this way. A more organized approach is to cut one or more strips of a card and paste them to the frame of the transparency. The presenter then lifts the strips one by one, uncovering the visual in steps. Masking should not be overdone. If all that is written on the transparency is a single message, it is not advisable to mask it.

Advantages: Masking allows us to explain structure, describe procedures, emphasize a part of the visual, and above all, to build up complex information bit by bit. Sequential information is delivered more effectively by overlay system rather than by masking technique. Overlay technique has more dramatic effect than masking.

Care of the Overhead Projector: OHP projector should be carefully maintained. All glass surfaces tend to collect dust and fingerprint smudges. These should be cleaned properly. The projector should be covered when not in use. To prolong the life of the bulb, the switched off lamp should be allowed to cool by running the fan so long as warm air is emanating from the fan to be operated on its own.

Projector

Screen: The screen size should be related to the size of the room. A general rule of thumb is the so-called 2 by 6 rule. It means that the nearest viewer should not be closer than a distance equaling 2 screen widths; and the farthest not more than 6 screen widths away. This approach ensures an optimum view for all members of the audience.

Projector Adjustment: The projector should be placed such that its beam makes a perpendicular with the screen. This requires the mounted lens of the projector to be at the level of the middle of the screen. The distance between the projector and the screen should be adjusted so the image fills the screen fully. If you increase the projector screen distance, the image will become larger but less brilliant.

Practical tips for improving OHP presentation

- Do not switch off the room lights.
- Stand on one side of the projector so that you don't obstruct the view of the screen.
- Place the transparency properly on the stage before switching on the projector. It looks amateurish to put on the projector first and then struggle with the transparency.
- Do not leave the visual on the screen after a point has been made.
- Switch off the projector if no transparency is being projected.
- Use a pen or a pencil as a pointer on the overhead projection system. This enables you to maintain eye contact with the audience. However, if you feel you would have more impact by using pointer on the screen, it is quite all right to do so.
- If you use transparencies framed on a cardboard, it is a good idea to write lecture cues on the frame as an aide memoir.
- It may be a good idea, at times, to add extra information to a prepared transparency at the time of presentation. It gives an element of spontaneity and helps draw better attention of the audience. If the transparency is valuable and cannot be written on, you may superimpose a blank transparency and use that for writing.

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4. Web based Learning: Several computers when interlinked with each other are called a network. This link may be by cables, telephone lines and/or the satellites. A user of any terminal of the network can share information from all the other terminals. Networks are created by individuals, interested in sharing information. A network may thus encompass several or all computers of a hospital (e. g. linking laboratories, wards, blood banks, pharmacy etc.) or of ten libraries in the country or a hundred medical schools in five continents. A very large network may have several constituent networks.

Most medical schools in the west provide extensive computer networks for their students, and these are increasingly becoming a core component of teaching and learning.

Internet

Internet: Internet is an extensive network of interlinked computers storing a vast and varying quantity of information. The facilities available through Internet are discussed below:

1. *E-* (electronic) *mail* is an extremely rapid method of sending messages, which may include text in the form of case histories or references and images such as clinical photographs or radiographs etc.

2. *Listserv* is an extension of E-mail facility and provides access to various discussion groups on a particular subject.

3. *FTP* (file transfer protocol) is a method by which the files of a remote computer can be accessed and transferred to one's own computer. For example, Centers for Disease Control at Atlanta has enabled free access to their weekly mortality and morbidity reports through FTP.

4. *Telnet* allows a computer to log on to the system of another computer and use its data. One can browse through Medline or other medical databases by using this facility.

5. *World wide web (WWW)* is the most popular application of the Internet. It is a network of servers which offer pages of information which is not only text but also graphic as well as audio. Through the hypertext system of the WWW, documents or even images may be obtained. Hypertext transfer Protocol (HTTP) is the Internet protocol for transferring hypertext documents. Uniform Resource locator (URL) is the special address system used by the WWW to locate specific documents.

Course based websites can be developed to provide easy access to all relevant documents and course based information. These websites can also offer links to external resources and facilitate discussion outside the classroom.

Applications of the internet

- Internet is the largest store of information. It uses the interactive hypertext environment for information exchange. The user can seek initial information and then go across to a sub-topic and onto related information, and so on. The search and access is not linear, but branching with loops for feedback. This becomes a unique learning medium.

- It can help medical teachers to share information about various aspects of education.

- It is an unmatched tool for distance education. Periodically updated information (say on management of dengue) can be put on Internet for rapid global dissemination.

- Using E - mail facility, you can communicate with people across the world and seek information on areas of concern.

- You can browse through university libraries and conduct online search of literature.

Contd...

- It is a publication medium also. The Cochrane network publishes scientific papers on meta-analysis of various clinical trails on Internet (without written publication). These are counted as publication by the concerned authors.
- Internet is also available for telemedicine, telesurgery and teleconferencing.

Internet revolution is just beginning to take off in India. Future students will be very well versed with Internet. It is time that medical teachers also familiarize themselves with the emerging importance, educational potential, reach and versatility of the information superhighway of which Internet is a mere harbinger!

Newer Methodologies in Medical Education

Before we conclude this book, it is time to introduce you to some of the newer methodologies being adopted for medical education all over the world. The basic reason to look for these alternatives is the dissatisfaction with the conventional mode of education which is losing its relevance in this era of information explosion. Continuing education of health professional poses another challenge which conventional education is unable to meet. There are over 25 different teaching methodologies described but we shall restrict our discussion to only two *viz*. Distance education (DE) and Problem-based learning (PBL).

A. Distance Education (DE): What does the term DE mean to you - shabbily printed course material to be read at home and an examination which is there only for name sake after which you are awarded a degree? Probably you are incorrect. This kind of impression about DE stems from our prior experiences with what was called correspondence education. The only commonality between DE and correspondence education is the use of printed material - otherwise they are poles apart. As we discuss with you the basic principles of DE, you will appreciate what we said just now.

Definition

It is difficult to give a precise definition of DE; depending on which aspect of it is being emphasised, experts have given different definitions. The common points which emerge from perusal of these definitions can be stated as follows. " Any non-conventional learner - centered teaching - learning system which does not rely on face-to -face teaching as the primary mode of instruction but which facilitates two-way academic dialogue by

a variety of media. " You will realise that this definition gives a very wide canvass to DE and does not restrict it to mere printed lessons.

The concept of DE is complimentary to the recent concept of 'New Learner', who prefers a non-formal, life long orientation of one's awareness and who is aware of his abilities, needs, strengths and weakness. The system does not bind the learner with constraints of place, time, space, entry requirements and pace of learning - rather it allows the learner and the teacher to work apart without depending on word of mouth as the sole means of communication but uses unorthodox means of communication to continue two - way academic exchange.

New Learner

We want you to distinctly understand that a distance learner is not a loner - rather he has the support of a large number of subject experts, educationists, psychologists, media experts, academic counsellors and tutors. In this sense, DE permits privatisation of institutional study as well as institutionalisation of private study.

It should be clear to you that while correspondence education tries to impart conventional courses and curricula through print, DE uses non - conventional, learner - centered curricula through multimedia approach. In this way, it compliments rather than replaces conventional education. DE is cost effective and cost efficient as compared to other modes of education - primarily because it can address a large number of learners at one go. Further, it maintains equality and quality of education. DE can also be used for traditional campus based teaching, thus allowing freedom to teachers to engage themselves in research and other academic pursuits.

In effect DE entails the following processes : -
• Formulation of curricula
• Production of self-instructional materials (SIM)
• Distance teaching
• Evaluation
• Student support services

Process

Let us discuss them one by one.

Curricula

Formulation of Curricula: DE evolved out of learner needs. The curricula for DE are therefore based on real life situations rather than on conventions. The curricula may relate to continuing education, skill updating, recent advances, growth of professional (*e.g.* management for doctors) or even self-enrichment. They evolve out of learner's needs, hence they are better accepted and are able to generate motivation on the part of the learner. We have already discussed this aspect with you in chapters 2 and 22.

Instruction

Production of SIM: SIMs are the 'heart' of DE. As the name indicates they are self-instructional and therefore act as surrogate teachers. Just like a real teacher, they provide information, they motivate, they inspire, they evaluate, they provide feedback and they guide to further reading. These materials are learner active, i.e. they require some activity on the part of the learner and do not lend themselves to passive reading. These materials can be in printed form or use other media like audio, video, learning kits, computers, *etc.* For cost considerations, most DE programmes use print as the primary medium, supplementing it with others.

You may be wondering, how SIMs differ from a textbook. Look at the table below and you will understand.

	Textbook	*SIMs*
Communication	One way	Two way
Learner	Passive	Active
Structure	Hidden	Known
Learning	Self directed	Guided
Mode	Lecture	Dialogue
Application	Less	More
Activities	None	Plenty
Division	Chapters	Small Chunks
Assignments	None	Provided
Feedback	None	Available

Teaching

Distance Teaching: As we have already pointed out, SIMs include a lot of activities and assignments. These assignments have to be completed and sent to a tutor. The tutor's job is not merely to assign marks or put a tick here and there but to *distance teach*. The purpose of distance teaching is to provide an immediate feedback to the student and guide him towards better learning. Distance teaching is done by writing academically useful comments, pointing mistakes and suggesting ways to improve learning. After a student has been graded, the tutor has to write a global comment explaining why a particular grade was awarded. A provision has to be built for supplemental communication also. In case a learner does not agree with the grades awarded, he can write back to the tutor seeking clarifications.

Assessment: We had discussed with you in previous chapters that assessment has a very strong influence on learning. This principle is extensively used in DE. Various forms of assessments used in DE include.
• In-text questions, meant to stimulate thinking. The answers are provided simultaneously.

Assessment	• Self-check exercises, given at the end of a complete piece of information. They may require either factual recall or ask the learner to relate a given information to his prior experience. Sometimes a learner may be asked to use this knowledge in a new situation. • Computer marked assignments, usually given at the end of a block and consist of multiple choice questions, aiming at test of factual knowledge. • Projectwork, aimed at providing practical hands - on experience to the learner so that he can apply his newly acquired skills to actual life situations. • Tutor marked assignments consist of short answer questions and structured essay questions to test comprehension and higher level of knowledge.
Support	**Students Support Services** are an important aspects of DE because there is no peer group. Being physically away from tutors and peers, distance learners require a higher level of motivation. Student support services are generally made available at study centres. Basically these include library facilities, A-V media, peer group interaction, tutor interaction and counselling. All these aim at breaking social isolation of the distance learner.
Philosophy	*B. Problem-based Learning (PBL):* Have you ever come across the term problem-based learning? Probably your response will be yes. You will say that you have been always teaching your students, based on problems. You expect them to analyse and synthesise facts that you have taught them, in relation to a particular problem. We are afraid, you are only partly correct - what we referred to just now is called problem solving which is a skill and qualifies to be called a teaching method. Problem-based learning (PBL), on the other hand, is a totally different educational strategy, where the problem is posed first and learning areas are identified later. Thus, in contrast to problem solving, where the student already has the knowledge, PBL emphasises acquiring new knowledge in the context of the problem. With this brief introduction, let us take you through some of the advantages of adopting PBL as an educational strategy.
Need	The contemporary scenario in medical education is radically different from that prevailing say 20 years back. The pattern of diseases, morbidity and mortality, population explosion, has never been so much as it is now. Every issue of thousands of medical journals brings new discoveries and modalities of treatment. The existing medical curricula is also showing

signs of expansion. In the recent years, many subjects have been added to the examination scheme and others are likely to be added.

The biggest criticism, however, against the traditional medical education is the fragmentary and unintegrated training given by different departments. There is no effort to keep the future requirements of students in mind. Passing the examination becomes the major concern of most students with the results that when students reach clinical years, they have already forgotten the basic sciences. Even in clinical subjects. emphasis is on teaching hi-tech theoretical aspects. Thus, our students can rattle off everything about Pontiac fever or Alzheimer's disease but find it difficult to outline the management of dehydration or pneumonia. Another tragic side of the coin is inability to perform minor procedures like giving an injection. Even if a student has learnt basic procedures, these are under the buffered and protected environment of a tertiary level hospital. When confronted with an actual patient in a practical situation, even the best of students finds himself at a loss.

The basic approach of PBL is learning in context. It puts the learner in a particular situation and then gives him a task as a source of learning, comparable to an actual task that he may be confronted in his future professional life. The burden of learning is shifted from the college or teacher to the student himself. PBL devotes less attention to filling the mind ; it aims to prepare and develop it.

Taxonomy

You may recall at this stage, the taxonomy of learning. PBL uses a slightly different kind of taxonomy which includes structuring the knowledge for use in clinical context (SCC); Clinical reasoning process (CRP); Self-directed learning (SDL) and motivation to learn (MOL).

Process

The process of PBL begins by identifying local/regional disorders, which are used as a base for problem formulation. It also needs to be identified at this stage as to what is not to be taught. A problem is then presented to the students in the form of an actual clinical case, as illustrated here.

A 25 years old male patient is brought to the emergency with complaints of pain in abdomen.

Once a problem has been stated, trigger areas are identifies by the students themselves under guidance of a tutor. These trigger areas are used to lay down learning objectives. With reference to preceding problem, the trigger areas could be :
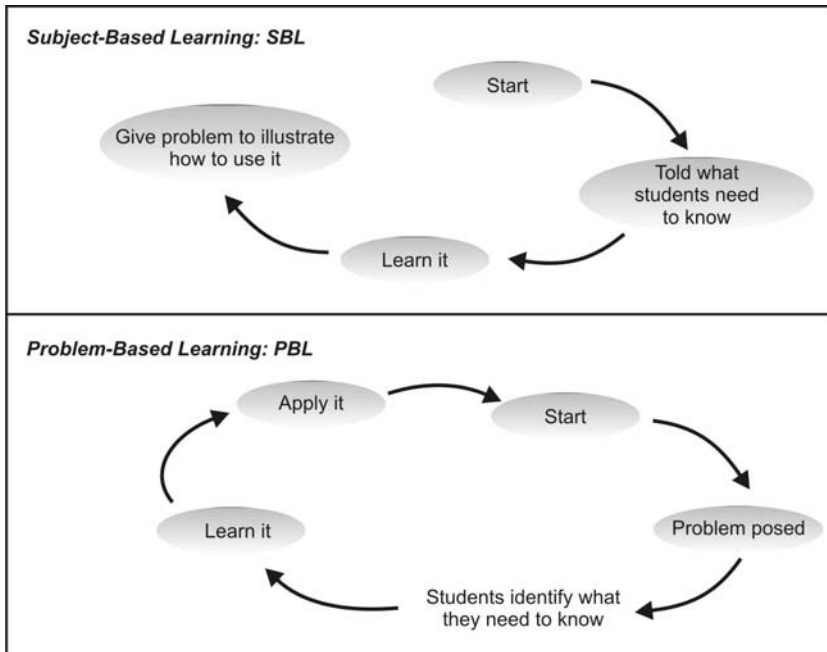
• Anatomical and physiological basis of pain in abdomen.
• Anatomical and physiological basis of presenting symptoms.
• Conditions which could mimic this type of presentation.
• Physical findings to conform or refute these conditions and so on.

After the learning areas have been identified, the students discuss with the tutor, from where and how to seek this information. This may

include library, skill labs, hospital wards, laboratories, museums or discussion with resource persons. The students collect facts, verify them from various sources, draw conclusions and form judgements. This educational strategy prepares the students to learn even in new situations and become what can be called life long learners.

No two patients present with similar features or with textbook symptoms. These are always variations. This requires development of a thinking

Advantages

Subject-Based Learning: SBL

Start → Told what students need to know → Learn it → Give problem to illustrate how to use it

Problem-Based Learning: PBL

Apply it → Start → Problem posed → Students identify what they need to know → Learn it → Apply it

process for correct diagnosis. By adopting PBL, reasoning and analytic skills of the student develop to a much greater extent. Students develop tolerance for ambiguity and develop an attitude of accepting a probability rather than a certainty. They develop respect for the views of others and a satisfaction in team work.

Experience has shown that students learning by this strategy acquire relevant facts, retain them better and longer, are ready to learn and accept their mistakes and have a more positive attitude towards self, colleagues and patients.

Did you notice that both the newer methodologies which we discussed with you are learner-centered? In both the situations, teacher is working more as a facilitator rather than a subject expert. Interestingly, you can use this in your classrooms also. Try to give more freedom to the students (of course, academically !) try to be a bit more tolerant for ambiguity and you will find your students more motivated and ready to accept new challenges of learning.

Appendix-I

Self-Study Skills

It is essential in study, as in warfare, to have a definite plan of action. A suitable plan makes all the difference between success and failure. Although a person's level of intelligence does make an impact on his ultimate performance, yet even mediocre students can significantly better their performance if they follow certain simple basic rules.

In this discussion, certain well accepted principles of better study and methods to manipulate the memory have been discussed. Before we actually go on to discuss them, it may be pointed out that these are not necessarily the best nor are they universally applicable. Each student can devise certain other methods to suit his own intelligence, aptitude and convenience.

A. **Make a Time Table:** This is the most talked about and yet most neglected aspect. It is worth giving a trial if you have not yet done it.

Here is how you should go about doing it. When you start making a time table, you find that total available time varies each day and no generalisations are possible. Certain evenings are heavy, others are light. The solution to this lies in making the week and not evening as the unit of study. With a policy of give and take, it should be possible for you to have a regular study time.

A word of caution is needed here. Estimate your own capacity because if you are too heroic, you may not be able to keep to the schedule—a time table that falls through has disastrous after effects. Therefore you should gauge your capacity fairly accurately. At the same time you should remember that if overestimating is bad, underestimating is worse!

Distribution of time also requires experience and estimation of needs. Some subjects are more demanding than others and may require a larger share of time. More often a subject is taken in a week, the better chance it has of getting justice. Thus, if you propose to allot three hours per week to Pediatrics, distribute it as half an hour per day or one hour every alternate day. Time alloted at one sitting should, however, be not less than half an hour.

One problem that you often encounter when following a time table is the rigidity that it induces. It is difficult to finish work in each subject at the exact moment when the next subject is due. This can be taken care of by leaving a buffer time in between; however, we will strongly advise against it. This gives a justification for not finishing the work on time. It is better to allow the extension of one subject into another. The very fact that you are using medicine time for studying surgery makes you feel uncomfortable and drives you to avoid such incursions except under genuine stress.

B. **Recognise Fatigue:** Don't regard tiredness as something to be avoided. After an honest work, you ought to be tried. But be conscious of fatigue. Drowsiness and other symptoms of fatigue are nature's way of warning that rest is needed. If that warning is neglected,

nature removes the symptoms and allows the work to go on but at a price. The work may not suffer but you will. It is just like ignoring the reserve signal of a vehicle and then end up walking all the way to a petrol pump. At the same time, don't keep on looking for the symptoms of fatigue, you may find them too easily.

A distinction must be made between boredom and fatigue. Boredom comes only when you lack interest although you are fresh and can do anything except reading that particular subject. In such cases, changing a subject is often as good as a rest period. Don't change it too frequently also, you must learn to face the uninteresting in order to attain something that is interesting.

C. **Setting to Study:** As you sit down to study, your effectiveness initially declines. This is because you are busy fighting all other interests that clamour for your attention. This phase is crucial and should not be confused with boredom - otherwise you will end up changing subjects and books but not gaining anything meaningfully. Once you settle your account with matters that occupy your mind, effectivenes steadily increases. This goes on till fatigue counter balances your efforts and then again a fall starts.

E. **Manipulation of Memory:** Most, in fact all, students complain about memory. However, the same students can rattle off everything about movies or cricket fixtures. This discrepancy can be attributed to poor management of memory. Everyone is born with a fixed endowment of memory which can't be altered but one can definitely make a more efficient and purposeful use of his memory.

Many drugs including herbal ones are credited with improving memory—most of these claims are baseless and rely more on placebo effect rather than on actual benefit. Others like nicotine, caffeince, alcohol and amphetamine commonly taken by the students may do the trick by providing euphoria. Any attempt at improving memory by resorting to drugs is bound to end in futility and therefore best avoided.

There are certain simple methods available to improve retention and recapitulation of what you have studied. For this it is important to make a distinction between reading and studying. We all have the experience of reading a book many times yet not being able to recall what we have read.

Reading and re-reading a page is not important. What really matters is analysing what is on the page, as thoroughly and deeply as possible. This is known as level of processing. The more deep processing you do, the better you are likely to remember. This requires a deliberate effort and time. Always remember that there are no short cuts in learning - you can't rush learning.

You should recognise what is known as Practice effect and make full use of it. It is a common experience that once you start reading a new book, you find it difficult and uninteresting. On your second reading, however, it doesn't seem so difficult. This is practice effect. It has been proven scientifically that it persists for about 10 days. Therefore, sessions should be scheduled as frequently as possible to make full use of practice effect.

D. **Where to Study:** There is difference of opinion on this point. Some say that you should treat your body severely and put it in an uncomfortable position, then only will your mind concentrate. Others think that body should be as comfortable as possible so that the mind

is free to work. Neither view can be pushed to extremity. The principle should be that the body should not make its presence felt, either by comfort or discomfort as to call attention to itself.

A point that often comes up is can you relax and study at the same time. The positive view is shared by many students and it is not uncommon to see students lying comfortably on a dunlop couch with a pack of chips in one hand, cold drink in other and eyes on the book. Our answer would be probably no. Study involves certain amount of tension and up to a level, the degree of performance is related to the degree of tension generated. However, if you become too tensed to the level of anxiety, your performance again falls.

Another point that needs to be emphasised is that what you remember is not a carbon copy of what you study rather you remember the results of your processing. In other words the more meaning and organisation you find in a material, the better will be the retention. This is another reason for learning by rule rather than by rote.

F. Recitation: If you have 6 hours to study and reading a chaper takes 2 hours then what do you do - read it 3 times ? That could be a bad approach. Better would be to cut down the reading time to 2 hours and spend the remaining 4 in reciting (not verbatim, of course) what you have read.

Recitation is an age old practice for improving retention. It is one of the reasons, why most of us can still recall 'Twinkle - twinkle little star' or ' Baa Baa Black Sheep' because as children we used to recite these rhymes many times.

Recitation helps in more than one ways. Firstly, it motivates because you know that you have to recite what you are learning.

Secondly, it provides immediate feedback and tells you, how well you have learnt and in which areas you are shaky. Thirdly, since you don't recite verbatim, you do some deep processing, further aiding memory. Lastly, it helps you to practice retrieval. You tend to store the material in such a way that you can readily call on it.

G. SQ3R Techinque: A related technique for better retention and an exercise in deep processing is SQ3R. It is specially useful when reading a topic for the first time. It leads to better understanding, lasting associations and better memory. Essentially, it consists of the following steps:

1. **Survey:** Give a quick glance to the topic/book to find out what it deals with, what is its level of discussion, which areas have been discussed satisfactorily and which areas will need recourse to another book.

2. **Question:** When you survey, you will find yourself asking certain basic questions like why this topic has been given so much importance; why such and such aspects has been skipped; how much can I depend on this book; which areas can be skipped because I have already read them and so on.

3. **Read:** Having prepared yourself with this basic information, sit down to read. Try to find the meaning and organisation of the material and do some deep processing.

4. **Recite:** After reading, close the book and try to recite what you have learnt.

5. **Review:** Go through the book again to check whether you could recite correctly. Go through the weak areas again and then follow the cycle of read - recite - review till you have perfected the material.

Law of overlearning states that you should not stop at the first perfect performance but continue to learn beyond that. If it took you 10 attempts to recite a para correctly then recite it at least 15 times (i. e. 150% overlearning) to remember it for a longer time. This law explains why we can still recall the story of 'Alice in Wonderland' or some other fairy tale learnt in our childhood because we continued to hear them again and again even after we remembered them.

Before concluding, we want to give you an example from a movie, Gigi. There is an elderly couple celebrating their marriage anniversary. They recall their first meeting. She says, that dinner was at 9, he was late and she wore a gown of gold. He says that dinner was at 8, he was on time and she wore blue. This sequence has been picturised in a song, 'I remember it well'. There is no way of knowing who is right but they are in full agreement on what really counts that the meeting led to a life time of happy affection. This is how your memory should be managed - not bogged down by unnecessary details yet accurate on what really matters !

Appendix-II

Objectives of Medical Graduate Training Programme

National Goals

At the end of undergraduate programme, the medical student shall be able to :

- recognize health for all as a national goal and health right of all citizens and by undergoing training for medical profession fulfill his/her social obligations towards realization of this goal;
- learn every aspect of national policies on health and devote himself/herself to its practical implementation;
- achieve competence in practice of holistic medicine, encompassing promotive, preventive, curative and rehabilitative aspects of common diseases';
- develop scientific temper, acquire educational experience for proficiency in profession and promote healthy living ;
- become an exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

Institutional Goals

In consonance with the national goals, each medical institution should evolve, institutional goals to define the kind of trained manpower (or professional) they intend to produce. The undergraduate students coming out of a medical institute should :

- be competent in diagnosis and management of common health problems of the individual and the community, commensurate with his/her position as a member of tertiary level, using his/her clinical skills based on history, physical examination and relevant investigations;
- be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems;
- appreciate rationale for different therapeutic modalities, be familiar with the administration of the essential drugs and their common side effects;
- be able to appreciate the socio-psychological, cultural, economic and environmental factors, affecting health and develop humane attitude towards the patients in discharging one's professional responsibilities;
- possess the attitude for continued self - learning and to seek further expertise or to purpose research in any chosen area of medicine;
- be familiar with the basic factors which are essential for the implementation of the National Health Programmes including practical aspects of the following:
    - (i) Family Welfare and Maternal and Child Health (MCH)
    - (ii) Sanitation and water supply.

(iii) Prevention and control of communicable and non-communicable diseases.

(iv) Immunization.

(v) Health Education;

- acquire basic management skills in the area of human resources, materials and resource management related to health care delivery;
- be able to identify community health problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures; (i) be able to work as a leading partner in health care teams and acquire proficiency in communication skills;
- be competent to work in a variety of health care setting;
- have personal characteristics and attitudes required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.

Glossary

Ability test: A test designed to measure what a person can do. Ability tests are subdivided into aptitude and achievement test.

Accreditation: A self-regulatory process of granting formal recognition to educational programmes or institutions that meet stated criteria of educational quality.

Affective: Related to attitudes, dispositions, motivations, preferences, tastes, or values.

Aim: A general change intended to be brought about in a learner.

Analysis: The examination of a whole by separation into its component parts.

Aptitude: Capacity for learning.

Assessment: A system of evaluation of professional accomplishments using defined criteria,
Formative assessment is testing that is part of the developmental or ongoing teaching/learning process. It should include delivery of feedback to the student.
Summative assessment is testing which often occurs at the end of a term or course, used primarily to provide information about how much the student has learned and how well the course was taught.
Criterion-referenced assessment refers to testing against an absolute standard such as an individual's performance against a benchmark.

Behavioral objective: An educational objective stated in terms of a specific or typical overt action to be performed by the learner following instruction.

Bedside Teaching: A part of clinical rounds where both student and instructor attend the patient's bedside to discuss the case and/or demonstrate a clinical procedure. This is the student's opportunity to see how the attending physician relates to the patient and to get hands-on instruction in interviewing a patient, physical examination, and counselling skills.

Checklist Evaluation: A method for assessing any competency or competency component that can be broken down into specific behaviors or actions.

Cognitive: Related to knowledge or intellectual activity.

Constructed-response test: A test (usually written) in which the examinee writes the answers to questions in his or her own words.

Criterion Referenced Test: Tests to establish the extent to which the student has achieved the stated objective. The criterion is a predetermined level of achievement.

Communication: The process by which information and feelings are shared by people through an exchange of verbal and non-verbal messages.

Communication Skills: Proficiency in the interchange of information.

Competence: Possession of a satisfactory level of relevant knowledge and acquisition of a range of relevant skills that include interpersonal and technical components. Competence may differ from "performance", which denotes actions taken in a real life situation. Competence is therefore not the same as "knowing" on the contrary, it may well be about recognizing one's own limits.

Curriculum : An organized set of formal educational and/or training intentions.

Design: A deliberate process of devising, planning, and selecting the elements, techniques, and procedures that constitute some object or endeavor.

Difficulty Index: A numerical value used to express the difficulty of a test item. It may be stated as the percent of the total class or the percent of the more or less able students in the class getting the item correct.

Discipline-based Approach: Teaching of the individual subjects such as anatomy, biochemistry, pathology, surgery or community medicine as separate educational building blocks.

Discrimination Index: Estimate of difference between scores on a test item of more and less knowledgeable or proficient examinees.

Distance Learning: An educational approach which does not depend on face to face teaching as primary mode of instruction. It uses media to compensate for absence of a live teacher. However, it does not mean isolation of the learner and teacher and uses the available opportunities to promote interaction between the two.

Distractor: A term used to designate the incorrect response options provided in a multiple choice item.

Domain: A scope of knowledge, skills, competencies and professional characteristics which can be combined into one cluster.

Educational or Instructional Objectives: Statements that describe what learners should be able to master. It is important to assure that objectives are measurable and that they delineate a specific level of competence.

Educational Technology: The development of a set of systematic techniques, and accompanying practical knowledge, for designing, testing and operation schools as educational system.

Evaluation: A process of judgment based on comparison of ascertained measurement against criteria. Evaluation can be related to structure, process, or outcome.

Evaluation, 360-Degree: A method used for overall assessment including interpersonal and communication skills, professional behaviors, patient care and systems-based practice.

Extended Matching Questions: These questions, unlike MCQs, do not have one best answer but can have a number of correct answers and therefore, force the students to think beyond an obviously correct answer. They avoid recognition effect of MCQs.

Goal: A general term encompassing all types of learning outcomes.

Grading : Recording student achievement using an alphabetical or percentage scale. The result is in ascending or descending order of students.

Guidelines: A set of steps to be taken in performing a task or implementing a policy, program or activities and the manner of doing so. Guidelines are more specific and more detailed than guiding principles, on which they are based.

Internal Evaluation: A review of a completed curriculum by its developers, usually conducted prior to external review.

Item Analysis: A formal technique for the evaluation of individual test items by examination of the pattern of response.

Integrated Teaching: A method of teaching that interrelates or unifies subjects taught by different departments. Integration may be vertical or horizontal. *Horizontal integration* functions between parallel disciplines such as anatomy, histology, biochemistry or medicine, surgery and pharmacology. *Vertical integration* functions between disciplines traditionally taught in different phases of curriculum; such as anatomy and surgery.

Key Feature Questions: These are a type of short answer objective questions, which assess knowledge in the clinical context. The questions give description of a realistic case followed by a number of questions requiring only essential decisions.

Knowledge: The acquisition or awareness of facts, data, information, ideas or principles to which one has access through formal or individual study, research, observation, experience or intuition.

Learner-Centered Education: A method of teaching in which the students' needs have priority. Learners are responsible for identifying knowledge gaps, actively participating in filling them, and keeping track of their learning gains. Teachers are expected to facilitate this process instead of supplying "spoon-fed" information.

Lecture: An instruction or verbal discourse by a speaker before a large group of students.

Mini-CEX: Mini clinical examination is a snapshot observation of students' professional behaviour in a limited period of time. It allows the teacher to evaluate the behaviours in a variety of settings including wards, outpatients, casualty etc. Immediate feedback is provided to the student.

OMP: One minute preceptor model is an educational method to diagnose the learning needs of the students and tailor instruction accordingly. Most useful in the clinical setting, specially for senior and postgraduate students.

Objective: A specific behaviour intended to be brought about in a learner.

Outcome-based Education: This approach emphasizes educational outcomes rather than the educational process and focuses on the product of medical education such as what kind of doctors will be produced, and with what professional knowledge, skills, abilities, values and attitudes.

Peer Review or Peer Evaluation: Method for evaluating professional attitudes and behaviour, used by trainees to assess each other and also used by supervisors, nurses and patients to assess trainees. Typical measurement tools for this form of testing are checklists and questionnaires.

Performance: Denotes what an individual actually does in a real life situation.

Problem-based Learning (PBL): In this approach, students learn in small groups supported by a tutor. They initially explore a predetermined problem. The problem contains triggers designed to evoke objectives or concepts which are used to set the agenda for individual or group investigation and learning after the initial session. Subsequent group meetings permit students to monitor their achievements and to set further learning goals as required. The tutor's role is to offer support for learning and to help reach the expected outcomes. PBL enables students to develop the ability to translate knowledge into practice at an early stage, encourages individual participation in learning and also allows the development of teamwork skills.

Reliability: The degree to which a test is consistent in measuring whatever it does measure.

Self-directed Learning: A form of education that involves the individual learner's initiative to identify and act on his or her learning needs (with or without assistance), taking increased responsibility for his or her own learning.

Simulated Patient (SP): Simulated patients are healthy persons who have been trained to reliably reproduce the history and/or physical findings of typical clinical cases.

Skill: The ability to perform a task well, usually gained by training or experience.

Telemedicine: The application of communications technologies for the provision of health care services over spatial distance in a situation where remoteness and/or availability of professional expertise is a critical factor.

Validity: The extent to which a test actually measures the characteristics it is supposed to measure. Validity may be characterized in four ways—content, concurrent, predictive or criterion-related.

World Federation for Medical Education (WFME): A non-governmental organization with ties to WHO and UNESCO, the WFME is concerned with global education and training of medical doctors and umbrella organization for six regional associations for medical education. The WFME's general objective is to strive for the highest scientific and ethical standards in medical education and to take initiatives with respect to new methods, tools and management of medical education.

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