Principles of Medical Education

FIFTH EDITION

Tejinder Singh • Piyush Gupta • Daljit Singh

Competence
Feedback
Formative summative
Mentoring
Integrated teaching
Self-directed learning
Examination
Internal assessment
Work place based assessment
One minute preceptor
Counseling
Performance
Systems approach
Early clinical exposure

Foreword
Janet Grant

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Principles of
MEDICAL EDUCATION

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Fifth Edition

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Foreword
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Teach a student and you impact a life;
Train a teacher and you impact generations of lives.

Hassezmusings

Foreword

The new edition of this handbook, *Principles of Medical Education*, is timely. Medical education in India is in the throes of fundamental change; from the promise of new regulation to the definition of a new curriculum with a new structure, new ideas about how students should enter medical school, new ideas about how they should learn, new areas of content and new assessment-based methods of progression.

As with any such sweeping educational innovation, it is not without its controversies. The apparent underlying intention to address the variability in quality of medical education seems laudable. Perhaps there was also a feeling that trying ideas that have been used elsewhere might improve medical education in India. While a number of guidelines for practice and planning have been provided, it is important to consider the development of a contextual curriculum as well as the new disability competences in foundation. These might appear in the next edition of this handbook.

It might be difficult to keep up with such a fast-moving landscape. And every teacher and educational leader will be expected to change their practice and planning in one way or another to meet the new demands. This book will help. It is a handbook that skilfully summarizes the salient points of many current concepts. I must congratulate the authors who have managed to be wonderfully clear in presenting the essence of each topic in a very few words. That makes this resource highly accessible.

Although the techniques detailed in the chapters are not supported by in-text citations, I can understand why this handbook has chosen this non-academic style. Medical education does not change as a result of a new and convincing evidence base. Medical education is a social science, and as such, it tends to change on the basis of social trends rather than evidence. In education, some ideas are integrated into practice simply as a political or regulatory imperative. Educational change is often based on current values and argument rather than evidence.

So, putting the risk of plagiarism aside, I hope that this approach liberates the reader to be critical, to question and to read around each topic. And then to reach your own conclusions about the contextual usefulness of the ideas so clearly presented. The essence of social science is critique.

On the other hand, I know that when there is the need to change, then a pithy summary can offer reassuring guidance. And as an introduction to the breadth of medical education, this handbook also sets out a lot of the terrain and explains terminology and basic concepts very well. It is a faithful presentation of some dominant ideas in medical education. Coming from the part of the world where most of these ideas originated, I know that what is said and what is done are often very different. As an educational psychologist, my personal bugbear is adult learning: that it continues to be touted as a theory is a mystery to me. It is an idea that has no evidence base, and did not arise from the context of professional training. And that is where your own critique and reflection come in.

Looking towards the future, I believe that such critique and reflection will lead to a book that includes theories and techniques that have been born in India, alongside those that were

invented elsewhere. The richness of educational philosophy, values and practice in India should surely have given rise to new ideas that those of us from other parts should consider.

I am pleased to see the focus on assessment in this book. Although trends change in this field too, and the current trends seem to be towards more holistic approaches, there are clear, and possibly largely uncontentious, procedures for the development of examinations that must be followed. Nonetheless, even ideas such as workplace-based assessment have been driven by ideas of feedback, rather than by applying the rules of valid and reliable measures. And in that, as in all education, the principle of feasibility is fundamental.

I wonder whether, given the turbulent and exciting times in medical education in India, a chapter on management might not have been useful: managing the curriculum, managing resources, managing change. I have always believed that much of the success of education in practice is in its management rather than its rhetoric.

So in reading this wonderful resource, keep thinking and asking questions. I congratulate the authors for their ability to present complex ideas so succinctly and economically. This is neither an instruction manual, nor is it an academic treatise; it is a concise introduction to the current landscape of medical education. You will find yourself asking questions: and that is what should happen in this area of social science.

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Preface

We are happy to present the fifth edition of the book, *Principles of Medical Education*. The edition has been revised with some deletions and many additions. The driver for change has been the ongoing curriculum change in India to competency-based education and the book presents topics useful to teachers for delivery of this curricular model. Most of the chapters have been updated to address the contemporary curricular change, but we have retained the basic nature of the material and its conversational style. We have added in the Further Reading, a number of publications which we have published on competency-based medical education and related aspects. Most of these are free access papers and we do hope that interested readers will read them for a detailed and more theoretical coverage.

We are grateful to the medical teachers in India, for accepting the earlier editions of the book and we hope that this edition will continue to fulfill their needs. The additions and revisions make the book a useful training manual and also the resource for basic and advanced medical education workshops.

We are open, as usual, to suggestions, criticisms, brickbats (and bouquets!).

Tejinder Singh
Piyush Gupta
Daljit Singh

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Chapter

1 Teaching and Learning

LEARNING OBJECTIVES

❖ Define teaching and learning
❖ Enumerate principles of learning
❖ Enumerate characteristics of adult learners
❖ Apply these principles in classroom situation.

Learning is not attained by chance. It must be sought for with ardor and attended with diligence.

Abigail Adams

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

Rabindranath Tagore

Educationists now lay more emphasis on "teaching–learning," as compared to the greater importance previously given to "teaching" alone. We are now more interested in understanding what and how students learn, why some of them do not learn, and when do they learn better. Learning, especially in medicine, has a direct relevance to the health needs of the society. Application of knowledge depends on the context in which the students have learnt. Hence, the attention is more focused on learning and the learner. Let us look at these terms in little more detail.

Teaching aims to facilitate learning and helps the learners to learn more effectively. The purpose of teaching is not merely dispensing information, but to also develop skills, good communication, attitudes, and values.

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

Teaching

Learning

information should be transmitted so that something will be learnt! It is also wrong to presume that 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.

The role of a teacher is not of bossing around and being authoritarian. The role of a teacher is to be a considerate and a friendly person, who creates an appropriate atmosphere for effective learning, so that learning is an enjoyable and a pleasurable process.

Are we, as teachers, able to create such an atmosphere in our institutions? Let us consider in this context, learning in more detail.

Learning

Learning is a process resulting in some *changes* or *modifications* in the learner's way of thinking, feeling, and doing as a result of practice. The change may be temporary or permanent. The more effective the learning experience, better is the learning. Provision of effective learning experiences depends on the teacher. Depending on the ability of teacher to provide a meaningful learning experience, the quality of learning would vary.

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

The Educational Spiral
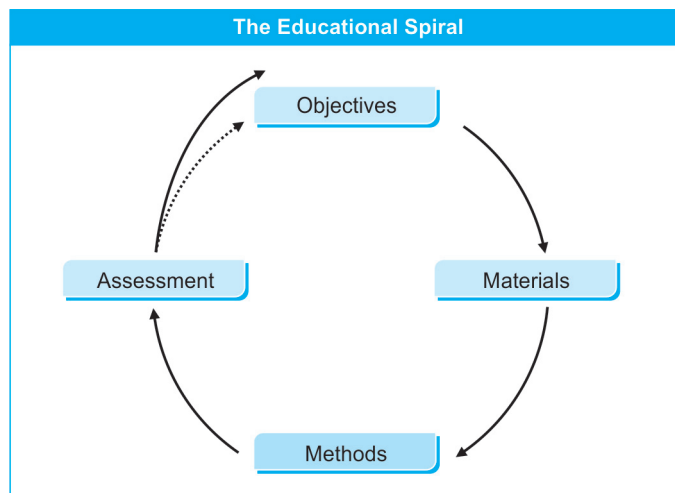
When and where one gets the new experiences and how often these are repeated are referred to as *learning opportunities*. A new experience or a new piece of information may be first heard or seen during a lecture

and may be accepted and analyzed 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, analyzed to be incompletely recalled, may be read further in the library or may be discussed with peers, 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. Hypothetically anybody can learn almost anything, given sufficient time and resources. However, at a practical level, our learning is limited. We all learn different things attaining different levels of achievement.

The scope and magnitude of learning depends to a large extent on the individual. For example, those who prefer "sensing" would learn better about those things which they can see, hear, or touch, whereas those who prefer "intuition" would like subjects that allow to create abstract ideas. Ideas and hypotheses would fascinate them. However, this is not to "brand" the learners into one or more types—rather it allows the teacher to deliver a "bouquet" from which the learners can learn by not only their own style but also challenge themselves to adopt a different learning approach.

How we Learn: Let us try to have a look at the psychology of learning. We presume that most of you are aware of how computers work and this provides a good representation of how people learn. Broadly, any new information is first put in the working memory (equivalent to the RAM of computers, which is lost if you do not save it and switch off the computer). Working memory can hold only 4–5 bits of new information, for about 10–15 seconds. If this information is considered worthwhile, it is transferred to short-term memory. As the name indicates, this can retain the information from few minutes to few hours. The information will be lost if it is not transferred to long-term memory (equivalent to hard disk of the computer). Information stored in the long-term memory is relatively permanent and can be retrieved if stored properly (just like saving a word file at the proper place, so that you know where you have stored it). However, like hard disk, long-term memory can also get corrupted and may need to be written over many times for it to become long lasting. It is interesting to note that there is no "delete" function in human brain—so what you have apparently forgotten has not gone anywhere. Rather it is buried under new information and with effort and practice, can be retrieved. Many of us can recall even minor but pleasant events of our childhood. This depends on the perceived importance of the information and its link with other sets of information.

You have guessed it right. The simplest way to improve the retention of information is to *transfer it to short-term and then long-term memory*.

Psychology of Learning

As teachers, you can try some simple interventions to improve the process. These include:

Improving Retention

1. Encouraging students to shift the information from working memory to long-term memory. This can be done by planned repetitions (you must be remembering *Baa, Baa, Black Sheep* still because your teachers made you repeat this many times even after you learnt it by heart), or telling about the utility of new information (e.g., role of basic sciences information in clinical work). Similarly, teaching someone else requires recall of information and its interplay with new information. This is the reason for the phrase *to teach is to learn twice*. Peer learning or team learning makes use of this principle.

2. Encouraging students to recall what they already know so that connections with new knowledge can be formed. This also helps in easy understanding by making it a part of habit to recall earlier knowledge.

Managing Memory

3. Working memory can be managed by increasing the number of channels through which information is being transmitted. Using words and diagrams, for example, increases the capacity of working memory. We will discuss more about practical application of this in Chapter 12. Mnemonics, flowcharts, concept maps, etc., are common tools to manage working memory and prevent the information from getting lost. Interestingly, *co-curricular activities*, such as music and theater tend to improve learning by training the students to better manage their working memory.

4. Reducing the cognitive load by reducing the demands on working memory. For example, while teaching interpretation of an arterial blood gas (ABG) report, a quick revision of acid–base balance will markedly reduce the cognitive load.

Principles of Learning

Now let us consider some basic principles of learning:

Principles of Learning

1. **Relevance:** Learning is better with subject matter of immediate relevance. When the relevance is remote or obscure and the student has to learn with a belief that the knowledge perhaps might be of use someday, 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 could be learnt later.

2. **Sequential learning:** We learn by progressing from simple to 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 generalization, and 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 order or 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. When integrating subject matter across disciplines, teachers may have to move away from traditional sequencing to incorporate other disciplines or to have their subject incorporated in the ongoing teaching–learning activities.

3. **Cumulative learning:** We learn by building on what we already know. An implication of this is that prior knowledge needs to be activated to build new learning. If prior knowledge is not there or is not activated, then it will become very difficult to build new knowledge. As an example, if we do not use the existing knowledge of anatomy before teaching pathology, we will never be able to complete pathology within the given time frame. Of the three principles stated here, this seems to be the most important, not only in theory but also from practical point of view. It reduces time and resources needed to learn. Failure to use it is one of the commonest causes of learning difficulties faced by the students. As discussed later in this chapter, cumulative learning is considered the most important aspect of adult learning.

Improving Learning

Let us now have a look at some of the factors, which promote learning:

1. **Active involvement:** Learning is more effective with an active involvement of the learner in the process, e.g., a small group discussion would be more effective for learning than a lecture. Active involvement allows the learner to interact with the subject matter, peers, and teachers, thereby increasing learning, assimilation, and retention.

2. **Formative assessment and feedback:** Learning, being a process of acquiring new knowledge and skills, enables the students to do something that they could not do before. Providing feedback on their performance helps the students to learn better. Feedback has been shown to have the single most important influence on learning. Feedback, to be authentic, has to be based on a system of ongoing assessment. This helps not only the students by making them aware of their deficiencies but also helps the teachers to modify their teaching styles. You will learn more about it in Chapter 13.

Process of Learning

3. **Driving effect of assessment:** The system and process of assessment has a direct effect on learning and learners. Students are generally blamed to be examination oriented. Given the fact that students learn for the sake of examinations, assessment can be utilized for better learning. For example, if more questions are asked regarding the common health problems faced by the community, students would work more for those topics and would learn more about them. Given a choice to choose between what is taught and what is asked, students will always prefer what is asked. As a teacher, you can always use this driving force to channelize students' learning in a particular direction.

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 behavior in a negative manner. Maintaining a positive atmosphere in the educational institutions is the joint responsibility of all teachers and students. The educational environment within an institution also affects teaching–learning to a significant extent.

Adult Learning

Adult Learning

It may be interesting to look at the characteristics of adult learners as identified by Knowles. Students do not come to us like a blank slate—they have their prior knowledge (right or wrong), they have their own beliefs about learning, and they work toward certain goals (e.g., a career in research, community-based practice, or super-specialization). Unlike school children, they do not learn for the sake of learning—they will always look for the practical utility of that knowledge and they will not learn simply because we tell them to learn something that is "important." As teachers, you have to keep this in mind. This may, in fact, be one of the reasons why we prefer to call teachers as "facilitators" of learning rather than information providers. The salient characteristics of adult learners are summarized in the box below. Many of these are liberally used in designing instruction for adult learners (e.g., medical students).

Characteristics of adult learners (Knowles)
Adults are:
❖ Autonomous and self-directed
❖ Have prior knowledge and experience
❖ Goal and relevance oriented
❖ Practical and look for application of knowledge
❖ Easy to manage in an environment of respect.

Types of learning

Learning Strategies

Let us also introduce you to the concept of types of learning. It is possible to identify three distinct types of learning strategies adopted by the students. These are described below:

1. **Surface learning:** This refers to a superficial approach to learning with the purpose of being able to recall information. Knowledge is stored in bits and pieces, and generally, there is no connection between these pieces. Knowledge acquired this way is short lived. Rote learning is a typical example of surface-learning approach. Certain instruction and assessment methods, e.g., asking only recall type of questions, will direct the students toward superficial learning.

2. **Deep learning:** This implies learning with the purpose of understanding. It is a slower process during which the learner tries to form connections between his prior knowledge and the new knowledge as well as between different pieces of knowledge. The purpose is to be able to apply this knowledge. This type of learning promotes retention, recall, and application. This requires *spaced practice* over a period of time. Certain teaching methods, such as problem-based or case-based learning and certain assessment methods, such as asking contextual or problem-solving questions will promote deep learning.

3. **Strategic learning:** This is the strategy used by students to do well in an examination. Learners try to categorize information by its utility for scoring good marks. Categorization of topics as "important" is an example of strategic learning. This also promotes short-term knowledge, which is often forgotten after the examinations. However, you can give a direction to such learning by "forcing" students to recall and activate their prior knowledge during teaching and assessment.

Teaching

Some teachers have an inborn gift of the art and skills of teaching, but most of us learn and develop the skills as we progress in our career. Teaching is an interaction between the teacher and student under the former's guidance in order to bring about expected changes in the latter's behavior.

What is the Purpose of Teaching?

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

❖ Develop an interest in learning for the topic in particular and more knowledge in general

❖ Develop proper lifelong learning habits and attitudes
❖ Acquire, retain, and apply the knowledge
❖ Achieve appropriate skills and use them with confidence.

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

Effective Teaching

Often, 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.

Qualities of a Teacher

You may find it interesting to look at the traits that students look for in their teachers. One such example is given in the box below. You will appreciate that though teaching style and your communication skills are important, they are not a replacement for your *subject expertise*. Subject expertise gives you the confidence to teach. Putting these two together, it is imperative that faculty development should focus not only on developing your teaching and managerial skills but also on improving your subject knowledge.

What it takes to make a competent medical teacher: Students' perspective

❖ Subject expertise
❖ Willingness to teach
❖ Ability to motivate the learners
❖ Basic organizational and managerial skills
❖ Ability to communicate and explain
❖ Ability to provide developmental feedback
❖ Understanding of how people learn
❖ Tolerance for ambiguity.

(Sutkin et al, 2008)

What to Teach?

Categorization of content

To learn everything in the field of medicine is impossible even in a lifetime. Some form of selection is therefore essential. A type of stratification is also necessary. You can categorize the subject matter into three, viz. must know, should know, and nice to know. Another type of classification is to divide the subject matter into core and non-core. Broadly, *core* coincides with the must-know area. Since time is limited, the major aim of your teaching should be to teach the vital and most of the essentials. The desirables could only be mentioned or suggested for self-study.

Making this type of stratification also helps you to design the assessments properly by including all the must-know or core areas in certifying examinations.

Categorizing the content

A. Must know—Core

B. Should know—Essential

C. Nice to know—Desirable
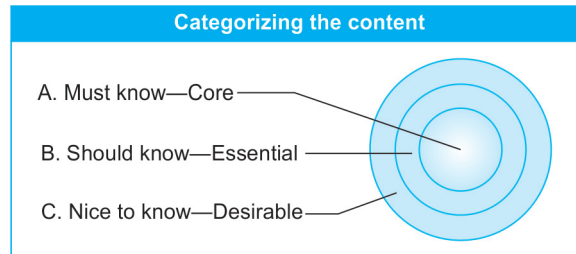
How to Teach?

We usually teach the way we were taught, unless there are reasons for a change. How we teach also depends on 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* of teaching.

Teaching–learning process is therefore a complex phenomenon. It should 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 lifelong learner himself to keep up-to-date and be well-informed about recent advances in different fields.

Although we will discuss more about it in the next chapter, we must introduce you at this point to the *systems approach*. A system refers to a collection of components, which are interdependent. Pancreas,

adrenals, liver, and brain are part of a system responsible for maintaining blood sugar levels. The key feature of this relationship is the ability to influence the functioning of others as well as get influenced in the process of attaining the desired outcome (i.e., maintaining blood sugar). In educational settings, objectives, materials, methods, and assessment are all part of a system, as are the students, teachers, society, and educational institutions. In its most simple form, an educational system can be represented by an *input–process–output* model. We have lectures and practical, the student processes this information in his mind and then is able to do something, which he could not do earlier (i.e., has learnt). This is called an educational system and can be diagrammatically represented as follows:

Educational system

Input (lectures, practical, field experience) → Mental processing by the student → Change in behavior (learning)
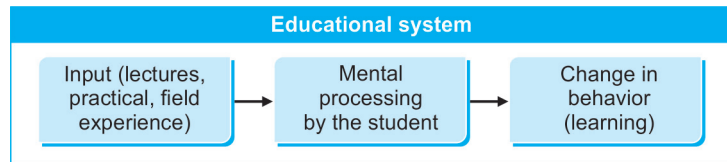
The output in this model has no influence on the input or process. However, when we add a component of feedback, i.e., assessment data being used to modify teaching methods or teaching materials, then the system can self-correct the inputs as well as processes to produce optimal output.

Feedback loop

Input (lectures, practical, field experience) → Mental processing by the student → Change in behavior (learning)

Feedback loop
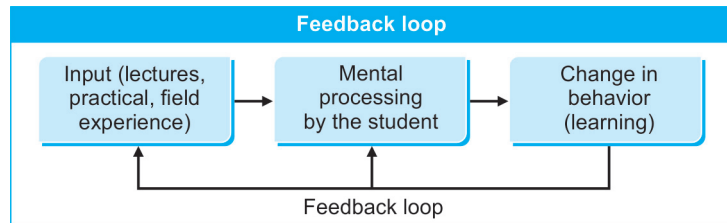
The key concept of systems approach is that each of the components influences and in turn gets influenced by them. For example, any change in objectives demands a parallel change in examinations and any change in examinations also demands a corresponding change in teaching methodology. This concept of systems thinking is crucial, especially when we are contemplating any change. Changing only one component and ignoring the others is likely to fail and sometimes even disrupt productivity.

The present book is an 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 emphasize here that all these components are inter-dependent and any of them cannot be sustained without adequate support from the others.

Happy reading!!

True teachers are those who use themselves as bridges over which they invite their students to cross; then, having facilitated their crossing, joyfully collapse, encouraging them to create their own.

Nikos Kazantzakis

Systems Approach to Instruction

LEARNING OBJECTIVES

- ❖ State characteristics of a system
- ❖ Describe systems approach
- ❖ Use systems approach for instructional design

Nothing ever exits entirely alone; everything is in relation to everything else.

Buddha

In the previous chapter, we introduced you to systems approach. Let us discuss it in little more detail. A system is an entity of inter-dependent components, which influence and get influenced by each other. *Input >> Process >> Output* is the simplest example of a system and is equally applicable to education. We also discussed that if we add a feedback loop in the system, it becomes a responsive system.

Systems Approach

Systems approach tells us that teaching, learning, and assessment are parts of a system and a change in any of them is bound to produce a change in others. Take the example of postgraduate entrance examinations. Since the future career of a student depends on *that* MCQ paper, students are likely to devote more time and energy in preparing for an MCQ test rather than learning clinical skills. However, we can also use this phenomenon in the reverse. If we design examinations, which require application of knowledge and problem solving, we can mold the students' learning toward that direction. Systems approach also tells us that instead of trying to focus on one aspect, we need to look at all the components of the system, especially looking for effects that will happen if any component was to be changed. This brings the importance of context in curriculum planning. At the same time, there

is a need to look at the linkages of education with other components of the system so that all components can work synchronously.

Application of Systems Approach

Let us now see how we can use this approach in designing an efficient teaching–learning process. The process begins with specification of the final product of the system. In other words, we are interested to know, what the graduates will be able to do after they successfully complete the MBBS course. Those of you who have had some earlier briefing to educational terminology would have rightly guessed that we are talking about learning objectives. This *beginning with the end in mind* (or *backward planning,* as some call it) is important because it allows us to produce graduates according to our requirements. In fact, some of the newer educational philosophies, such as competency-based medical education actually begin by first listing the competencies the graduates should have and then work backward on teaching-learning methods.

Once we have stated what we want the products of the systems to be, the next point to be considered is how we will know that the students have learnt what we wanted them to. Taking a very simple example, if our intention was that at the end of the course the students will be good doctors, then we have to think how we will know that they are actually good? You are very right in thinking that if we state the outcomes in measurable terms, then knowing if they have attained those outcomes becomes easy. Continuing with this example, it may be difficult to think of means to find out "good doctors", but if we had stated that the students will be able to manage common medical emergencies as one of the points, it would be easy for us to decide if they can manage common emergencies. It may come to you as a surprise that planning for assessment comes *before* planning for instruction.

Systems approach to teaching-learning

What will the learners be able to do the end of the course?

↓

How will we know that they can do it?

↓

What learning resources are required?

↓

How will we use these learning resources?

↓

How will we assess them?
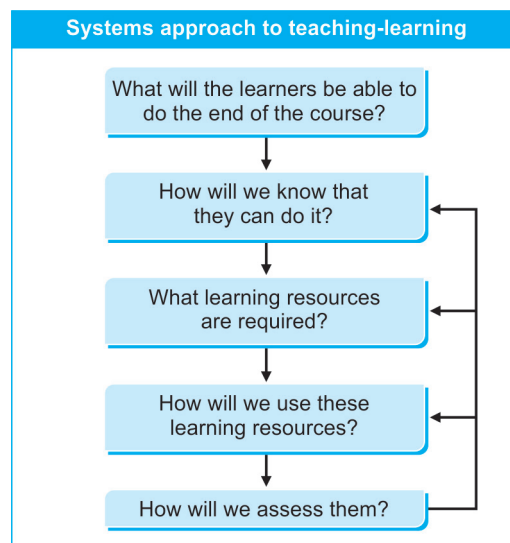
Once we have planned assessment, then we start thinking about what learning resources and methods are required to develop the qualities that we envisaged in our graduates. These learning resources may be in the form of teachers, hospital, field area, laboratories, books, journals, models, etc. Closely related to this is the issue of how best to use these resources. In other words, how many lectures, how many demonstrations, how many experiments, etc. need to be given a careful thought.

The final stage in this process is actually assessing the students to find out if they have attained the required objectives for that course. You will notice from the diagram above that the results of the assessment provide useful inputs to modify the type and use of learning resources as well as examinations.

Can you identify the components of an *educational system?* Yes, you are right—these are society, regulatory bodies, medical colleges, students, and teachers at the macro-level. At the micro-level, the components are educational objectives, teaching material and methodology, and assessment. At both macro- and micro-level, any change in one component is bound to induce a change or get affected by the other. Replacing lectures by small group teaching, for example, without adequate faculty training is going to fail. Similarly, by not having enough career opportunities for MBBS graduates will prevent them from paying attention to acquire the core competencies. The implication is to be aware of this phenomenon and address all components of a system when making a change. A number of times, our frustration with medical education is due to our inability to see the totality of the system.

Why follow Systems Approach?

We should follow systems approach in medical education for many reasons. It allows us to develop clarity of objectives of the course being offered. It allows us to decide on appropriate assessment methods to find the attainment of these objectives. It allows us to select the most appropriate resources for teaching, and lastly, it allows us to use the assessment to modify the system. As you would have noticed, assessment is decided even before we decide about teaching methodology and is not used as an add-on, which comes in the end. Assessment becomes a part and parcel of educational design.

In the chapters that follow, we will retain the discussion around these three components. In Chapter 4, we will elaborate further on this concept.

Chapter

3

Group Dynamics

LEARNING OBJECTIVES

❖ Describe the stages in group formation
❖ Manage common problems with group processes
❖ Use group dynamics to maximize learning

The group dynamics can bring synergy, or tear things apart.

Margaret Bau

The saying that man is a social animal is not without substance. In the contemporary world, there is hardly any situation where you do not need to interact with people. Can you think of some groups of people with whom you have to interact? You are right in naming these, such as family, friends, colleagues, seniors, students, and patients. Many a times, these interactions turn unpleasant due to various reasons, leading either to bad interpersonal relations or to failure to attain the desired outcomes. What do you think goes wrong? It is the group dynamics that creates such problems. On the other hand, a group is able to share experiences, to provide feedback, to pool ideas, to generate insights, and provide opportunities for analysis of experiences. The group provides a measure of support and reassurance.

Group Dynamics

This is a general term for group processes. Because people in a group interact and influence each other, groups develop a number of dynamic processes that separate them from a random collection of individuals. These processes include norms, roles, relations, development, need to belong, social influence, and effects on behavior.

Definition

Crowd, Group, and Team

Before moving further, let us try to clarify some commonly used terms. Can you differentiate between a crowd, a group, and a team? Often, we tend to use these terms—at least group and team—interchangeably, but there are subtle differences between them. A *crowd* is a collection of people with a short-term common interest. A collection of people watching a cricket match, for example, will qualify to be called a crowd. A *group*, on the other hand, is a collective unit with common interests and shared goals. Teachers attending a medical education workshop, for example, represent a group by virtue of their common interests. *Team* denotes a collection of people with complementary abilities. The instructors conducting medical education workshops represent a team, where each one is expert in one particular area.

Examples

Groups are not inert entities. They are lively and vibrant entities, which form, which grow, and which die. Groups can be strength and groups can be weakness. It is up to us, what we make them. Let us see what happens when people with common and shared interests come together. Just recall what happens when you sit in a theater to watch a movie. As you sit, the person sitting next to you starts competing with you for the armrest. Both of you try to push the other's arm and claim your own space. A little while later, you adjust yourself in such a way that you both find a space for keeping arms and there is generally no pushing now. For rest of the movie, there may be no attempt from either to disturb the status quo. If you are a lady and an unknown male sitting next to you tries to capture the space, you may choose to keep your hands in your lap and withdraw from claiming your space on the armrest. Sometimes even arguments may erupt on this issue. As they say, some clatter is inevitable in the kitchen!

Let us look at another example from your student days. When you were asked to arrange a class party and a group of students was selected. The group met for the first time and you wanted to know what the group is going to do and how it would be done. This was usually rapidly followed by a struggle for control—who would be the leader? Once that was resolved, unsaid rules were laid and the group moved to perform what it was supposed to. Sometimes, you could never agree and the plans had to be shelved.

These examples may be too simple but let us try to see them in scientific perspective.

Stages of groups: Irrespective of the education, status, or background of people, groups generally follow similar patterns everywhere. It is possible to categorize the stages into the following sequence:
  i. *Forming:* It is the initial stage of development, when team members may often have differing ideas about purpose. There is relatively

Stages of Groups

little trust and there is uncertainty of purpose. People tend to be careful about what they say, and how they say it. Communication is generally limited to the immediate vicinity of the member.

ii. *Storming*: It represents the arguing that will likely occur as the group defines itself. There may be intragroup conflicts about the purpose, leadership, and working procedures. Sometimes, people try to gauge each other's strengths and show their superiority. This is the stage when a group is in danger of breaking down. At the end of this stage, however, a clear leadership pattern emerges.

iii. *Norming*: It occurs when the group members are developing a shared vision and are setting goals and objectives. People are getting to know one another's strengths (and weaknesses) and are learning how best to work together. A leader may emerge and communication generally becomes leader centric, though some members may still communicate directly with each other. Group evolves a common set of expectations of what is desirable behavior.

iv. *Performing*: It happens when members become clear about the goals and purposes and start working toward a common goal. This is the stage when the group starts producing useful work. All communication is toward the leader. In more mature groups, the leader can withdraw at this stage leaving others as a self-managed group.

Can you identify these stages in the examples given above?

The role of the leader is crucial to maintain and support group. Each stage of the group requires a different strategy for support. We have summarized them in the table below:

Supporting Groups

Supporting group processes		
Stage	*Issues*	*Interventions*
Forming	What to do? How to interact? Importance of task	Clarify roles Encourage participation by all
Storming	Concern over: Issues, leadership	Identity dysfunctional behavior Suggest how to deal Help in developing norms
Norming	Spoken and implied rules, clear tasks, and purposes	Uncover implicit issues, promote sharing of ideas
Performing	Productivity, problem solving	Positive reinforcement, encourage self-facilitation

The movement through these stages is not linear. At times, more than one stage may be operating; at others, the group may regress to the previous stage. These phenomena represent the *dynamic nature* of group dynamics.

Why should you know it? You may be wondering, why medical teachers should know about group dynamics. This is for more than one reason. The first and the most obvious is that medical teachers are also members of many formal and informal groups. These may include medical education unit, curriculum committee, college council, board of studies, or even your faculty club. In all these areas—in fact in all areas where there is more than one person—group dynamics operate.

The second and more direct reason is that all of us are involved with handling groups of students either during classes, tutorials, or group discussions. If we are not able to handle group dynamics well, we may either fail to take full advantage of the group's potential or, worse still, the group may break. Both the situations are not desirable. As a teacher, you have a very important role to play during the forming and norming stages.

When students come together for a group discussion, they may try to outsmart each other. Brighter students may try to overshadow others and may prevent the shy ones from voicing their opinion. In fact, one of the criticisms of group discussion that all students do not participate actually originates from poor management of this stage. You should keep a watch for various group roles to manage the group well.

Group roles	
Functional	*Dysfunctional*
Leader	Aggressor
Recorder	Blocker
Timekeeper	Recognition seeker
Information seeker	Dominator
Encourager	Know-all
Compromiser	Uninterested
Standard setter	Cynic

Managing group dynamics: What can you, as a teacher, do to ensure that group dynamics operate in a productive manner? We would say a lot. There are a number of techniques to ensure that the group does not disintegrate at the storming stage. While we will not go into the details of all, we will discuss a few techniques that you can use.

Ensuring equal participation is important not only to maintain the group dynamics but also to ensure that all students participate in the process *and learn*. For optimum learning, merely listening to the discussion is not enough—an active participation is essential. Asking students who wish to speak and then calling them to speak in the same order works well. For overactive students, saying "we have heard you,

why not give a chance to X who has not spoken so far" also ensures uniform participation. Addressing shy students by name and posing specific questions helps to open them. If a question does not elicit a response, it is a good idea to wait till the student speaks. Very often, it is the impatience of the teachers that does not allow them to open up. Other common causes of lack of participation include not being able to identify with the goal, feeling of insecurity or dominance in some students, and lack of adequate preparation. Each one of them needs to be addressed appropriately.

We have discussed the formation of groups and the method of successful transition through these stages. It is important to be able to successfully manage groups in order to exploit their full potential. Role modeling good behavior is also likely to pay good dividends in future. Successful management of group processes can help you to attain your objectives faster and more efficiently.

Chapter

4

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

The task of modern educator is not to cut down jungles but to irrigate deserts.

CS Lewis

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:

- ❖ It is a statement of learning objectives
- ❖ It is a statement of learning experiences
- ❖ It is a statement of learning outcomes
- ❖ It is a listing of the subject matter

While all of the above statements are true, none of them individually reflects the total 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*

Concept

to be followed and the *time frame* within which it has to be followed. If we synthesize 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 conceptualization provides flexibility to the teachers to use different kinds of learning experiences to attain similar learning outcomes. A corollary of this is that even within a given subject area, you can have different types of curricula. It is like *different religions* following *different approaches* yet taking their followers to *same end point* of salvation.

Planning the Curriculum

You should know about two more terms, viz. curricular foundations and curricular components, to be able to plan a curriculum. 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*.

Foundations

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 conventional teaching or competency-based medical education (CBME) model]?
❖ 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)?

Zais model of curriculum
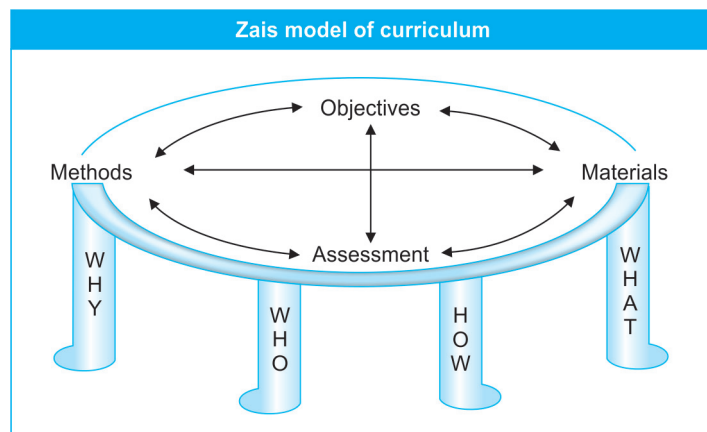
You should be absolutely clear about the answers to these questions since your teaching methodology and learning resources will be dependent upon them. Let us illustrate it by an example.
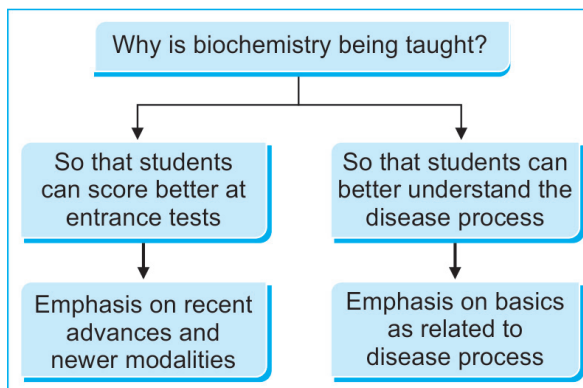
The same is true of answers to other questions, e.g., if the students are of higher ability, you would teach in a very different way as compared to students from say a rural medical college. This is the reason why we called these four questions as foundations of curriculum—the whole curriculum is built on them. They provide *context* and *linkages* to the curriculum.

Curricular components originate from the curricular foundations. Whatever type of curriculum it may be, it will essentially have the following four components:

Components

1. *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 Chapter 7.
2. *Materials* include all learning resources, such as books, manuals, models, and A–V aids.
3. *Methods* denote the way the materials will be used, e.g., lecture, practical, group discussion, self-study, and field visit.
4. *Assessment* helps to provide a feedback to the learner and the teachers and also helps to certify the attainment of stipulated proficiency. You will learn more about it in the Chapter 13.

These curricular components are not in isolation but are highly dependent on one another. We hope it reminds you of *systems approach*. Your assessment has to be based on teaching methodology and, conversely, the teaching methodology has to be in concurrence with assessment. This interrelation can be expressed with the help of the following diagram.

Interaction of curricular components

Objectives

↓

Assessment planning

↓

Material

↓

Methods

↓

Assessment

Interdependence
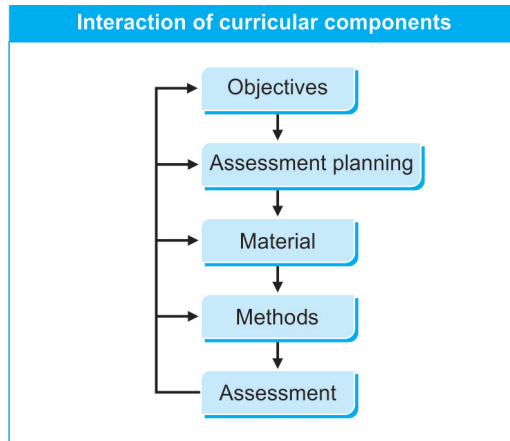
Did you notice that assessment planning comes immediately after objectives and not as an end product? This approach makes a decision about material and methods easy and more rational. It also avoids any mismatch between objectives and assessment.

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 philosophy of the institution and choice of individual teachers, the approach to curriculum can be one of the following types. These are not absolutely black and white but in varying shades of gray.

Approaches

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 MBBS curriculum that we were following till now was a classical 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 entrance examinations.

Problem-solving approach emphasizes 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 the needs of the subject and the needs of the learner. Please note that we are not talking of problem-based learning, which we will discuss later.

Competency-based approach uses the outcome model where the primary determinant of completion is the attainment of listed competencies rather than the time spent in learning a course. Competency-based medical education (CBME) is an overarching term, which can include many teaching practices, such as integration, early clinical exposure, skills training, and communication training.

Backward planning model looks at the outcomes which we are looking after they complete their education; and decide what kind of learning resources and experiences are required to let the graduates develop these outcomes. This is at variance with the conventional models where we work under the assumption that if we provide the defined learning experiences, desired learning outcomes will follow. Competency-based curricula generally follow the backward planning model.

Types of Curriculum

Terms commonly used in relation to curriculum	
Recommended curriculum	The formal curriculum as recommended by regulatory bodies
Supported curriculum	Curricular material as is available in books or other resources
Tested curriculum	Portion of the curriculum which is subjected to assessment (has the highest influence on learning)
Taught curriculum	What actually is taught by teachers. In case of any discrepancy between recommended and taught curriculum, tested curriculum takes over
Hidden curriculum	Unintended content learnt through college, culture, influence, and hidden agenda of students

You will appreciate that none of the these approaches are entirely satisfactory. The subject-centered approach is the least satisfactory. It has been rightly pointed out that through the years at an authoritarian medical school, idealistic young students are molded into rigid doctors, who have lost much of their original ability to sympathize 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 recognized, each seen as a continuum. These are depicted here.

SPICES model	
Student centered	Teacher centered
Problem based	Information gathering
Integrated	Discipline based
Community oriented	Hospital oriented
Electives	Standard
Systematic	Opportunistic

Let us make it very explicit that these attributes in any medical school do not exist in absolute black and white; rather they exist in varying shades of gray. You may have a student-centered curriculum without integration or you may have a teacher-centered curriculum offering electives. 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 center stage of the 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.

Systems Approach

An easy and accepted way of curriculum planning is to follow systems approach, which in effect means keeping the interdependence of various components in mind.

Curriculum Development Model

A model of curriculum development

Content → Society → Students

Context and linkages of medical education

Purpose of education

Objectives

Learning activities — Learning experiences

Assessment/evaluation (in the program and of the program)

Maintenance and renewal
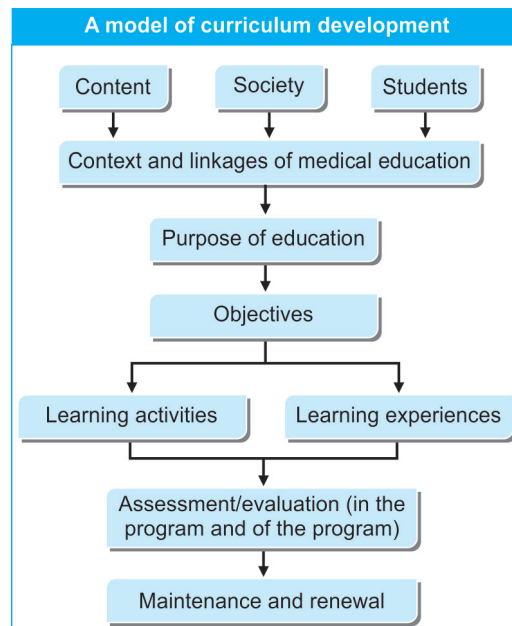
Based on this approach, a number of planning models are available—we do not intend to go into those details. If you are keen on knowing them, we have listed some resources for you to go through. However, we will like to mention *Kern's six steps approach* to curriculum development, which is very commonly cited in medical education literature. These steps include problem identification, targeted needs assessment, goals

and objectives, educational strategies, implementation, and evaluation and feedback. We hope you appreciate the similarity of approach.

You may find some of these terms difficult to understand at present but as you progress through this book, you will find them more understandable. We suggest that you go through this chapter once again after you have read the chapters on **Learning Objectives** and **Student Assessment**.

Curriculum is like a living organism that exists to fulfill the needs and expectations of the society. If we do not pay attention to its renewal or if we allow people to tinker with curriculum without a good rationale, it can also suffer from many diseases. Let us have a look at some of the common ones:

Curricular diseases	
Disease	*Example*
Curriculo-sclerosis	Hardening of the categories; too much of departmentalization
Carcinoma of the curriculum	Uncontrolled growth of a part or section, unrelated to objectives of the course
Curriculitis	Too much meddling with the curriculum based on individual whims and fancies
Curricular obesity	Continuing additions without deletion of redundant portions
Curricular ossification	Too much rigidity in curriculum; disregard for changing trends in education and disease pattern

(Abrahamson, 1978)

Curriculum mapping is the reflective process of indexing or making a diagram of a curriculum to identify and address learning gaps, duplications, and misalignments to improve the effectiveness of a course of study. Basically, it involves collecting and recording data to identify the content, the process of teaching, and assessment methods used. This improves learning and instruction, makes curriculum responsive to societal needs, helps to connect with all stakeholders, promotes integration, and avoids duplication and redundant content.

Before we close this discussion, we would like to reemphasize 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. Please also remember that ultimately, it is the rigor of implementation that matters rather than the type of curriculum.

Chapter
5
Integrated Teaching

❖ Discuss the concept and advantages of integrated teaching
❖ Understand the types and levels of integration
❖ Use strategies to promote integrated teaching

Concept

It you want to make music, you must play the black and white notes together.

Rihard Nixon

Let us begin this chapter with a common scenario. When you dress up for a party, you select a trouser and then you have to struggle finding a shirt and a tie which will look good together. This is time consuming and may not always result in the best combination. However, if you had arranged your wardrobe as sets of trousers, shirts, and ties—rather than putting all trousers at one place and all shirts at another—the task will become much simpler and more efficient.

You may be wondering why we are talking of dressing up in a book on medical education. This example helps us to understand the concept of integration in medical education. In conventional subject-based teaching, students get isolated bits of information in each subject, but generally no effort is made to build connections between these pieces. For example, students are taught about glucose metabolism during the first year, but they do not understand why are they being taught this and what are they going to do with this information. By the time they reach clinical years, where they should be using this information, they have already forgotten it.

Let us take another example. You have purchased a new laptop and printer. You copy the printer software to the laptop. Now, will

you be able to print? No. To be able to print, you need to *install* the printer software and not just copy it. This is the concept of integration. Copying isolated pieces of information to your brain does not result in the application of knowledge. For that, the knowledge has to be "installed."

We would like you to recall what we discussed in the Chapter 1. Adults learn by building on what they already know and relevance is important if adults have to learn. Somehow, both these conditions are violated in the traditional teaching.

Why integrate? Integrated teaching is an important strategy to promote meaningful learning and make it last longer. In addition, integration helps to efficiently recall knowledge when it is required. From this perspective, all teaching should be integrated; however, integration is needed most for basic sciences, where relevance of the content may not be immediately apparent. For all subjects, integration ensures continuity of learning and avoids duplication and redundancy.

Advantages

The dictionary meaning of the word integrate is "*to form a more complete or coordinated entity, often by the addition of or rearrangements of elements*." On the other hand, integration means "*organization of teaching matter to interrelate or unify subjects usually taught in separate departments*." All strategies of integration in education are usually centered around these ideas.

Integration promotes
❖ Deep learning
❖ Meaningful learning
❖ Recall of knowledge
❖ Retention of knowledge
❖ Application of knowledge
❖ Interdisciplinary working

Commonly, integration is taken to mean integration between subjects, but there can be more to it. Another type of integration that is used is the one between various domains of learning, viz. knowledge, skills, and attitudes. There has to be an integration between clinical and behavioral sciences as well. Educationists have now also started talking of integration not only between subjects or domains but also between professions, such as medicine, nursing, physiotherapy, and dentistry. Unless we train our students that way right from the beginning, it may be difficult for them to accept it later.

Types of Integration

Though the concept is very interesting and attractive, implementing it could be rather complex. It has been rightly suggested that integration

Types

does not exist in black and white—rather, there are shades of gray along a continuum. Integration can happen within subjects being taught at the contemporary stage (e.g., basic sciences), in which case, it is called a *horizontal integration*. Some experts call it *alignment*. This can happen when anatomy, physiology, and biochemistry, of say thyroid, taught at the same time. Integration can also happen between subjects taught at different phases of curriculum (e.g., physiology and medicine), in which case, it becomes *vertical integration*. When a medicine teacher revisits the relevant anatomy, physiology, and biochemistry of thyroid before teaching thyrotoxicosis, she is practicing vertical integration. Vertical integration can happen in both directions—during physiology teaching, the teacher can start with a case scenario and try to explain the physiological basis of signs and symptoms. Early clinical exposure (ECE) can be considered as an example of vertical integration. Although it may be tempting to think of vertical integration as more useful, horizontal is of no less importance, especially in the conventional models of medical education.

Levels of Integration

Many models have been described in the literature to identify the level of integration. We do not want to go into all of them but will introduce you to the most commonly cited integration ladder model proposed by Harden, which conceptualizes integration at 11 levels. It may not be possible for all medical schools to reach the highest levels; even within topics, the levels of integration may vary—therefore, it is best that you and your school decide the level where you want to reach. All said and done, departments are unlikely to forego their identity completely—therefore, we must accept some compartmentalization. It is better to view integration along a continuum.

Levels

Models of integration		
Traditional	Basic sciences	Clinical sciences
Inverted triangles model	Basic sciences / Clinical sciences	
Total integration model	Biological sciences	
	Behavioral sciences	
	Clinical sciences	
	Communication skills	

Horizontal

Within the Basic Sciences

Many approaches can be used for integrated teaching. In its simplest form, same teacher teaching the anatomy, physiology, and biochemistry of pancreas would provide the best example of horizontal integration. Such *interdisciplinary teaching* though sound in theory is difficult to practice because of departmental loyalties. We would caution that merely teaching pancreas at the same time by the three departments would not really qualify to be called integration. Even though the teachers may be willing for it, the differential time allotment may not permit integration to happen. In addition, not all areas (e.g., limbs) are fit for integration. However, to the extent possible, basic sciences departments should collaborate with each other to teach in an aligned manner.

Basic and Clinical Sciences

Many approaches are available to integrate basic and clinical sciences. Let us have a look at some of them.

Vertical

i. *Early clinical exposure (ECE):* This is a very useful strategy to bring clinical relevance to basic sciences teaching. It makes the content "meaningful" for the students. Complimenting instruction with case-based learning (CBL) activities, teaching basic sciences by using vignettes of clinical problems and taking the students to the hospital or the community to show the relevant clinical cases have been successfully used.

Teaching of anatomy, for example, can be supplemented by clinical examination of the same part. Respiratory physiology can be supplemented by clinical examination of the chest. You can think of many more such examples where teaching in basic sciences can be supplemented by clinical examples, making the content relevant to students.

ECE does not necessarily mean taking the students to the hospital or to a live patient. It can also be implemented by using brief case histories, laboratory reports, photographs, X-rays, blood films, or any other clinical material. Community visits can also be used to bring clinical relevance.

ECE is a very useful strategy to let students experience the utility of basic sciences in clinical medicine. It helps to correlate the signs and symptoms with underlying physiological or biochemical derangements. In a way, it takes the learning from "knows" to "knows how" (we discuss this aspect a little later). It also helps to let the students develop positive attitudes and good communication skills.

Spiral Curriculum

Bringing clinical relevance to basic sciences is the easiest of integration strategies. Similarly, integrating social and behavioral sciences is also best done during basic years.

ii. *Revisiting basic sciences in clinical years:* When students are being taught about myocardial infarction, they can be taken to the dissection hall again and taught about blood supply to the heart. When encountering a case of liver abscess, they can be taught again about anatomy of the liver. Short of that, revising the relevant portions of anatomy, physiology, and biochemistry before teaching diabetes can help the students to understand the pathophysiology and clinical features better. This helps to remember the basic sciences in context. This method is much easier and simpler compared to what we have described above. Unplanned repetition of the content is replaced by planned reinforcement.

Yes, you are right! This is the concept of *spiral curriculum*, which promotes periodic revisiting of basic sciences during clinical years.

iii. *Case-based learning (CBL):* Clinical teachers can effectively use this strategy. Instead of giving a lecture on typhoid fever from etiology to prevention, they can start with a brief history of a child who presents with fever of 10 days duration and rash. This can be built up to teach clinical features, diagnosis, and therapy.

CBL and PBL

iv. *Problem-based learning (PBL):* This implies using a clinical problem as a trigger and then helping the students acquire the basic sciences knowledge in the context of that problem. It is different from problem solving where the knowledge has been acquired in a non-contextual way and is now being used to solve the given problem. PBL has many shades—from the classical variety to subject based and even topic based.

Integrated Assessment

Aligning Assessment

One of the many reasons for the failure of integrated teaching at many medical schools is the process of conventional assessment. Since integration requires a change in teaching and learning methodology, both teachers and students are unlikely to apply it unless the assessment pattern is suitably amended. Simply stated, integrated assessment would mean moving away from departmental boundaries. Rather than asking the students about the clinical features of fracture femur neck, integrated assessment would mean also asking them about the anatomy of the part involved, peculiarities that make it a problem entity, and biochemical changes that may be expected during the process of reunion. This is often done informally even now during case presentations. Objective structured clinical examination stations testing various areas can be similarly designed. While the university

Developing Teachers

examinations may still be discipline-based, formative and internal assessments provide ample opportunities for integrated assessments.

Faculty Development

Integration is a new paradigm for most colleges where subject-based teaching has persisted for years. It requires a change on the part of the faculty to accept "intrusions" of other departments into their domain. Developing an integrated teaching program would mean the involvement of clinical faculty in designing basic sciences teaching and *vice versa*. During teaching, you can play an important part in promoting integration by linking your topic to what has been taught earlier. This would mean even sharing your lecture contents with other departments. You may also need to structure your teaching around themes (e.g., diabetes mellitus, HIV, myocardial infarction, and anemia) rather than around processes (e.g., maintenance of blood sugar, immune function, cardiac cycle, and iron metabolism).

The faculty also needs to develop their expertise in using integrated assessment. As discussed earlier, integrated teaching is unlikely to sustain in the absence of integrated assessment. You would appreciate that both these play crucial roles, and without appropriate faculty development, we may not be able to initiate or maintain integration.

Chapter

6   Domains of Learning

The practice of medicine is an art, not a trade; a calling, not a business; a calling in which your heart will be exercised equally with your head.

William Osler

In this chapter, we will take you through a very important concept. Can you enumerate all the activities that you will be undertaking when examining a patient in an OPD? You may have thought of some or all of these:

❖ Take history and perform physical examination
❖ Make a diagnosis and write a prescription
❖ Explain the treatment and diet
❖ Address concerns of the patient related to protection of his children from this infection.

Can you categorize these activities in some way? Yes you are right—you did something related to *knowledge*; something related to *performance*; and something related to *communication*. In fact, in every doctor-patient interaction, most of the activities are divisible into these three domains.

Let us try to understand them in more scientific terms. Educationists have given a taxonomy (or classification, in simple terms) of learning to categorize various learning activities into domains. These domains are:

❖ Cognitive (proposed by Bloom et al.)
❖ Psychomotor (proposed by Dave and modified by others)
❖ Affective (proposed by Krathwohl)

It may be easy to remember them as domain of the *mind*, domain of the *hands*, and domain of the *heart.* Let us clarify here that though activities, may broadly appear to be related to only one domain but generally, there is no water tight division between them. As an example, explaining prevention may appear to fall in affective domain but it requires certain degree of knowledge and language skills before it can be done. Same is true of clinical skills.

Within each domain, divisions have been proposed to provide graded learning. The diagram given below lists the subclassification in each domain. Let us look at what each of these terms means.

Taxonomy of learning
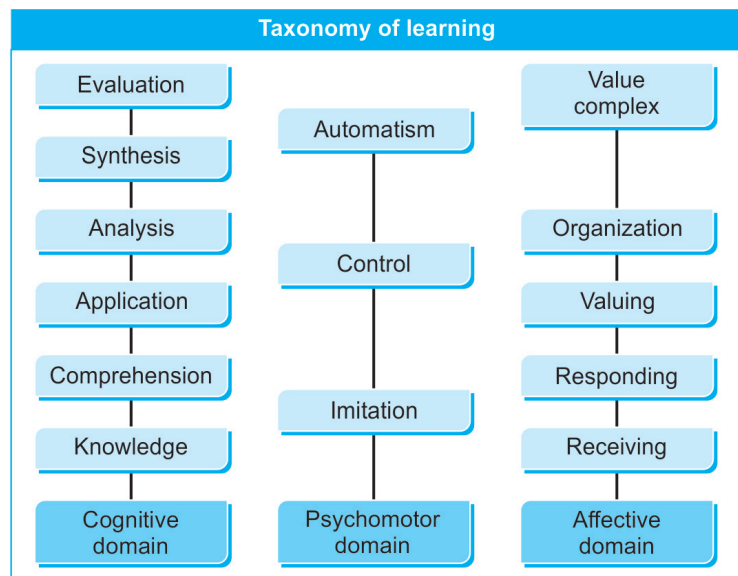
It may be of interest to know that this classification is abbreviated as KSA (knowledge, skills and attitudes). However, in the recent times, a greater attention is being paid to the attitudinal aspects (ethics, communication, professionalism) of medical training and therefore, you will find it abbreviated as ASK (attitudes, skills, and knowledge. As stated earlier, the classification of various professional activities into one of the three domains is not in black and white and some overlap will always be there. What is important, however, is to remember that your teaching should cover all the three domains of learning. It may also be of interest for you to know that a fourth domain of communication has also been added to this and the new abbreviation for domains is modified as knowledge, skills, attitudes and communication (KSAC).

Shift in Emphasis

Cognitive domain deals with the knowledge part. It is classified into following levels:

Domains of Knowledge

Level	Example
Knowledge: Recall of data or information	Enumerate five side effects of rifampicin
Comprehension: Understand; explain in own words	Explain the mechanism of hepatotoxicity by rifampicin
Application: Use of a concept in a new situation	Calculate the dose of rifampicin for a 20 kg child
Analysis: Distinguish between facts and inferences	Discuss advantages of using rifampicin in the initial treatment of tuberculosis
Synthesis: Build whole from parts and derive meaning from the new whole	Discuss characteristics of drugs which prevent development of drug resistance
Evaluation: Judging the value or worth of an action	Select the most appropriate drugs for drug resistant tuberculosis

Psychomotor domain is involved with skills and is classified as follows:

Domains of Skills

Level	Example
Imitation: Copying actions after being shown an activity	Teacher demonstrating and students performing intubation on a dummy
Control: Performing an act according to instructions	Performing intubation under supervision
Automatism: Performing a series of articulated acts	Independently intubating a patient in a busy emergency room

You should be aware that performing an activity requires a certain degree of baseline knowledge also.

Affective domain deals with attitudes, communication, ethics, professionalism and other attributes which are broadly referred to as non-cognitive or non-scholastic. It is classified as follows:

Domains of Attitudes

Level	Example
Receiving: Paying attention to what is happening around	Paying attention to a mother who is crying in the ward
Responding: Participation and exploration, developing interest	Trying to find out why she is crying
Valuing: Consistent behavior showing a positive regard	Saying soothing words to the mother
Organization: Clarity about the issue with no conflicts	Realizing that grief is inevitable on death of her child
Value complex: Internalizing the phenomenon	Showing to the mother that we care about her grief

While a very rigid classification of professional activities into one of the above may not be possible, it is still useful to look at this framework. It provides a guide to the teachers to emphasize the different levels from different domains in their teaching at various stages of curriculum. In addition, some topics may require more of one domain as compared to others. Fallout of this is that when you frame objectives, you should include all domains of learning. If we ignore affective domain (as most commonly happens), there would be no incentive for the students to learn good communication skills. You should also assess all domains of learning to ensure that students learn them.

Learning by objectives is an acceptable methodology to give a desired direction to learning. In the next chapter, we will discuss the importance and process of writing educational objectives and see how they need to be spread across all domains of learning.

Chapter
7
Learning Objectives

LEARNING OBJECTIVES

❖ Enumerate the components of a learning objective
❖ Identify components of a given learning objective
❖ Write learning 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.

Robert Mager

Have you ever experienced that if you have a precise goal in mind, things begin to happen easily and effectively? Let us take an example. Suppose you want to see Brindavan Gardens during your next vacations. You will make a plan, take a train to Bengaluru and then to Mysuru. You will not have to ask yourself this question midway: Where do I go from here? On the other hand, if you had started for your vacations without a goal, you may still have had your vacation, but the places that you visited, may have been haphazard. May be, you had seen lot of other places but missed out on Brindavan Gardens. For teachers and students to work successfully towards achievement, a clear description or outline of the goals and a step-by-step description of achievements on the way is necessary. The goals stated with clarity and in concrete terms are usually referred to as objectives. Let us look at a formal definition of the term 'objective' with reference to education.

An educational objective is a statement describing the expected results of learning as seen by a change in behavior or performance of the student. (Remember the definition of learning—*a change in the behavior of the learner.*) In other words, educational objectives state *what the learner should be able to do* at the end of the course.

We hope that by now you are clear about the difference between aim and objectives. Let us repeat it for you. Aim is a broad statement of an educational activity while an objective is a precise point in that direction. To take a simple example, you may aim towards south with the objective of reaching Chennai. 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 a good doctor. Let us try to state this in another way. An aim can be defined as an answer to the question 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.

Why Learning Objectives?

One of the obvious reasons is that they help the learner in the process of learning by making explicit what he should be able to do. In a way, it makes your task as a teacher easier. Objectives also help you by letting you choose appropriate teaching-learning and assessment methods. Objectives can be seen as a useful tool to improve the teaching-learning program.

Advantages

Advantages of learning objectives	
For the students	*For the teachers*
Awareness of what is expected at the end of the course	Awareness of what the students should be taught
Clarity about knowledge and skills to be acquired	Choosing appropriate teaching-learning activities
Awareness of the criteria by which performance will be judged	Planning for assessment and acceptable performance levels

In addition, objectives are also useful as a means to promote shared communication between teachers and students. They help the educational institutions to provide appropriate resources. They make the society aware about the competence of the future graduates. Finally, they make comparison between different institutions easier.

Educational objectives can be stated at various levels. To begin with, there may be objectives at the *national* level, outlining the broader focus of educational programs. For example, the objectives of Graduate Medical Education stated by Medical Council of India tell us about the focus of medical education in this country. Further down, they can be stated at level of the *institution*, level of the department, or level of *specific instruction*. Let us take a look at these levels.

Institutional objectives generally state the institution's aim or purpose. It could be related to producing community-oriented doctors, doctors of first contact, specialists, or researchers. Institutional objectives give a direction to what and how medicine is taught at that institution. In a way, they are the reason for the existence of that institution.

Based on the institutional objectives, individual departments within the institution can state *intermediate objectives* toward fulfillment of the overall goal. You will realize that for a single institutional objective, a number of intermediate objectives need to be stated. Whereas institutional objective will be a broad goal or purpose, intermediate objectives will be toward more specific issues. However, they will still be broad.

Teachers state *specific learning objectives* to design teaching-learning activities which will help in attaining the already stated objectives at institutional and departmental level. They are very specific and written using standard methodologies. Specific learning objectives (SLO) are also called instructional objectives, learning objectives or sometimes simply *objectives*. When we use the term *objective* in an unqualified way, it generally refers to SLOs.

Levels of Objectives

Examples of various levels of objectives	
Institutional objective	Students will be able to effectively function as physician of the first contact
Departmental or Intermediate objective	Students will be able to apply the knowledge of pediatrics for solving common health problems of children
Learning objective	Students will be able to diagnose and treat pneumonia using Integrated Management of Childhood Illnesses (IMNCI) algorithm.

You would have noticed that as we move down the list, the precision keeps on increasing as does the number of objectives.

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.

Let us take you for a while to systems approach again. 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 behavior (learning). Diagrammatically, it can be represented as follows:

Systems approach

Input	Process	Output
Reinformed practice	Internal processing	Permanent change in behavior

Learning events → Learning → Behavior

Feedback
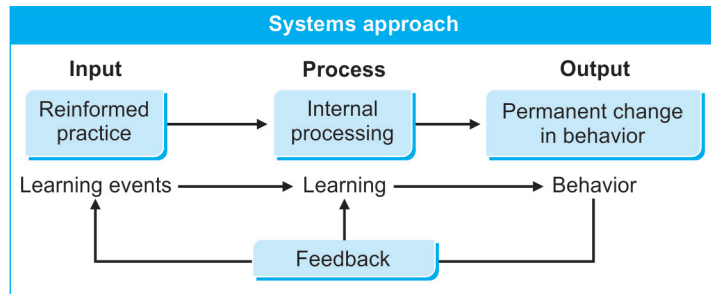
You have rightly noticed that as a teacher, the phenomena you can control are learning events and observation/measurement of performance. In other words, you as a teacher must be able to use a more precise language which describes in behavioral terms, what the student will be able to do at the end of a lesson. When you have stated the change in behavior that you hope to produce in the student, you have stated an objective.

Objectives, Competency, Outcome

You may have recently come across these terms, especially in view of changing curricula by the Medical Council of India. All three – more or less- are descriptors of the end of the course status, i.e., what would have changed after a course. However, there are certain differences among the three.

Competency refers to an observable activity of the health professional using the necessary knowledge, skills, attitudes and communication. Learning outcomes describe what would have happened after the students complete the course while objectives describe what precisely the students will be able to do.

If you look at the these definitions, what becomes apparent is that all the three refer to observable activities. It also shows that there is a sequential relationship between these. A student is able to do something *(objective);* he uses the requisite knowledge, skills, attitudes, communication (KSAC) to perform a professional task *(competency)*, which results in some change *(outcome)*. Thus, outcomes require the students to be competent, which require them to learn the needed objectives. This sequence becomes important because in competency based educational models, the objectives have to be derived from competencies, which in turn are derived from the outcomes. Each outcome may have multiple competencies and each competency may have multiple objectives.

You should be aware, however, that you may find different definitions of these terms, depending on the course, context, or geographic region.

Relation of objectives, competency, outcome	
Term	*Example*
Objective	The student is able to take immunization history
Competency	The student is competent to run a well-baby clinic
Outcome	The student is independently running a well-baby clinic

Writing Objectives

The learning objectives can be divided into three basic categories: (i) Objectives related to acquisition 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. We told you about the fourth domain of communication being added. However, in all our subsequent discussions, we will club communications with the attitudinal domain.

Professional tasks differ in their requirements of how much of knowledge, skills, or communication they need. Does it mean that weight to different categories of objectives depends on the whims and fancies of individual teachers? The answer is 'No'. For any course and any subject, the relative weight should be pre-decided, 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 hypothetical example.

Methodology

Table of specifications				
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
(All figures in percentages)				

Writing Objectives

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 criticized 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 three specific elements *viz.*

Components

❖ Specific performance of the student
❖ Conditions under which this performance is expected
❖ The minimum acceptable level of performance.

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

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

Can you recognize the three components in each of these objectives? They are:

Examples

Performance	Condition	Minimum acceptable level of performance
1. Palpate the liver	Child	Accurate to ± 0.5 cm
2. Recognize pre-eclampsia	Antenatal visit	Three major symptoms
3. Record weight of newborn	Using lever type scale	Accurate to ± 50 g

In general, all learning objectives will have these three components. Now look at the following objectives and try to find them out.
❖ Identify ova in a stool smear.
❖ Recall common causes of diarrhea 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 diarrhea). This type of writing will, however, be applicable only if there is 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).

Let us introduce you to two other techniques of writing instructional objectives, which are used by some teachers. One of them is ABCD technique. This is an acronym for audience (who will do), behavior (what will be done), context (where will be done/under what conditions) and degree (minimal acceptable performance). Another method which is gaining popularity is Kern's method, which states objectives as answers to the questions '***who*** will do ***how much*** (how well) of ***what*** by ***when***'. Kern's method includes the stage of curriculum also in the statement of objectives. This is particularly useful for competency-based education as it reflects the incremental learning over time. You will realize that though the method changes, the contents essentially remain the same. We have retained Mager's method due to its strength of ease and familiarity.

Qualities of Good Objectives

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

- ❖ 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 or 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 assessment and feedback.

Many a times, the qualities of an objective are indicated by a mnemonic *SMART*, which stands for specific, measurable, attainable, relevant, and time bound.

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 the course. It is clear that good objectives are derived from actual base and not from imagination. You would be wondering, what forms this base.

Sources of 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 legitimized. 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 diarrhea 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 diarrhea, pneumonia, and malnutrition rather than with rare syndromes.

e. *Competency statements:* For institutions following CBME, the competency statements are the source of writing educational objectives. Obviously, this will be used only if you are following a competency-based medical education.

It is not that using objectives is without their share of criticism. Some people find them reductionist, i.e., breaking the professional tasks into

Basis of Writing Objectives

such smaller components that the tasks lose their meaning. Similarly, breaking the task into knowledge or skills may be too rigid and artificial. For example, performing a lumber puncture requires a certain degree of knowledge. The student needs to know the treatment and prognosis before he can counsel a patient with myocardial infarction. With emphasis on objectives, the knowledge, skills, and communication may never get integrated. However, despite these issues, objectives provide a useful means to teach, communicate with and assess students.

Before concluding, let us come back to the vacation example that we gave at the beginning of this chapter. We had stated that if you do not know where you want to go, you may have your vacation yet never see Brindavan Gardens. Can reverse be also true? You may go with the specific objective of seeing Brindavan Gardens but, may miss a number of other tourist attractions in the vicinity because they were not on your list. This could be one of the problems with objectives. Let us have a look at various advantages and disadvantages of using objectives in education. As you look at the table below, you will appreciate that the disadvantages relate more to the issue of implementation rather than being an inherent property of objectives.

Advantages	Disadvantages
Provide direction to institutions, teachers and students to design relevant educational programs	Can give a wrong direction to learning
Help in designing appropriate assessment tools	Can restrict the scope of learning
Provide functional profile of future graduates	Can lead to trivialization of content
Help in integration of knowledge, skills, and attitudes	Can restrict scope of learning
Help teachers in lesson planning	Can discourage creativity
Help students in directing their learning efforts	Can appear too much examination oriented
Shared means of educational communication	May not capture the essence of professional tasks

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 subsidized; the end products of the system must be able to address the common health problems of our country.

	Action verbs to be used in framing objectives					
	Knowledge/ Comprehension		**Application**		**Problem-solving**	
C O G N I T I V E	Arrange Cite Classify Convert Copy Define Describe Discuss Distinguish Explain Express Give example Identify Indicate Label List Locate Match Name	Order Outline Recall Recite Record Relate Reproduce Repeat Report Restate Review Rewrite Specify Summarize Tell Translate Underline	Apply Assemble Calculate Change Choose Compute Defend Demonstrate Discover Draft Dramatize Draw Employ Estimate Explain	Illustrate Infer Interpret Modify Operate Practice Predict Prepare Produce Relate Schedule Select Show Sketch Use	Analyze Appraise Argue Arrange Assemble Assess Categorize Choose Combine Compare Compose Conclude Construct Contrast Convert Create Debate Define Devise Differentiate Discriminate Distinguish Estimate Evaluate Examine Experiment Formulate	Illustrate Infer Inspect Interpret Judge Justify Manage Modify Organize Plan Predict Prepare Propose Question Rate Relate Score Select Solve Support Test Value Write
A F F E C T I V E	Accept Accumulate Ask Describe Follow Give Identify	Locate Name Point to Respond to Select Sensitive to Use	Affirm Approve Assist Choose Complete Conform Describe Discuss Follow Initiate Invite Join Justify	Perform Practice Propose Select Share Study Subscribe Work	Act Adapt Change Defend Display Influence	Integrate Mediate Organize Revise Solve Verify
P S Y C H O M O T O R	Complete Demonstrate Distinguish Hear Identify Locate Manipulate Move Pick up Point to Practice	Press Pull Push See Select Set-up Show Sort Specify Touch Transport	Activate Adjust Assemble Build Construct Copy Demonstrate Disassemble Disconnect Draw Duplicate	Loosen Manipulate Measure Open Operate Perform Remove Replace Rotate Select Set Execute Load Locate	Adapt Combine Compose Construct Convert Create Design Devise	Fix Generate Illustrate Modify Organize Plan Repair Service

Source: Based on Bloom and Krathwohl (1956). Taxonomy of educational objectives. Longmans, New York.

Chapter
8

Taking a Lecture

LEARNING OBJECTIVES

❖ Plan a lecture
❖ Enumerate pre-requisites for delivery of a good lecture
❖ Incorporate these points in your lectures

College is a place where a professor's lecture notes go straight to the students' lecture notes, without passing through the brains of either.

Mark Twain

You might be aware of the criticism, which is often leveled against lecture as a teaching method—yet most of us are using this as a primary mode of teaching. The reasons are simple—lecture is one of the most cost-effective methods, which can transmit a large amount of information to a large number of students with minimal resources. Given the current situation, there is no doubt that lectures as teaching method are 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, especially to build up basic theoretical knowledge, which must be gained before we can use other interactive methods, such as tutorials or small group discussions. Lecture, however, is unsuitable for teaching skills, communication, or promoting attitudinal change. It is mostly 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 or to handle the wide diversity of abilities and attitudes, which the students represent.

You must consider the logistics before taking your lecture. You must also study the nature of your audience, adapting the topic to their interests and understanding. You should organize your material

Challenges

Making a Plan

in a manner which is effective and use aids where appropriate. You should also plan for variation in your presentation, and include time for questions and discussion, which will reveal how much learning has taken place. We shall now discuss these in more detail.

Utility of lecture	
When to use lecture	*When not to use lecture*
Disseminating information to a large class	Presenting complex or abstract information
Presenting new information before other activities, such as small group discussions or practical	For objectives related to attitudes or behavior change
Arousing interest by sharing own experiences	Higher order thinking (e.g., upper levels of Bloom)
Providing a broader picture of the topic	Teaching practical skills

Planning the lecture: Before you plan your lecture, you should try to answer the following questions:
❖ Who is your audience?
❖ What is the purpose of your lecture?
❖ What is the time available?
❖ What is the subject matter?
❖ Which teaching aids to use and how?

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 lecture (e.g., giving general information and giving specific information) will make it easy for you to select appropriate material and to decide on the most effective way to present it.

A good teacher 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 utilized 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 10–15 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 humor, interesting examples, rhetorical questions, and audience participation.

Using A–V aids wisely is a key factor to deliver a successful lecture. Avoid putting everything on the slides, as you should avoid reading from the slides. As a general recommendation, you should be spending about

1.5–2 minutes per slide—so for a 1-hour lecture, 25–30 slides should be more than enough. Also, avoid too many transition effects in your slides. Remember, the purpose of A–V aids is to enhance learning, not to distract the students. We will discuss it in more detail in Chapter 12.

Preparation

Subject matter is crucial for a good lecture, since 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 ideas. Jot down the material by consulting reference books, texts, previous notes, etc. After you have collected the material, categorize 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.

Delivering the Lecture

Content Delivery

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. Try linking the content to what they have already learnt. Try to link it to how it is going to be useful for their future work. You should also 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.

A very interesting term, *lecturalgia* (painful lecture), has been used in the literature to denote problems with poorly conceived or delivered lectures. Many factors have been recognized to be associated with lecturalgia. Do you relate to any of them? Surely we do. However, if we are aware of these, we can make deliberate efforts to avoid many or all of them. In our opinion, trying to pack too much of content simply to "cover" the subject, needs to be avoided at any cost.

Students' perception of poor lectures	Teachers' perception of poor lectures
Unorganized	Misjudged context
Objectives unclear	Lack of preparation
No opportunities for questioning	Problems with A–V aids
No response to student queries	Too much content

Source: McLaughlin K, Mandin H. Med Educ. 2001;35:1135-42.

Generating Interest

The key to a successful and absorbing lecture is to generate the interest of the students. Come to think of it, if it is only the content, students have access to current, concise, and updated content in the comfort of their hostel rooms. It does not bring them to the class. You can use a variety of techniques to generate and sustain interest. Some of these are:

- ❖ Narrating an event contrary to the expectations (e.g., advantages of low hemoglobin in the body)
- ❖ Narrating a real-life story (e.g., encountering a patient with cardiac arrest while traveling)
- ❖ Demonstrating an experiment (e.g., recording blood pressure in the classroom)
- ❖ Recalling experiences of students as a patient or an attendant to a sick family member
- ❖ Posing problems to be solved by students.

This is only a representative list and you can think of many more such activities. They are best performed during the introductory part of the lecture. At the same time, please be also aware, not to overdo them. Being conversational, rather than didactic, allows you to capture and sustain attention.

Interactive Lectures

Bringing Interactivity

While lectures are criticized for being one-way passage of information, their educational value can be enhanced by making them interactive. An interactive lecture is one, which allows the teachers to break it by using what are called *engagement triggers*. These help to maintain and enhance the students' attention, which generally tends to dip after 10–15 minutes. Interactive lectures have been shown to promote deep learning, which allows better understanding, retention, and recall of knowledge as well as its application.

Many techniques can be used as engagement triggers and we do not want to go into all of them. Some of the important ones, commonly used, are as follows:

i. *Think, pair, and share:* During the course of the lecture, you ask the students to turn to their neighbor and discuss some issues related to the topic being taught. You then randomly ask the students to share the results of their discussion with entire class.

ii. *Demonstration:* These are especially useful to promote application of knowledge. During a lecture on breastfeeding, for example, you may use a doll to show the positioning of the baby.

iii. *Crossword:* You can give a crossword to the students, which contains points to be remembered and ask them to solve the puzzle. This is especially useful for topics that require one-word answers (e.g., toxic effects of drugs).

iv. *Concept maps:* These are used to graphically represent the main ideas being presented in the lecture.

v. *Point of the day:* You ask the students to write one main point that they learnt. They can then exchange their papers and see what others have learnt.

vi. *Muddiest point:* You can use this technique to find what the students have not understood. Ask the students to write what was most difficult to understand on a slip of paper. This paper is then passed like a musical parcel 7–8 times. Then, you ask the students to read the difficult area from the slip that she has *now* in her hands. This allows students to point out difficult areas without being identified.

vii. *Questioning:* Open-ended questions are a very useful tool to promote understanding. However, asking the right questions requires careful planning on your part. It has been rightly pointed out that *mediocre teachers plan what to teach while excellent teachers plan what to ask.*

Most common interpretation of the term interactivity relates to interaction between teachers and students or between students and students. However, one must never forget that the most important interactivity is *between the student and the content.* Therefore, never try to equate interactivity with level of physical activity. A student sitting quiet and trying to understand the text may be more interactive than one making a lot of noise but not assimilating anything. As a teacher, you have a crucial role in designing learning activities to promote such interactivity.

Jigsaw Technique: This is another interesting technique which you can use to engage the students in active learning. As the name indicates, it involves breaking the subject matter into pieces, giving one piece each to a group of students, and then challenging them to combine the pieces and come out with meaningful information. Let us give a brief description of this technique by using anemia as an example.

Jigsaw Technique

Suppose you want to teach anemia to third-year medical students. For ease of explanation, we will assume that your class has 20 students; however, if you have more number of students, you can run parallel sessions.

Divide the class into four groups of five students each. Let us call them A, B, C, and D. Each group will further have students A1, A2, A3, A4, and A5. Now divide the subject matter into four distinct portions, e.g., prevalence and etiology; clinical features; diagnosis and differential diagnosis; and treatment and prevention. Give the material related to each part to each group of students. In this case, group A will have matter related to prevalence, B will have matter related to clinical features, and so on. Ask the students to assemble in their groups and discuss the matter over 20–30 minutes. Now mix the groups so that the new group

will have A1, B1, C1, and D1. As you will appreciate, this new group has one student from each of the groups that we formed earlier. Over the next 20 minutes, A1 will teach prevalence and etiology to the new group and B1 will teach about clinical features. At the end of 20 minutes, there will be a general discussion to sort out issues, which need clarifications.

You have rightly guessed that in this method, each student is required to teach others and has to be an active learner. Unlike traditional group discussion, where only one or two students are active, here everyone is learning. And as is said, *to teach is to learn twice*, the quality of learning is also better than passively listening to a lecture.

Pre-lecture assignments: Let us also introduce you to another technique which is very commonly used to improve the benefits from lectures. We all use quizzes and assignment after the lectures but using them before the lectures is fast emerging as a useful strategy. You may be wondering how the students will answer them when they have not been taught a subject. The fact is that prelecture activities improve retention of knowledge and studies have shown that students given prelecture activities score better on postlecture tests as well. The technique is simple. If, for example, you have to teach nutritional advantages of breastfeeding, ask the students to complete a fill-in-the-blank type questionnaire. They can consult books if they want. You can also give them a small clinical problem about a child who has been having repeated episodes of diarrhea, is malnourished, and has been on bottle feeds. This is usually given 3–4 days prior to the lecture. The responses do not have to be marked but you can randomly pick some responses and discuss them during your lectures.

You will appreciate that the basic purpose of using various techniques described above is to make the students interact with the content rather than merely listen to what you are saying. Interactivity cuts down on boredom, increases attention span, and promotes deep learning.

Flipped classroom: This is another technique to make the lectures interactive and interesting. As the name indicates, it involves flipping two important activities, viz. lecture and self-study. This has been illustrated below
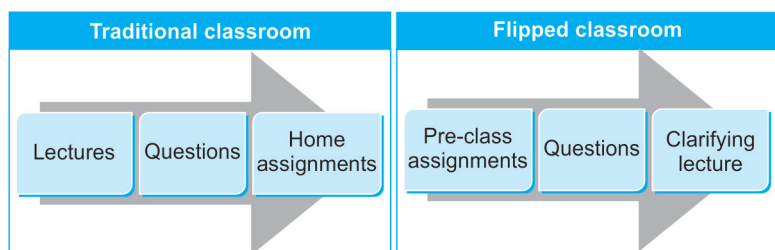
You would have noticed that a traditional lecture is used to impart knowledge, whereas in a flipped classroom, the lecture time is used to check understanding and clarify doubts. Pre-class assignments are the starting point of flipped classroom. These could be low tech tools, such as MCQs and reflective writing or hi-tech such as online quizzes or Google survey forms. The in-class activities also differ—rather than just giving a lecture, these could include one or all of the following: problem-solving exercises, concept map preparations, affinity mapping, or reverse brainstorming. Thus, reading and understanding are carried at home, while the class time is utilized for higher levels of learning, such as analysis, evaluation, and application of the basic information.

In addition to promoting active and deep learning, flipped classrooms are a very useful tool to promote self-directed learning. They do require extra efforts and preparations by teachers and students alike, but the results are worthwhile. Students also seem to like this form of teaching.

Writing Notes During Lectures

We all have the experience of our students vigorously taking notes during our lectures. To some extent, it may indicate that the students are taking interest in the lecture. However, it compromises on the quality of learning for the simple reason that human brain cannot perform two tasks—understanding and writing—at the same time.

Taking Notes

We have been using the following technique to tide over this problem. Presuming that each lecture is of 1-hour duration, we divide the content into three parts of 15 minutes each. At the beginning of the lecture, the students are requested to close their notebooks and concentrate on the matter being discussed. At the end of 15 minutes, they are given 5 minutes to write what has been discussed. During this time, they are free to ask their neighbors or even the teacher if they have forgotten anything or have not been able to understand. This is followed by another talk of 15 minutes and the sequence is repeated.

Educationally, the process has the advantage that rather than passively writing notes, students have to mentally process the information before making a summary and this promotes active learning. There may be some students who do not write during the 5 minutes slot and you should accept this as normal. To save time, you should try to supply photocopies of diagrams or complicated processes.

Another technique, which can be used in this situation, is to provide *programed notes*. These are outlines of the lecture with any diagram, etc., but which have key components missing. During the lecture, students complete these missing links to make complete sense of them. As you would realize, they are useless to any student who has not attended the lecture.

Practical Tips for an Effective Lecture

Delivering the Lecture

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

❖ Arrive a few minutes before the scheduled time to give yourself some buffer 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 read them. Students feel more interested in your experiences rather than a literary oration.

❖ Speak from a posture that is comfortable to you. Avoid moving up and down on the stage.

❖ Be poised, courteous, and sincere. Careless choice of language or humor may create blocks to communication. Be particularly careful with humor, especially if you do not know the audience well.

❖ 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 your gaze on a particular student or a group of students.

❖ Any action or gestures should be natural and spontaneous. Mannerisms 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—do not 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.

You should remember that a good lecture is like a story, which has a beginning and an end. It should maintain the curiosity of the student. Many of us think that a lecture can be made great by using presentations or other teaching aids. This is not true. Recall the last movie that you saw. In spite of the grand sets, glamour, and well-rehearsed performances, people move out of the hall because they find many things boring. Compared to that, a lecture lacks all these elements, yet good lecturers keep their audiences spellbound, yearning to learn more.

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.

Tutorials and Small Group Discussion

LEARNING OBJECTIVES

- ❖ Explain the concept of tutorials and small groups
- ❖ Effectively conduct a tutorial and small group discussion

Definitions

*If students can not learn the way we teach, may be
we should teach the way they learn.*

Ignacio Estrada

In this chapter, we will introduce you to two of the very effective teaching–learning methods, viz. tutorial and small group discussion. Apparently, both tend to convey the same meaning and both happen with a small number of students (compared to a lecture, for example), but there are some qualitative differences which are worth considering. Let us do it for you.

Tutorial is a teacher-centered activity, while a small group discussion is a student-centered activity. Tutorials, usually conducted after a few lectures or a series of lectures, are mainly designed to find out the extent of understanding and learning achieved by the student. The teacher assesses, by the way of asking questions, the performance of students and may also clarify some of their doubts. Whatever the activity during the tutorial, it is controlled by the teacher. The students are observed and assessed. Depending on the need, some amount of mini-teaching may also be undertaken by the 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 assessment of each student and negative marking, for remaining absent without valid reason, can ensure regular attendance and effective participation.

Small group discussion, on the other hand, is used 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 some time 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. Thus, it is a more complex role for you.

Involving the Students

For the student, a group should provide a relaxed atmosphere to develop a better understanding of the subject matter suitable to her individual needs and abilities. In a previous chapter, we discussed with you the importance of managing group dynamics so that none of the members perform dysfunctional roles. An active participation by all members of the group is ideal; however, some can gain a lot even by listening to the discussion. You should try to encourage the silent members so that they get an opportunity to express their views. 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, where as, during the tutorial, it is presumed that most members of the group have learnt the subject and the extent of learning is being assessed and 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 necessitating pure memorization.

The time spent in tutorial discussions may vary from teacher to teacher. The effective utilization of the time may also vary by different teachers. Your way of conducting the discussion is likely to influence

Role of the Teacher

Setting

students' interest in a 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 lifelong learning.

Maximizing the Utility

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

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 must know, understand, be able to apply, or use effectively, by the end of the semester.
2. Use a variety of approaches during each session and over the course of the year according to what is most appropriate for the material being presented. An entire course of only lecture sessions or only slides becomes tedious, not only for the students but also for the teachers as well.
3. Develop clear expectations of 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 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, 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 from the students.
7. Avoid yes/no questions. Ask "why" or "how" questions that lead to discussion. When students give only short answers, ask them to elaborate. This is a very useful opportunity to take the students to a higher level of learning.
8. Do not fear silence. This may be the most difficult thing to do, but it is absolutely essential. Research shows that generally teachers do not wait for more than 3 seconds before starting to answer the

question themselves. This takes away the opportunity to let the students think and articulate.

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 an authority figure.

10. Provide positive feedback for participation.

11. Show enthusiasm for the subject. You cannot expect students to become interested in a discussion topic in which the teacher shows no enthusiasm.

12. Assign roles to the students. These roles should be self-managed. Ask them to elect a discussion leader, timekeeper, recorder, and a reporter. You may like to go through the Chapter 3 again to revise these roles. The habits inculcated at this stage are of great use in later professional tasks.

Chapter

10   Teaching Clinical Skills

LEARNING OBJECTIVES

❖   Discuss the role of clinical skills
❖   Describe various models of teaching clinical skills
❖   Use the models of teaching clinical skills in day-to-day work

The whole art of medicine is in observation… but to educate the eye to see, the ear to hear and the finger to feel takes time, and to make a beginning, to start a man on the right path, is all that you can do.

William Osler

One of the very important aspects of training medical students is teaching clinical skills. As of now, teaching of clinical skills is taken for granted in the hope that by observing his teachers and seniors, the student will be able to imbibe a good amount of clinical skills. While this assumption may be true to some extent, it leaves much to be desired.

In our country, clinical skills teaching is most often opportunistic. It means that most of the time, we have no control over which patient the students are going to see and what are they going to learn from these encounters. It is also to be emphasized that students do not acquire clinical skills in a vacuum—rather, they acquire these skills on a cognitive base. If the student does not have the requisite knowledge or he has not activated this knowledge in the clinical context, then it may be difficult to precisely acquire the skill.

Before going to skill teaching, let us clarify what is meant by the term *clinical skill*. Loosely taken, a skill implies something which is in psychomotor domain and mainly focuses on procedural skills. However, lately, clinical skill is taken as any action performed by the physician, which has a bearing on the patient's outcome. This broadens the

Basis

concept of skills. With this perspective, skills could be technical (history taking, physical examination, communication, IM injection, etc.) or they could be non-technical (decision-making, analysis, teamwork, etc.). We will also like to reiterate that very few skills are in the psychomotor domain alone. Most require an underlying foundation of cognitive domain and an overarching support of affective domain. A student needs to know the anatomy of muscles and nerves in the gluteal region, know where and how deep to insert a needle, and also know how to explain the procedure, before successfully acquiring the skill of giving intramuscular (IM) injections.

Teaching Clinical Skills

In this chapter, we will look at some of the models of skill teaching. It is interesting to know that many of the techniques of teaching clinical skills originated from the world of sports, where either the coach observes the player or *vice versa*. Both the models have produced excellent sportsmen (and women!). Each model has its own strengths and weaknesses and you will need to make your judgment about the suitability of a particular model in your setting. In medical education, this is especially useful as teachers can model professional thinking, behaviors, and attitudes in an authentic atmosphere.

For successful acquisition of clinical skills, the student must understand the cognitive basis of skill, must see the skills demonstrated, must hear a narrative of the steps, and finally must get an opportunity to practice the skill with a graded level of independence. Various models discussed below operate on this basic premise.

a. *Observer model:* This model—one of the oldest and most commonly used—implies that the teacher interacts with the patient and the student observes the interaction, picking up the skills in due course. This is especially useful for busy clinical areas such as OPDs where the volume of workload is high, leaving little time for formal teaching.

As already mentioned, much is left to chance in this model. What the student observes and what he interprets is largely based on earlier knowledge, context, and situation; this may leave different students with different ideas from the same encounter. However, the utility of this approach can be improved by periodically asking the students what they observed and comment on the adequacy or otherwise of the encounter. For senior students, this should provide a good opportunity for reflection and adoption of clinical skills.

Active Observation

While teaching junior students, random observation may not be appropriate. In this situation, it may be best to provide a preamble

Observation Guides

to the students as the teacher interacts with each patient. For example, students can be told, "now I am going to elicit history of bronchial asthma in this patient" or "now I am going to counsel this patient about modifying his lifestyle." This type of priming allows the students to be more focused on their observation rather than making their own interpretation of what the teacher is doing. Sometimes, it may be useful for the teacher to "think aloud" by describing what she is doing. Making a commentary on what she is doing helps the teacher to model analytical thinking. You are right in saying that this briefing will also help to activate prior knowledge of the student.

Literature has also suggested developing *observation guides* to make explicit to the students, what they should be observing and what knowledge and skills are being targeted in that particular encounter. For example, while dealing with a patient of cirrhosis of liver, the students should be told in advance to focus on history, cutaneous manifestations of liver cell failure, abdominal examination, and investigations. These guides may need to be modified depending on the patients to be shown for that level of students. If time permits, the students can be told briefly about the patient going to be examined and can be given the responsibility to discuss in pairs what they are going to observe. A debriefing session at the end helps to identify what was correctly observed, what was missed, and what better can be done in future.

Many variants of this technique can be employed. In addition to asking all the students to observe the same things and then comparing the observations during debrief, it is also possible to ask students to observe different aspects (e.g., some observing social history, others focusing on dietary history) and then collate all the findings at the end. You have rightly noted that *active* observation is the key to successful learning of skills.

Direct Responsibility

b. *Direct responsibility model:* Here there is a kind of role reversal. Primarily, the student interacts with the patient and the teacher observes the interaction, makes a few notes, and then provides feedback and developmental counseling to the student. This approach has its strengths since it provides the direct role of caregiver to the student. However, not all students may be ready or willing to take up the challenge. In addition, it may be difficult to practice in busy situations. The teacher needs to have a lot of patience for this model to succeed. You would also appreciate that tools such as mini-clinical evaluation exercise (mini-CEX) are based on this principle.

Staged Approach

One-minute Preceptor

c. *Staged approach:* This has been particularly advocated for procedural skills. *Peyton*, who advocated this model in 1998, outlined four stages, *viz.:*

i. Demonstration of the skill with no explanation

ii. Repetition of skill demonstration with full explanation and encouraging the student to ask questions.

iii. Teacher performing the skill for the third time with the student describing each step. The teacher may also question the student on some of the key issues.

iv. Student performing the skill under supervision, explaining each step before it is performed.

v. A fifth step may be added to include the student teaching the skill to her peer using the same sequence (this is also called *modified Peyton's approach*).

You will recall that this is in line with Bloom taxonomy of psycho-motor skills (imitation, control, and automatism). The component of questioning and explanation added here helps to provide a sound theoretical foundation to the skill.

d. *One-minute preceptor model:* This is an exceptionally useful model for targeted teaching of clinical skills, especially the non-technical ones. In a nutshell, the model consists of making a diagnosis of the learning needs of the students and then challenging the student to apply her knowledge in the context of the given patient. As the name indicates, it takes relatively lesser time and therefore is best suited with high workload. We will discuss this model in detail in Chapter 11.

Skill Laboratories and Simulations

These are educational facilities that provide a protected environment for learners to practice clinical skills before using them in real settings. Repeated practice in a skills laboratory not only ensures that students acquire proper, safe techniques but also helps them maintain a high level of skill. Skill laboratories focus not only on technical skills (by using mannequins, models, simulators, etc.), but also provide practice for non-technical skills, such as communication. Using *simulated patients* (SiPs) or *standardized patients* (SPs) helps to provide safe practice and avoids any harm to the patients.

A SiP is an otherwise healthy actor who has been trained to display different clinical symptoms and signs. He participates in the history taking and the examination and communicates sufficiently well. An SP, on the other hand, is usually a real patient who has the history and the clinical findings of a medical problem. He is tutored to depict a specific medical case for the specific purpose of training medical students. They

both provide uniform learning experiences for the students and need to be trained extensively and monitored.

Assessment of Skills

One of the important add-ons for teaching skills would be to assess them. The traditional clinical examinations are generally lacking on this count. It may be difficult logistically also to assess skills in summative examinations. However, *workplace-based assessments* and *internal assessment* provide extremely useful opportunities to assess clinical skills. In a later chapter of this book, you will learn about some of the assessment methods especially used for clinical skills. Some of those methods, such as mini-CEX can be used to directly observe the skill and provide a structured feedback in addition to assessing the skill. Similarly, another tool, viz. direct observation of procedural skills, is extremely useful for not only assessing procedural skills but also providing feedback to the student.

In this chapter, we have focused on clinical teaching using real patients. A lot of emphasis is now being laid on using simulations in medical education. Though some of them are expensive, it is possible to have equipment for almost any clinical skill and procedural skill. For those interested in reading more about simulations in medical education, we have provided some references in the *Further Reading* Section.

Chapter

11 One-Minute Preceptor

LEARNING OBJECTIVES

❖ Discuss the rationale of using one-minute preceptor model
❖ Enumerate the microskills required for using the model
❖ State the components of the microskills
❖ Use the model in day-to-day clinical teaching

Intuitive diagnosis is reliable when people have a lot of relevant feedback. But people are very often willing to make intuitive diagnoses even when they're very likely to be wrong.

Daniel Kahneman

At some point during our teaching—both as a teacher and as a student—we have felt dissatisfaction with bedside teaching. Either we are not clear about what we want to attain, or sometimes, it has just been a repetition of what is already known without the addition of any new knowledge or skills. It has also been rather rare that as a teacher we have praised a student's presentation—rather, the general trend is to *teach by humiliation.* As a teacher, we also have many other tasks to perform (e.g., patient care, administration, and sometimes private practice) and bedside teaching generally comes last on priority. All these issues make bedside teaching less than satisfactory.

Problems with bedside teaching
❖ Lack of clear objectives
❖ Focus mainly on recall
❖ Teaching inappropriate to learners' needs
❖ Taking over the case
❖ Teaching by humiliation

Let us recall for a minute, how people learn. We have discussed in the first chapter that knowledge is built on what is already known. In addition, people need to relate the new knowledge and facts to what they already know and this leads to "construction" of knowledge. What this means is that if the instruction is not commensurate with what the student already knows, he will not be able to construct new knowledge. It also means that we need to provide opportunities for the student to reflect and discuss to generate new knowledge and link it to the existing one.

Against this background, let us introduce you to a model of bedside/clinical teaching, which takes care of many of the issues we just discussed. This model, called one-minute preceptor (OMP) model, can be effectively used to teach clinical-reasoning to students. Please note that this model is not used for teaching procedural/technical skills—rather it is useful to teach clinical reasoning. A corollary of this is that you can use this model to teach reasoning skills in non-clinical areas also. You may be interested to know that this model was first developed by Neher et al. in 1992 and has been extensively used since then.

The model is based on the assumption that whereas we do spend time in making a diagnosis of the patient's problem, we do not try to diagnose student's learning needs. As a result, either we keep on teaching what the student already knows or we fail to teach what the student needs to know. This model advocates that in addition to making a diagnosis of the patient, we should also make a diagnosis of student's learning needs and then tailor our instruction accordingly. To be able to do both, the model proposes the use of five "microskills."

Rationale

If we look at a clinical interaction between a teacher and a student, especially in busy timings, such as morning rounds after an admitting day or in the outpatients, it lasts for an average of 10 minutes per patient. We can arbitrarily divide this period into three parts: presentation by the student (approx. 6 minutes), questioning and clarification (approx. 3 minutes), and discussion (approx. 1 minute). These are not hard and fast limits, but in most cases, this is what happens. OMP model is based on the premise that it is during the last 1 minute that real teaching takes place and we need to make most out of it. Some others think that *one minute* does not really refer to actual time but is used as a figure of speech to denote a quick teaching session.

Let us now introduce you to the various microskills that you need to develop to successfully use this model. They are called *microskills* because they are very simple and easy to acquire and use. You need to use these microskills after the student has finished presenting the

Components

Microskills

case—you guessed it, they are used during the second and third part (i.e., questioning and clarification and discussion part of the clinical encounter) of presentation. Let us also clarify it here that these microskills do not have to be necessarily used in the same order—although for beginning teachers, it might be a good idea to follow the order till you develop a control over the process.
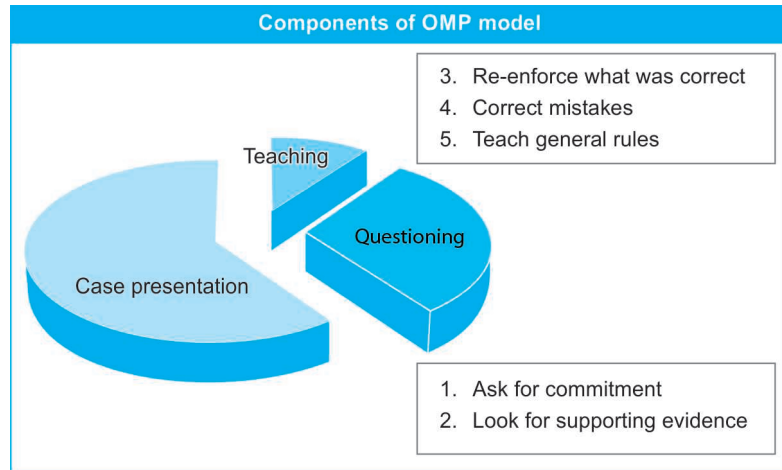
Using the OMP Model

The microskills, which you would be using, include:

1. **Get a commitment:** This is the first step to gauge the level of student's knowledge and understanding. Generally, students do not offer any interpretation of the facts they have presented, and most of the times, the teachers subconsciously step in to explain or interpret what has been presented by students. If you start offering comments or explanations at this stage, you do not allow the student to use her mental faculties to reason out. By asking the student to "commit" to a diagnosis, you are helping her to activate and use her prior knowledge.

Five microskills for one-minute preceptor model
1. Get a commitment
2. Look for supporting evidence
3. Re-enforce what was right
4. Correct mistakes
5. Teach general rules

2. **Look for supporting evidence:** Often, students tell you the diagnosis because they may have known it earlier. Simply knowing the diagnosis is not enough. The student should be able to defend the diagnosis by way of reasoning. You should encourage her to articulate the reasons which made her arrive at the diagnosis. You should also ask what other factors she considered or why she did not consider certain other similar conditions. You would have noted that both these microskills aim at activating the prior knowledge of the student as well as help you assess the gaps in her understanding.

3. **Re-enforce what was right:** Sometimes, students may make a guesswork to come out with the right diagnosis. You should re-enforce this point so that they develop a mental association between the clinical picture and the diagnosis that they guessed. On some other occasions, a student may make an effort to find relevant financial history to select a treatment modality. Re-enforcing them is the right way to ensure that such behaviors are repeated in future as well.

Components of OMP model

Teaching

3. Re-enforce what was correct
4. Correct mistakes
5. Teach general rules

Questioning

Case presentation

1. Ask for commitment
2. Look for supporting evidence

4. **Correct mistakes:** This is a very important microskill in the process. Mistakes which are not corrected may tend to get repeated. Commonly, the mistakes may be errors in judgment or acts of omission [e.g., not looking at ears of a child with upper respiratory infection (URI)]. Rather than humiliating the student when a mistake is made, it is a good idea to first let the student think what mistakes she made. This is more likely to open her up and make her more receptive to corrective advice.

5. **Teach general rules:** It is unlikely that a doctor will get "typical" patients during her clinical practice. Most of the times, there would be a variation in the clinical picture and the student should be able to apply what she learnt during one case presentation to another situation. General rules are remembered better than very specific rules. These rules should provide knowledge of a general nature rather than specific answers to a particular problem. You should avoid the temptation of giving unsupported personal opinion.

Utility of the Model

Utility

Let us now look at the utility of this model. As is clear from the description that the model stresses the need to allow the student to activate and use her prior knowledge in making a clinical decision. It also allows you as a teacher, to diagnose the learning needs of the student and then teach her at a level appropriate to her needs. While the model works well with senior students, there may be some problem with junior ones. The student should have adequate knowledge before she can "commit" to a diagnosis. It may, therefore, not be suitable for say junior third year.

Using the Microskills

Using the microskills			
Microskill	*Rationale*	*Do's (What you should say)*	*Don'ts (What you should avoid saying)*
Get a commitment	First step in making a diagnosis of the learner	What do you think is going on in this patient? What other history might be useful in this case? What are the main problems in this case?	Anything else?
Look for supporting evidence	Helps to assess gaps in knowledge and target instruction	Why do you think so? What other possibilities have you considered? What is your differential diagnosis?	I do not think this is mitral stenosis. This is a clear-cut case of myocarditis
Re-enforce what was right	Re-enforcement establishes knowledge firmly	It was good to take financial status into consideration, while deciding choice of drugs	Well done
Correct mistakes	Mistakes unattended tend to be repeated	Unless you look at the ears, you cannot say that there is no otitis. Antibiotics are not required in a child with vomiting and loose watery stools	You do not know even this!
Teach general rules	Makes knowledge retention longer. Allows it to be used for other situations	Patients with diabetes generally have hyperlipidemia also. Integrated management of neonatal and childhood illnesses (IMNCI) algorithm is a good means to diagnose and treat pneumonia	

The OMP model provides a good framework to support clinical teaching. However, it can also be used for nonclinical subjects. If, for example, a student is making a diagnosis of some cell seen under the microscope, you can very well follow the same steps (what cell is this; why do you say so; which other cells look similar to this; how will you distinguish between them; and so on). We will also like to emphasize that while it may be good to follow the microskills sequentially, you can always use a different order depending on the situation. If a student is making some mistake right in the beginning, you need not wait till the end to correct the mistake. Neher et al., the originators of this model, rightly describe it as a "flexible and pliable" rather than a "static and rigid model!"

Media in Medical Education

LEARNING OBJECTIVES

❖ Enumerate the most widely used media to facilitate medical education
❖ Describe Mayer's cognitive theory of multimedia learning and apply its principles in medical education
❖ Define computer-assisted learning and discuss its components, advantages, and limitations
❖ State and apply the basic principles of creating and delivering good PowerPoint slide presentations
❖ Familiarize with salient features of web-based learning including Internet

Designing a presentation without an audience in mind is like writing a love letter and addressing it 'to whom it may concern.'

Ken Haemer

Today, the education system does not depend on a single medium of instruction, such as a narrative text or visual medium. Most often, both are used in conjunction to facilitate learning. The technology has also advanced making it possible to combine the verbal and visual information in several ways. Multimedia simply means software comprising a variety of media together. This can be a combination of text, sound, still pictures, animations, illustrations, or videos that can be easily stored and carried in a pen drive, CD, or hard disk. While we agree that delivery of education through multimedia is better than using a single medium, we still do not use multimedia in the best possible way. To enable us to use multimedia to achieve the best results in medical education, we need to be aware of the basic principles and theories related to learning through this medium of instruction. There are many theories to explain the utility and effect of multimedia, but we will explain just one—*Mayer's theory*—which is most widely respected in educational literature. We suggest you to go

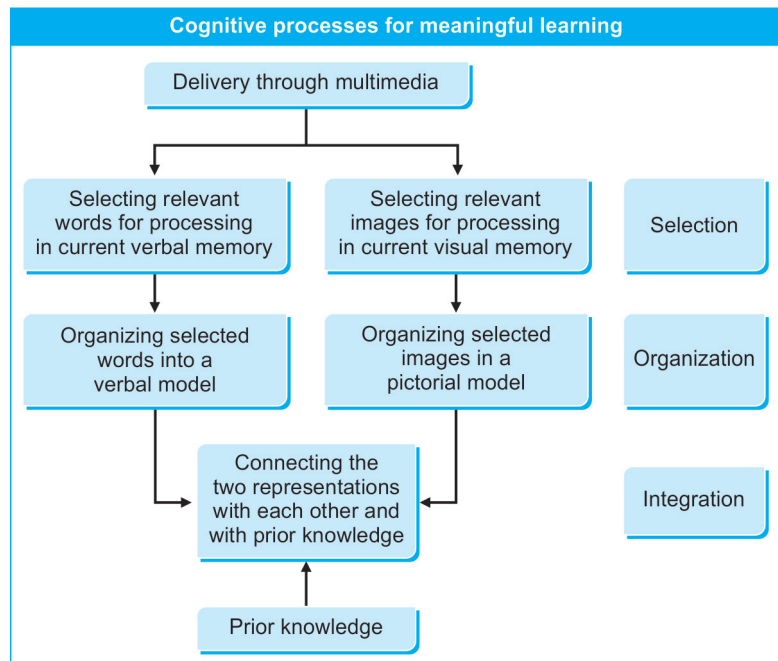**Mayer's Cognitive Theory of Multimedia Learning**

back to Chapter 1 and read the "Psychology of Learning" part again to better understand this.
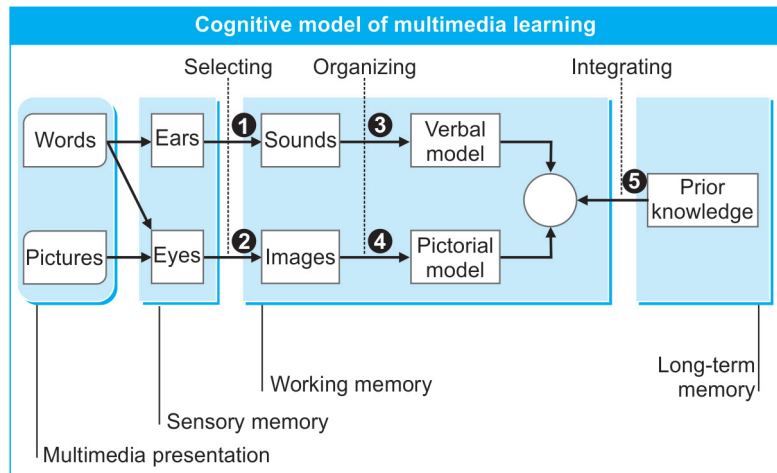
The theory is based on three assumptions:

1. *Dual-channel assumption*: There are two channels for working (current) memory: one for the audio inputs and second for the visual inputs. You can also call them the verbal processing system and the visual processing system, respectively.
2. *Limited-capacity assumption*: Each channel of working memory has a limited capacity for assumption.
3. *Active-processor assumption*: In response to new information, learner constructs new knowledge and integrates it with past memory.

Multimedia learning is characterized by three important cognitive processes: (a) selecting, (b) organizing, and (c) integrating the information. *Selection* ensures that the auditory inputs (e.g., words, narrated text) go to the verbal system and visual inputs (e.g., images) go to the visual system. In the next step, the selected text and visual files are subjected to an orderly arrangement of the information to enable the learner to create a model in her mind. This is known as *organization*. *Integration* is the final process of combining or connecting the selected and organized visual and verbal data. The ultimate learning through multimedia depends on all the three processes.

These steps are shown pictorially in figure below:

Cognitive processes for meaningful learning

Delivery through multimedia

Selecting relevant words for processing in current verbal memory — Selecting relevant images for processing in current visual memory — **Selection**

Organizing selected words into a verbal model — Organizing selected images in a pictorial model — **Organization**

Connecting the two representations with each other and with prior knowledge — **Integration**

Prior knowledge

Cognitive model of multimedia learning

Source: Mayer (2005).

You will agree that these processes are highly dependent on how the facilitator or educator uses the media. The cognitive theory of multimedia is best depicted in figure below:

The Five Principles of How to Use Multimedia

To have best selection, organization, and integration of delivered visual and verbal information; Meyer has also suggested five main principles on how to use multimedia, which are discussed below:

a. *Principle of multiple representations:* It is always better to teach with more than one medium. Educational process should ideally be represented by both verbal and visual information. For example, lecturing on how to take blood pressure should also be accompanied by visuals (images, films, etc.) of the same. The learner thus builds two mental representations: auditory and visual; finds connections between them; and finally combines them together to learn the concept. You will recall that this also helps to transfer information to long-term memory.

b. *Principle of contiguity:* When using multimedia, it is better to offer verbal and visual information side by side and not one after the other. For example, the narration of "how blood pressure is to be taken" is to be made at the same time when the procedure is being shown or demonstrated. The linkages between the verbal and visual processing systems are built better and are more long-lasting, if the above principle is followed.

c. *Principle of split attention:* Words are better expressed through narration than on visuals, while making a multimedia presentation. Do not duplicate the words used in narration in visual medium. This may cause unnecessary overloading of the visual information

processing system with components of verbal database. Thus, on-screen text should be avoided as far as possible.

d. *Principle of individual differences:* The three principles discussed above are highly dependent on individual learner characteristic. Learners can be classified on the basis of their prior knowledge of the subject (high-/low-knowledge learner); or capacity to absorb relations of objects/phenomena in a given space (high-/low-spatial learner). Low-knowledge learners tend to benefit more from a multimedia strategy based on the principles of multiple representations and contiguity. High-knowledge learners already have a robust mechanism by which they can create their own visuals for narrative and *vice versa*, thus bypassing the required principles of multimedia learning discussed above.

e. *Principle of relevance:* Learners tend to imbibe and benefit more when given fewer words and fewer visuals for any topic/session, as compared to large convoluted text and multiple images. Drive home one message instead of multiple messages, and use minimum words and visuals to deliver that message. Also, it is important that the delivered text/images are relevant to the learning objective of the session.

Salient points of Mayer's multimedia theory with its applications are listed in below table. Published research has conclusively proven the validity of these principles.

Salient points of Mayer's multimedia theory with its applications	
A. Assumptions	**Teaching–learning applications**
1. Dual-channel assumption	Can provide information simultaneously through words and pictures
2. Limited-capacity assumption	The content of each (words and pictures) need to be limited
3. Active-processor assumption	It is important to map the existing knowledge of learner before devising a new session and relate the new knowledge to that already stored
B. Principles	**Teaching–learning application**
1. Multiple representations	Use visual media (images) to reinforce what you teach by narration (words)
2. Contiguity	Offer verbal and visual information side by side and not one after the other
3. Split attention	Do not duplicate the words used in narration in your slides
4. Individual differences	Keep in mind the heterogeneity of the learner group depending on their prior knowledge and target both in your session
5. Relevance	Be as brief and relevant as possible to the objective. Select relevant words and relevant images. Limit content as far as possible; basing it on prior knowledge. Do not overload with text/images

Computer-assisted Learning

Computer-assisted learning (CAL) is defined as using the computer technology to assist, augment, or deliver part or all of the instruction or course and also to evaluate the student's progress.

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, and communication).

Interactive multimedia allows the participants to interact with the computer by following instructions, completing exercises, answering questions, and solving problems. Computers are excellent tools for providing simulated situations. CAL is also an excellent method to train the students in problem-solving ability. Stimulated situations can train a novice to think and decide like an expert.

Online Learning

The other dimension of CAL, i.e., learning through Internet, is tricky. A load of information is available on the Internet that may/may not take the learner to the right path. Here, the facilitators can direct the learner to the websites providing evidence-based material. Evaluation on the 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 gaining access; gradually becoming familiar with online environment; seeking and providing information; and ultimately taking responsibility for one's own continuing development in online learning.
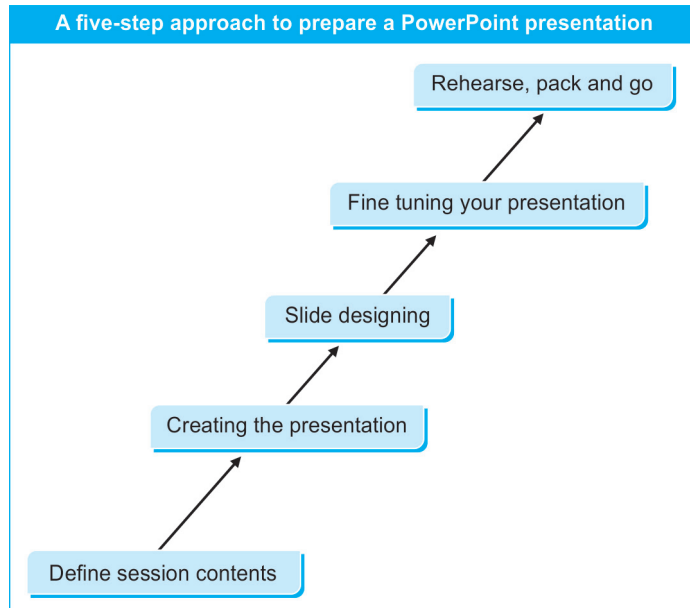
PowerPoint

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 the PowerPoint is called a presentation and each presentation is made up of the 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. It also has provisions for incorporating audio and video clips. Slides can bring the remote and inaccessible to the classroom. Full-color capability makes the slide presentations highly absorbing.

The five-step approach for creating presentations is depicted diagrammatically below: Defining session contents is the first and most

important initiating step. Decide the topic, learning goals, and specific learning objectives of your presentation. Organize your thoughts and arrange the matter you have in an orderly and logical sequence. The logical flow of the content material includes the title, introduction, aims and objectives, the body of presentation, and finally the summary and/or conclusions. For a presentation to be effective, the content should be dictated by five major elements:

1. *Novelty*: A presentation commands attention only if it offers something new. It is not the new technology, but the new content that matters more.
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.
3. *Conversational value*: The contents should deal with topics of interest. At the same time, do not overload the cognitive capacity of the learner's brain.
4. *Emotional value*: A presentation should strike a chord with the audience by captivating them on the emotional front.
5. *Entertainment value*: The presentation should not bore the audience or douse any sparks of interest.

A five-step approach to prepare a PowerPoint presentation

Rehearse, pack and go

Fine tuning your presentation

Slide designing

Creating the presentation

Define session contents

Tips for Making Good PowerPoint Slides

Tips for making good PowerPoint slides include the following:

1. *Use "Sans Serif" fonts:* The fonts are of two types—serif and sans serif. Serif type is preferred for the printed word and 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*").

2. *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. Layout should be appealing, do not make it distracting (multimedia instructional design theory).

3. *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 points for the main text and 36 points for titles. Changes in font type and size may be resorted to when one wants to emphasize main points or keywords in the presentation, but they should preferably be used as sparingly as possible. As already emphasized, do not duplicate the same text on slide that you are also speaking (principle of redundancy).

4. *Avoid caps:* Use uppercase capital letters judiciously. Choose predominantly lowercase letters for obtaining maximum presentation effect and improved reader comprehension. As per cognitive theory, we have learnt that the human brain creates a reasonable mental representation. When a word is in capitals, the eye is presented with a rectangular shape that is more difficult to read and is less intuitive. It is also not a must that the titles be in capitals. They also look better when presented in *sentence case*, i.e., a mix of upper/lowercase letters.

5. *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. As per Mayer multimedia theory also, remember the principle of relevance, which is very much applicable here.

6. *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 text presented. Combine the visual cues provided by the slide with verbal explanations to improve understanding and attentiveness. We have already learnt the principles of contiguity and split attention. These clearly imply that words and pictures should appear together in the same slide, they should be linked, and only that text should be shown in slide, which you are not using in your narrative.

7. *Colors:* Use a uniform color scheme throughout the presentation. Limit the number of color regions on any one slide to a maximum of four. The changing colors should arouse interest toward the key concepts and not distract the reader from it. Avoid busy and confusing backgrounds. Not all visuals/colors support the text. Research has shown that cognitive overloading is harmful

Tips for Making Slides

for working memory and may sacrifice acquisition of essential concepts.

8. *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 be captured, played, and replayed. The remote (an experiment in Antarctica), the inaccessible (an endoscopic visual of the duodenum), and 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.

9. *Animation:* Animation should only be used sparingly only to teach complex manual skills. 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. Static graphics in instruction are more effective than animations. It is because the learner's brain activity animates the static graphics (*active learning*), whereas the brain remains inactive if animations are shown in the first instance (*passive learning*).

10. *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. 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 toward the back rows may remain turned on.

Advantages and disadvantages of learning through PowerPoint presentation (PPT) are listed below:

PowerPoint is a means to an end. Do not take it as the end	
Advantages	*Disadvantages*
Easy to create and update	Discourages interaction (used as teleprompter)
Portable, easy sharing	Promotes passivity
Can use different multimedia files	Information overload (PowerPoint toxicosis, "death by PowerPoint")
Brings closer to reality	Competition for short-term memory (animations, transitions, unnecessary graphics)
Message is more important than the medium. Problem is not with the PowerPoint—rather, it is with the way we use it	

Key messages for making good PPT are listed in below box:

PowerPoint slides: Key messages.

❖ Use a simple dark background with light letters or white background with dark letters
❖ Use a uniform color and font scheme throughout the presentation
❖ Use sans serif type of fonts (e.g., "*Arial*," "*Helvetica*," or "*Tahoma*")
❖ Use a font size large enough to be seen from the back of the room (at least 32 for main text and 40 for titles)
❖ Avoid 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 PPT should have 10 slides, last no more than 20 minutes, and contain no font smaller than 30 points. A little flexibility is allowed. However, you should never create more than one slide for every minute of your presentation
❖ Always have a backup plan (adequate copies of presentation, transparencies, handouts, etc.)

Examples of good and bad pre sentations are given in below figure.

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 all the words that need to be spoken is written on the slide; corrected in **(D)**; **(E)** Use of fancy fonts and too many font types (four in number) in a single slide; corrected in **(F)**.

For your convenience, we have listed the application of seven most important instructional principles of Meyer's multimedia theory in relation to PowerPoint presentations in below box:

Application of instructional principles for PowerPoint presentations

- ❖ Include only relevant material in your presentation *(principle of coherence)*
- ❖ Provide cues to highlight organization of your presentation *(principle of signaling)*
- ❖ Avoid printed text. Use words in narration and pictures in graphics *(principle of redundancy)*
- ❖ Place corresponding words and pictures together *(principle of spatial contiguity)* on the same screen/page
- ❖ Use the narration at the same time when the relevant pictures are being shown *(principle of temporal contiguity)*
- ❖ Divide your presentation into more than one segments, rather than presenting it as a single unit *(principle of segmenting)*
- ❖ Sensitize the learner about the key components of your presentation, beforehand (by a handout, etc.) *(principle of pretraining)*

Web-based Learning

Several computers when interlinked with each other are called a network. This link may be by cables, telephone lines, and/or 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, and pharmacy) or of, say, 10 libraries in the country or a hundred medical schools over five continents. A very large network may have several constituent networks.

Most medical schools in the West provide extensive computer networks to their students, and these are increasingly becoming a core component of teaching and learning.

Internet: Internet is an extensive network of interlinked computers storing a vast and varying quantity of information. Applications of Internet are listed in the box:

Internet

The facilities available through Internet are:
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.
2. *Listserv* is an extension of E-mail facility and provides access to various discussion groups on a particular subject.

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 subtopic and onto related information, and so on. The search and access are 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 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
❖ It is a publication medium also. The Cochrane network publishes scientific papers on meta-analysis of various clinical trials on Internet (without written publication). These are counted as publication by the concerned authors
❖ Internet is also available for telemedicine, telesurgery, and teleconferencing education

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 offers pages of information that 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

It 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. Massive online open courses (MOOCs) are a new beginning to provide maximum information on Internet superhighway, simultaneously to a very large number of learners.

Internet revolution has begun in India. Today's students are 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!

We hope that it is clear to you why we need to have multimedia presentation and what are the best ways to deliver a session based on Meyer's theory of multimedia instructions. Next time, try to plan your session with its applications as highlighted in this chapter and see the difference!

If you think presentations cannot enchant people, then you have never seen a good one.

Guy Kawaski

Chapter
13   Student Assessment

LEARNING OBJECTIVES

- ❖ Discuss the role of assessment in the teaching–learning process
- ❖ State the types of assessment and their uses
- ❖ Plan assessment in your subject
- ❖ Prepare a table of specifications for your subject
- ❖ Use assessment to promote learning

If you want to know the truth about an eduction system, just look at its assessment procedure.

Derek Rowntree

Have you ever thought that if our body did not secrete glucagon and other hormones in response to hypoglycemia, what would happen? The results would be simply catastrophic. Let us see what the body does—it "measures" the levels of glucose, evaluates them in the context of the needs, and then sends corrective signals for regulatory mechanisms. This is exactly what we do when we assess students. We measure their performance, compare it with previously decided standards, and take corrective actions 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 that are commonly used in this context.

Terminology

Assessment refers to any formal or purported action to obtain information about the competence and performance of a student. Implied in this is the fact that assessment need not be limited to a few formal occasions (like semester or university examinations). It also

implies that a number of activities can be used by teachers to collect information about students' competence. Traditionally, the term assessment is used in the context of students.

Evaluation, on the other hand, means passing a value judgment on the quality or worth. Generally, evaluation is used in relation to educational programs. For example, you may evaluate the graduate course at a given institution or you may evaluate postgraduate training in a particular subject. You have rightly noted that assessment forms an important input for program evaluation.

Why Assess?

Importance

For many 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 *systems approach* and you will notice that assessment is influenced by and in turn influences the other two curricular components. In other words, other than a pass/fail function, assessment also serves many other functions.
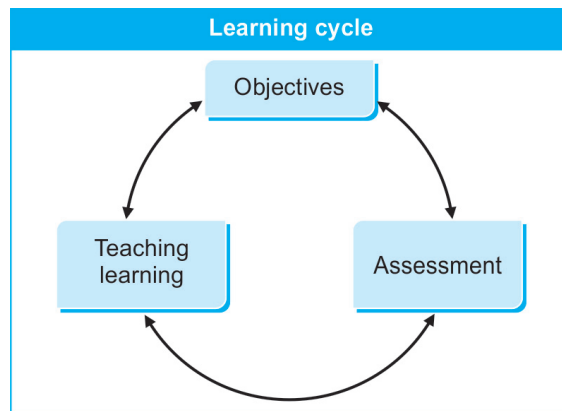
You may be wondering about those other "functions" of assessment. Let us have a look at them:

Functions of Assessment

a. ***Diagnosis:*** The results obtained from assessment serve to diagnose areas that have not been properly learnt and that require remedial 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) are an example of this function.

d. *Grading:* We assess to rank order the students of any given class for prizes, scholarships, etc.

e. *Program evaluation:* As already stated, assessment helps us to modify a program and make it more useful and cost-effective.

You will appreciate that assessment becomes contextual depending on the use to which results of assessment are being put to. Thus, the paper used for final university examinations is not suitable to be used for selection to postgraduate courses. Many of the problems and issues arise because of our failure to look at the context of assessment.

Types of Assessment

Let us now look at certain terms used in the context of assessment.

a. *Summative assessment* refers to end of lecture, end of system, end of semester, or end of year assessment to know the *sum* of the students' learning. Contrary to the popular belief, summative does not mean only the university examinations. In fact, all assessments are summative by default (*end of something*—lecture, system, semester or professional, for example). Summative assessment is generally used for making pass/fail decisions in most setups. It is also known as *assessment of learning*.

b. *Formative assessment*, on the other hand, refers to the assessment undertaken to provide feedback to the learner as well as the teachers to make learning even better. The purpose is to make a diagnosis of learning difficulties and take remedial actions. Since the purpose is to improve learning, it is generally not used for making pass/fail decisions. It is also known as *assessment for learning*.

These two aspects of assessment are not watertight rigid areas—rather, they can be blended, with the same assessment serving both the functions. Sometimes, assessment itself can be used as a learning tool, allowing the students to learn in the context of the task. This is referred to as *assessment as learning.*

Contemporary thinking places a lot more emphasis on formative assessment. The relationship between formative assessment and learning is very clear and is supported by a good amount of meta-analytic evidence—though for summative assessment, it is still unclear. In general, as well as in medical education, feedback has been found to be the single most important factor in making learning better.

As you would appreciate from the above, the distinction between summative and formative is not based on the timing of assessment. As mentioned earlier, all assessments are *de facto* summative *unless* they are used to make learning better (by providing feedback or by changing learning strategies).

Summative Assessment

Formative Assessment

c. ***Internal assessment*** is yet another term used in Indian context. By convention, internal assessment means the assessment conducted by the teachers who taught the course without any external (e.g., University's) supervision. A good number of teachers think of internal assessment as formative. However, if you go by what we have discussed above, you will appreciate that internal assessments are in effect summative *unless* teachers use them to modify teaching–learning strategies. Internal assessment can, therefore, serve formative as well as summative function. We will discuss more about internal assessment in a later chapter of this book.

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 the sake of simplicity, the temporal inter-relationship of various types of assessments can be represented by the following diagram:
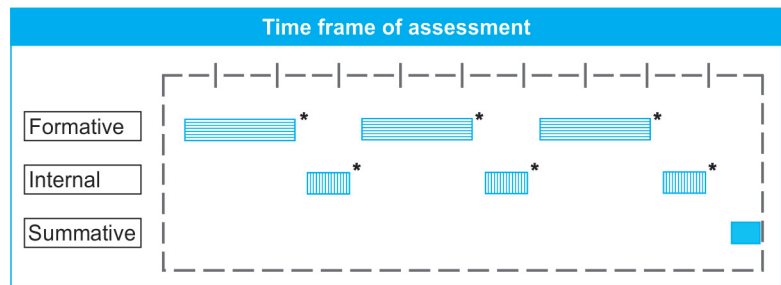
*Feedback to the learner.

How to Assess?

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 MCQs 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 Chapter 7. It is thus imperative that a medical student is assessed on all the three 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 that lists subject matter on one axis and the weightage given to various domains on the other. This makes it very easy for the teacher to decide the proportion of marks that have to be allotted to each of knowledge, practical, and communication skills.

Abilities to be Assessed

Weightage

You will appreciate that the weightage allotted to various components will vary with the subject area under consideration. For example, while assessing the student on antibiotics, knowledge and practical skills are of importance, while for assessing 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 arbitrarily prepared—rather, it requires a lot of effort and discussion amongst subject experts to arrive at a consensus; however, the advantages it offers are more worthy than efforts involved. You can also initiate discussions in your own department to reach at this consensus.

Assessment is not the end of teaching—rather it is the means to further the effectiveness of an educational program. To make full use of the intended purpose of assessment, it should be undertaken after careful planning, especially keeping the educational objectives in mind. The assessment should be appropriate for the learning outcomes.

Attributes of Good Assessment

An appropriate assessment has the following attributes:

a. *Validity:* In simple terms, validity can be defined as measuring what is supposed to be measured or in even simpler terms as *accuracy* of measurement. In more technical terms, it refers to the empirical evidence and theoretical foundations used to make a particular interpretation from assessment data. Validity is a matter of degree and has to be inferred from the available evidence. You would have noted that validity refers to *interpretation of results* and not to the tool itself. As an example, a foot rule is considered a valid measure of length, but if its markings are not correct, then you will not be making a valid inference about length. What it means in effect is that tools are not inherently valid or invalid—they become so by the way we use them. Let us take another example. If we ask a student to write a short note on eliciting knee jerk, then the valid interpretation is that the student "knows" about knee jerk. However, if we were to interpret that he can elicit a knee jerk, then the interpretation will become invalid.

Validity

This has important implications for assessment design. Often, we go with the idea that objective structured clinical examination (OSCE) (you are going to learn about it shortly!), for example, is a valid tool of practical skills. But many a times, we see OSCE stations, which are nothing but theory questions. Selection of tools should, therefore, be based on their content rather than their format. What you ask is always more important than how you ask.

Validity is a matter of inference—therefore, it requires that we look at various aspects and collect evidence. The number of "evidences"

is decided by the stakes of assessment. You guessed it right—a high-stakes examination (like certification or selection) needs to collect many evidences compared to a low-stakes one (like a classroom test). This is similar to the situation where jumping a traffic light does not require any evidence other than a cop's statement, but in a homicide case, even a confession is not sufficient and has to be corroborated by many others. Many a times, we fail to make use of full assessment opportunities because we tend to apply the same stakes to class tests as we do for a selection test.

Experts suggest that to reduce examination stress, multiple low-stakes assessments should be conducted and then aggregated for high-stakes decisions. So multiple assessments at regular interval are better than a single assessment at the end.

In terms of educational assessment, we look for the following aspects of validity:

i. *Content validity:* This is an important criterion for the usefulness of assessment. It indicates synchronization between the contents of assessment and contents of teaching (simply stated, you assess what you teach and you teach what you assess!). 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 assessment—more representative the sample, more is the content validity of assessment. The easiest and most efficient way to build in content validity is to prepare a table of specifications and then choose questions accordingly. While all that is important may not be assessable at the final examinations, most of it can be done during internal assessment. This helps to build validity into assessment process.

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. If we use a test to select postgraduates and those scoring well also turn out to be efficient postgraduates, then this test has a high predictive validity. Competency statements are examples of criterion to be used for assessment.

iii. *Construct validity:* This is considered as the most important aspect of validity. A construct can be seen as a collection of various interrelated attributes. Honesty, for example, is not a single entity but is made of a number of interrelated attributes. For our purpose, *clinical competence* is an example of a construct,

Characteristics of Validity

which is not a single trait. Educational attainment is another such example. What we are trying to assess by our tests is educational attainment, which can be seen as a construct, made up of a number of attributes, such as knowledge, understanding, application, interpretation, communication, literature search, and expression. A valid assessment should give us information about educational attainment and not about isolated aspects, such as knowledge or skills. When an assessment gets influenced by factors other than educational attainment, for example, an essay being marked on the basis of handwriting or good presentation, the assessment becomes low on construct validity.

Although we mentioned about types of validity, let us emphasize it here that currently, validity is *not* seen as being of different types. Rather, it is considered as a unitary concept (like the honesty example above, one cannot be honest in one setting and dishonest in another), which is inferred from content-related, criterion-related, and construct-related evidence.

Before moving further on, we will like to emphasize once again that contemporary 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, for example, that assessment can have good content validity but be low on construct validity. It should also be understood that a tool *per se* is not valid or invalid—it is the interpretation that we draw from the results which is valid or invalid. The context of testing has an important bearing on validity or otherwise of a tool. Reliability is also a part of validity evidence. An assessment with low reliability does not allow valid interpretations. (Remember the foot rule example given above!)

Threats to validity
❖ Too few test items
❖ Too easy or too difficult items
❖ Items not aligned with learning objectives
❖ Improper/biased sampling of items
❖ Improperly worded items
❖ Items testing individual skills and not constructs
❖ Leakage of question papers/checklists
❖ Inappropriate standards (e.g., 50% pass for MCQ-based tests)
❖ Low reliability

Threats to Validity

b. **Reliability:** We shall now proceed to look at another equally important attribute of a test, i.e., *reliability*. Reliability, as the term indicates, implies how much dependence can be placed on an

A L G r a w a n y

Reliability

assessment (try reading it as *rely-ability*). Contrasted to validity, reliability is rather easy to calculate. (Yes, it is a mathematical concept!) Let us look at what this term means.

Reliability refers to the consistency of measurement or in simple terms, precision of measurement. The degree of reproducibility determines the reliability of assessment. Unlike validity, which needs to be inferred from various evidences, reliability is a mathematical concept and is numerically expressed. To be valid, an assessment has to be reliable; but all reliable assessments may not be valid.

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 that is administered again 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* mean consistency of results when two similar tests (of same content and difficulty level) are administered to the same group of students.

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 the correlation between scores obtained on the two parts is calculated.

iv. *Cronbach's alpha* refers to the internal consistency of a test and can be calculated by different formulae.

There are different methods of calculation of reliability and you can go to the listed resources to read more about them. Please note that this is generally applicable only to knowledge tests and not to performance tests. For performance tests, generalizability is a better measure.


Threats to reliability

❖ Too few test items
❖ Too easy or too difficult test items
❖ Items not representative of learning objectives
❖ Poorly written items
❖ Inappropriate length or timing of the test
❖ Inter-rater variation
❖ Leakage of question papers/checklists
❖ Inappropriate examination conditions (e.g., hot and humid room, tired students)

Threats to Reliability

You would have noticed that careful sampling is an important activity to build both validity and reliability. While marker variability may contribute to low reliability, a more important cause of low reliability is small or unrepresentative sample of test items. You

would have also noticed that increasing the size improves both validity and reliability. This is another reason for having frequent tests so that the sample size can be increased.

Validity and reliability

| Valid and reliable | Reliable but not valid | Neither valid not reliable |
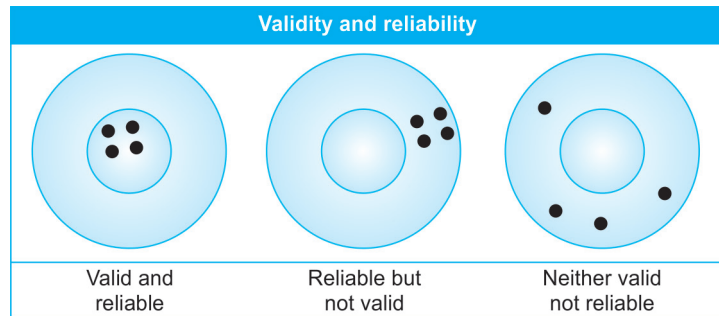
c. ***Feasibility and acceptability*** are yet other important aspects of assessment. Take the example of a practical test. The ideal situation would be to actually observe a student doing a lumbar puncture or putting an IV drip, but that may not be feasible in actual practice. Similarly, highly subjective assessments may not be acceptable in general. You should give careful consideration to these aspects when planning assessment. Many a times, acceptability of the tests may override all other issues.

d. ***Educational impact of assessment:*** This is also considered an important attribute of assessment. Any assessment should stimulate the students to adopt good study habits and engage in deep learning rather than in recall of facts. However, if it promotes students to adopt shortcuts in learning, then it indicates a poor quality assessment. You would appreciate that most entrance examinations in our country are low on this parameter and tend to promote rote learning.

The **utility of assessment** can be *notionally* conceptualized as follows:

Utility of assessment

Utility = validity × reliability × acceptability × feasibility × educational impact
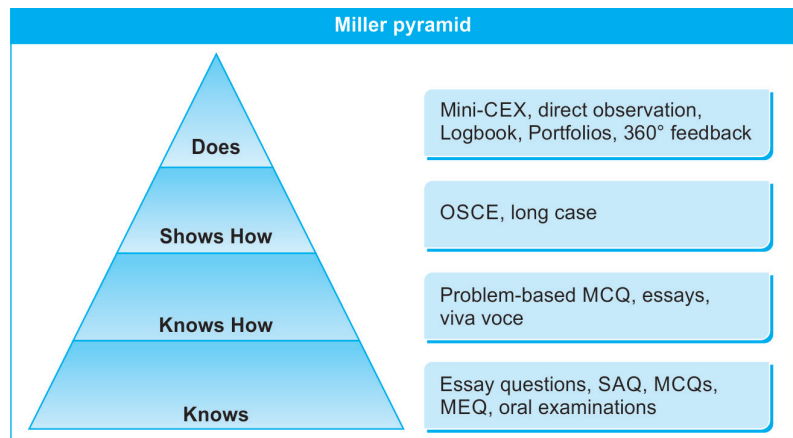
(Vleuten, 1996)

This conceptualization helps us to put assessment in its proper perspective. Internal assessment, for example, though low on reliability has same or even more utility by virtue of being high on educational impact. You should be aware that no single tool can meet all the requirements of a good assessment. However, as explained above, a

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Feasibility

Educational Impact

tool can still be useful by virtue of its strength on another parameter. It, therefore, makes a lot of sense to look at the validity and reliability of the assessment program as a whole rather than look at individual tools or tests. This is the concept of programmatic assessment.

Before we conclude this discussion, let us introduce you to yet another important concept related to student assessment. *Miller pyramid* proposes clinical competence at various levels. A student has to first "know" (factual knowledge) before he "knows 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 taxonomy of learning. Although you can see its inclination towards clinical competence, it is applicable to basic sciences as well.

Miller Pyramid

Miller pyramid

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, MCQs, MEQ, oral examinations

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.

Miller pyramid provides an useful way to build authenticity in assessment. The tools used for assessment should be matched with the level sought to be assessed. We have shown some examples of tools that can be used for assessing each level of the pyramid. We will also like to caution that although assessment becomes more authentic as we climb the pyramid, still each level of the pyramid has to be assessed. Knowing higher level does not mean that the student knows the lower level as well.

Sounds confusing? Well, we must admit it does. However, it is important to internalize these concepts for a better understanding of student assessment. You may like to read some more material listed in the further reading section. All the best!

Assessment terminology	
Test	Assessment to test knowledge. Could be paper and pencil or computer-based
Tool	Assessment used to observe skills or behavior, e.g., OSCE, m-CEX
Formative assessment	Assessment conducted with the primary purpose of providing feedback to the student. Generally not taken for pass/fail decisions. It is a part of ongoing teaching–learning process
Summative assessment	Assessment conducted at the end of a unit/semester/course to check how much the student has learnt and how well was the teaching
Criterion-referenced assessment	Comparing the performance of the students against the predetermined criteria. Generally used for certifying examinations. Standards have to be established *before* the examination
Norm-referenced assessment	Comparing the performance of students with one another. Generally used for selection examinations. Standards are established *after* the examination
Validity	Degree to which the inferences drawn from assessment data are supported by empirical evidence or theoretical rationale. Validity is a unitary concept and inferred from various evidences
Reliability	Degree of confidence which one can place in the assessment results. Measured by precision, consistency, or reproducibility
Competency	An observable activity demonstrating habitual and consistent use of knowledge, skills, communication, clinical reasoning, emotions, values, and reflection in daily practice
Competent	One who possesses the required competencies
Competence	Satisfactory level of knowledge and skills required to perform a professional task. It tells us what the student is capable of doing
Performance	Assessment of what an individual does in actual life. All competence may not translate into actual practice
Authentic assessment	Making assessment task as close as possible to actual tasks that a student will perform in real life
Integrated assessment	Assessing multiple competencies within the same encounter. Knowledge, skills, professionalism, and communication can be tested by a single well-designed OSCE station
Checklist assessment	Assessing by breaking the professional task into smaller components. Useful mainly during early clinical years
Global ratings	Ratings by subject experts, used mainly for complex clinical tasks, such as decision-making, professionalism, or communication. Useful for later clinical years.

Competency-based assessment (CBA)	CBA operates within the framework of competencies. Its purpose is not only to certify the competencies but also to help in attainment of competencies. They are therefore longitudinal, happen in authentic settings, are concerned more with formative function, and liberally use developmental feedback to guide the learner. Self-assessment and self-regulation are also important part of CBA. Rather than assessing knowledge, skills, and attitudes in isolation, they assess them in an integrated way, in addition to integrating various subject domains. Compared to traditional assessments, they may appear subjective but are high on validity and educational impact
Programmatic assessment (PA)	PA is a program of assessment wherein information about learner's competence and progress is continually collected, analyzed, and acted upon. It is a move away from the focus on individual assessment tools and episodes. It is an ongoing feedback and assessment with periodic decisions based on an aggregation of available data points. The focus of PA is on the assessment for learning and uses various tools as and when required. The validity and reliability of assessment is looked upon for entire program rather than individual tools. It can have some tools which are highly objective, but others that are subjective but high on educational impact. Individual assessments are not used for high-stakes decision-making but for providing feedback to the learner to modify his learning strategies

If summative assessment can be described as a digital snapshot, formative assessment is like a streaming video. One is a snapshot of what the student knows captured in a single moment of time; the other is a moving picture that demonstrates active student thinking and reasoning.

Anonymous

Chapter

14

Essay Questions

LEARNING OBJECTIVES

❖ Discuss the advantages and disadvantages of essay questions
❖ Enumerate various modifications of essay questions with their advantages
❖ Frame different varieties of good essay questions

Not everyone who takes extra paper during exams write extra sense.

EA Yeboah

We discussed the basic assumptions underlying student assessment in the previous chapter. With this basic knowledge, you are now ready to go on to an assessment of specific learning outcomes.

You may recall that learning outcomes are presented hierarchically so that an increasingly complex learning demand is made to the student in the context of cognitive skills. The sequence is represented as Factual knowledge, Understanding, Application, Synthesis, Analysis, and Evaluation. 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 the picture. This must be reflected in the assessment also.

Traditional essay questions are the most common tool used for the assessment of knowledge. Let us discuss the various advantages and disadvantages of using essay questions. The most widely used form in most Indian universities is what can be called an unstructured essay question. These questions are worded in such a way that the student

Essay Questions

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 Immunization Program.

Sometimes in some places, the task given to the students is even shorter. For example:

❖ Cataract.
❖ Congestive cardiac failure.

You will appreciate that different students will write different answers to these questions—hence, these are also known as free-response questions. These questions are especially useful for assessing the higher domains of learning and comprehension of the student, but since a great deal of subjectivity is involved in the assessment of these questions, the marks are often criticized as being unreliable. Did you note that we have not labeled essay questions as unreliable—rather, we have said that it is the marking that 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.

Limitations of traditional essay	Solutions
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

Modifications of Essay Questions

Structured Essay Questions(SEQ) differ from traditional questions in the freedom regarding the 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 the expected answer or in terms of points to be included in the answer. Take a look at the following examples:

❖ Write an essay on protein-energy malnutrition covering the causes, classification, clinical diagnosis, and initial management in the hospital.
❖ Discuss the Universal Immunization Program in the context of its objectives, operationalization, targets, and limitations.

Before proceeding further, let us revert back to Bloom's taxonomy of learning and look at the various levels. You will notice that the verbs

used for each level are different. Thus, the levels of these questions can be improved by using verbs at a higher level of learning.

Matching questions to Bloom's level of cognition		
Level	*Sample action verbs*	*Examples of questions*
Knowledge: Memorize and recall information	Define, draw, label, list, name, repeat, order	List the clinical features of malnutrition
Comprehension: Interpret information in one's own words	Describe, indicate, discuss, restate, explain, review, summarize, classify	Explain the clinical features of malnutrition in the light of metabolic derangement
Application: Apply knowledge to new situations	Apply, illustrate, prepare, solve, use, sketch, operate, practice, calculate	Calculate the daily requirements for a 2-year-old child brought with a weight deficit of 40%
Analysis: Breakdown knowledge into parts and show relationship among parts	Analyze, categorize, compare, test, distinguish, examine	Compare the utility of "weight for age" with "weight for height" in the diagnosis of malnutrition
Synthesis: Bring together parts of knowledge to form a whole; build relationships for new situations	Arrange, compose, formulate, develop, organize, plan, assemble, construct	Formulate a diet plan for a 2-year-old child brought with a weight deficit of 40%
Evaluation: Make judgments on the basis of criteria	Appraise, evaluate, conclude, judge, predict, compare, score	Compare the utility of vegetable proteins with that of animal proteins in treating malnutrition

Despite some of these modifications, essay questions may have issues related to marking (reliability, subjectivity). They may also be testing only the recall ability of the student. You can make some efforts to overcome these limitations, which are listed in the box below.

We will like to particularly mention about shortening the questions. This not only reduces the freedom available to the students, but also increases the sample of syllabus which can be assessed. We will discuss about this in the next chapter.

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.

Modified Essay Question

> A 3-day-old neonate presents with the 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 serum 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.

Answer to an essay question on sarcoidosis
(from a WhatsApp post: not to be taken seriously!!)

Question: Write an essay on sarcoidosis.
Answer: Sarcoidosis is an important type of disease very important from medical perspective.
Incidence: A good number of people suffer from sarcoid disease, the incidence varies from place to place. It is commonly said that the number is gradually increasing, but it is probably because of better diagnostic facilities and increasing awareness among people.
Definition: Different authors have defined sarcoid disease in different ways, but the most commonly used definition is one, which helps in clearly defining this disease.
Classification: The sarcoid disease is classified according to the types and degree of the disease. This is important to know the classification because the treatment and prognosis depends on this. Some authors have mentioned different stages also, depending on the severity of the disease.
Signs and symptoms: The signs and symptoms of sarcoid disease depend on the type, degree, and duration of the disease. Many people present early and many people present late in OPD. The time lapsed from onset of the disease to presentation in OPD, is influenced by the educational status of the patient and family, financial condition, availability of medical facility, and individual tolerance. Many a times, the patient comes after the traditional treatment and other systems of treatment have been tried and failed.
Investigation: Although by examination and history taking the majority of the cases can be diagnosed, modern modalities of investigation are helpful in borderline cases.
Diagnosis: The diagnosis depends on a good history taking, thorough examination and investigations.
Treatment: The treatment depends on the type and degree of the sarcoid disease. This varies from conservative treatment to surgical intervention.
Prognosis: The prognosis depends on the type and degree of the disease, the interval between the onset of disease and instituting the treatment and the skill and experience of the doctor.

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 that will help you in writing better essay questions. This will also help in improving their reliability.

Writing Good Questions

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 it will be to formulate good essay questions.

b. *The question should clearly specify to the student what is expected of him.* Recall the question on protein-energy malnutrition—one student would write about epidemiology, another about clinical features, yet another about domiciliary management, and all would 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.

d. Where necessary, *provide reference points or supplemental information.* (For example, management of hemolytic 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 the answer and avoid spending too much time on trivia.

f. *Providing model answers* has also been suggested to improve reliability; however, this has not been very popular in India.

g. *Train students in writing specific answers* to the problems posed in the question. Allowing the sharing of answer sheets after the test (during formative assessment) helps to let the students know different approaches of answering the same problem.

Improving the Marking

Essay questions have the inherent drawback of a high degree of subjectivity involved in marking, although much of it relates to the ambiguous nature of task given to the students. Additionally, in spite of best of efforts, extraneous factors, such as handwriting, grammar, diagrams, underlining, and use of colored pens are all likely to influence the marks awarded. In addition, the examiner may be biased toward a particular point of view. Response to the first question—well written or otherwise—is also likely to have an effect on subsequent answers. It has also been seen that there is a significant interrater difference between

Guidelines

Drawbacks

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 by giving the "impression" of being knowledgeable. Many of these problems can be eliminated if we follow the following simple rules:

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 be influenced by her performance in the previous questions.

Ways to Improve

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.

f. You must *provide feedback* to the students after their questions have been marked. This helps them to improve the quality of their writing.

You can use this tool effectively in your assessment, if you include the above guidelines in framing and marking essay questions.

In addition to problem of subjectivity, essays have the limitation of testing only a small sample of the subject. In a 3-hour test, not more than five to six questions can be asked. While structuring will help us to improve objectivity, reliability of essays may still be low. You can increase the reliability of essays by increasing their number—but that will require reducing the length of the expected answer.

In the next chapter, we will discuss about a variant of these questions—the short answer questions, which are also free-response type but allow testing of more content areas.

Chapter

15 Short Answer Questions

LEARNING OBJECTIVES

- ❖ Enumerate various types of short answer questions (SAQs)
- ❖ Critically analyze a given SAQ
- ❖ Frame good SAQs for various levels of learning

Purpose

The value of experience is not in seeing much but seeing wisely.

William Osler

In the previous chapter, we discussed the various advantages and disadvantages of using essay-type questions for assessment of knowledge. You will appreciate that literary presentation, style, and other similar factors can influence the marks obtained by two different students who may have the same amount of knowledge. In addition, the sample of knowledge which can be tested by essay questions—however, well written—is limited. To obviate these problems, the trend is now changing in favor 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 also called *supply type* tests, as compared to multiple-choice questions (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:

❖ *How many mEq of sodium are contained in 1 L of low-osmolarity ORS?*
❖ *How will you prepare ORS if readymade packets are not available?*

In the first question, the expected answer is 75 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 g 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 answer options available to the student are limited.

Types of SAQs

Short answer questions can be presented in many forms. Some of the commonly used formats are presented below:

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

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 the number of infant deaths per 1,000 live births.
Question: Infant mortality rate is number of infant deaths per _____ live births.

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.

Types

β Thalassemia
↓
Decreased β chain production

Excess of _____

Precipitation inside RBCs   Anemia
                                                                              ↓
                                                                    _____
                                                                              ↓
Bone marrow expansion   _____
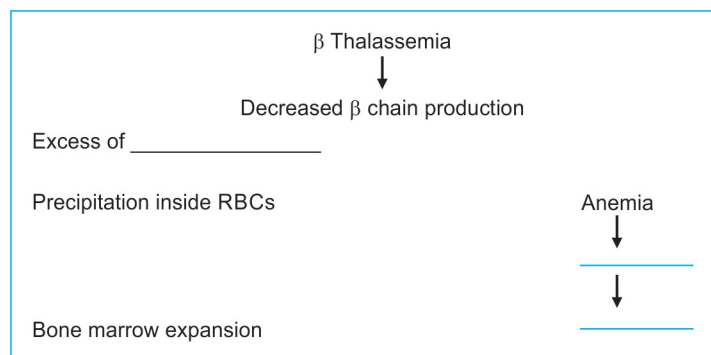
*Label the following diagram.
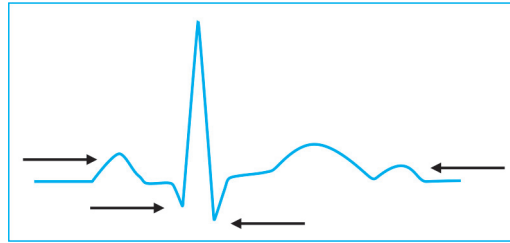
b. **One best response type:** These questions also allow themselves to be marked fairly objectively. They can include a variety of learning outcomes as illustrated below:

Examples

‣ *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 "the dose of isoniazid is" would have made it subjective. We shall discuss this aspect later on).
‣ *The formula to calculate the total dose of parenteral iron is:*
   weight X _____ X_____
‣ *Arrange the following antibiotics into bactericidal and bacteriostatic groups.*
   Penicillin, chloramphenicol, cephalosporins, tetracyclines, rifampicin.
‣ *A 1-year-old child weighing 6 kg is brought with pedal edema and anemia. Her weight deficit is _____ %.*
   Her 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 a 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 condition?
   Write the dose 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, analyze the facts available and then write an answer. However, that adds a problem. You will find that the answers to second and third part in the last question depend on the correctness of the first.

If the answer to the 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 vasovagal syncope, the latter two answers may vary from the key. This may, thus, require some subjective interpretation regarding the correctness of the first answer.

c. **Open SAQs:** They are called open because they provide some flexibility to the students regarding the correct answer. The following questions will illustrate this fact.

> ▸ *Enumerate three side effects of ampicillin.*
> ▸ *Enumerate three causes of massive splenomegaly.*
> ▸ *What is the cause of hemolysis in G6PD deficiency?*
> ▸ *How will you prevent typhoid in the sibling of a patient suffering from the disease?*

The first two questions require the students to choose three options out of the many available while the latter two require her to offer an answer in her own words, based on her 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 marks as one writing say, kala-azar and malaria.

Advantages and disadvantages of SAQs:	
Advantages	*Disadvantages*
Relatively easy to construct and mark	Can take the format of mini-essays with all their disadvantages
Allow wider coverage of content	May not be very useful for summative purposes
Properly framed, can assess higher levels of learning	Content covered is still less than an MCQ paper of the same duration
Very useful for formative purposes	May be subjective in some types of questions
Can provide very good distracters for framing MCQs	

Writing Good SAQs

To ensure that we do not get vague 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 her mind. She 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.

> ❖ *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 as ambiguous responses.
> ❖ *A baby is called neonate up to what age?*

Look at another example.

> ❖ *Infant mortality rate (IMR) of India according to 2018 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 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 emphasized 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 allotted to each question or each subpart of a question so that the student knows how much time should be spent on it.

Validation

It is a good idea to have the questions validated before using them for actual test situations. One way for this is to request your colleagues and other subject experts to go through the paper to see if questions sound all right 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 assessment and then discuss the questions and their answers with the class. This ensures that the students are not penalized 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 these indices in a later chapter.

Limitations

Before concluding, let us introduce you to certain limitations of SAQs. It has been shown that a student has to spend 3–4 times more time in answering an SAQ as compared to an 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 checking has to be done by the subject experts.

You can, however, turn some of the disadvantages of SAQs to your 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.

Disadvantages

Chapter
16

Objective–type Questions

LEARNING OBJECTIVES

❖ Enumerate various types of multiple-choice questions (MCQs)
❖ Enumerate advantages of various types of objective questions
❖ Critically analyze a given MCQ
❖ Frame "good" quality MCQs

*Life is principally multiple choice but at the end there
is a tough essay question.*

Robert Breault

During your student 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 15% 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 recommended method, 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 asked within the allotted time. As you will learn in Chapter 17, the reliability of a test and standard error of measurement are directly proportional to its sample size. Thus, even with very careful

and planned marking, essay questions are bound to have a low reliability.

Against this background, objective-type questions offer a distinct advantage of being more reliable—not only because of a predetermined correct answer, but also because of the more content being tested. They are easy to mark and can be used on repeated occasions. They provide a wider sampling of the 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:

❖ Multiple-choice questions (MCQs): single best answer (SBA)
❖ Multiple facets
❖ Matching and extended matching
❖ Relation-assertion type
❖ Rearrangement type
❖ Extended matching questions (EMQs)
❖ 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 may be *as prone to subjective errors* as any other test. It is, therefore, important that due care and attention is given while writing these questions (they are conventionally called *items*—in our subsequent discussion, we shall also use the same terminology).

Multiple-choice questions: 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.

MCQs

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)	*Isoprenaline*	*Distractor*
(d)	*Digoxin*	*Key*

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

Writing Good MCQs

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!

| *Steps in Writing* | ❖ Select a specific learning objective which you want to test. |

❖ 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 earlier 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.
❖ 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 calculate the *facility value* and *discrimination index* of each item. Only those items that 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 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.

Building Quality

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 penalized twice for one wrong answer. Look at the following example:

> *Scurvy is caused by deficiency of which vitamin?*
> *(a) A*
> *(b) B*
> *(c) C*
> *(d) K*   *Key: c*
>
> *The most common 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.

> *(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 lesion*
> *(d) Motor neurone disease*

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

> *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:

> *The most common 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 spots precede the rash*
> (b) *Tuberculin test becomes positive*
> (c) *Pancreatitis is a common complication*
> (d) *Prodrome lasts for 1–2 days*

As soon as the student reads the stem, the correct answer should flash in her mind and all she has to do is to compare the correct answer with the options provided. In the preceding example, she 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*

A good way to check if the stem has been properly worded is *cover the options* test. You have written a good stem if the student can answer the question without looking at the options. The item given above, for example, cannot be answered without looking at the options.

G. The statement should be qualified wherever necessary.

> *The infant mortality rate is:*
> (a) *40*
> (b) *80*
> (c) *95*
> (d) *120*

Here, neither the denominator has been provided (per 1,000 live births) nor it has been stated whether the infant mortality rate (IMR) of urban or rural areas or of any particular state is required. The year under reference has also to be mentioned since figure of IMR may be 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 item and its modified versions.

Protein requirement of Indian reference man is:
(a) *1 g/kg body weight*
(b) *2 g/kg body weight*
(c) *5 g/kg body weight*
(d) *10 g/kg body weight*   *Key: a*

Protein requirement (g/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 underlining them.

Clubbing of nails is NOT associated with:
(a) *Chronic lung disease*
(b) *Cyanotic heart disease*
(c) *Ulcerative colitis*
(d) *Bronchial asthma*   *Key: d*

Double negatives should be avoided at any cost. Following items illustrate this:

Which of the following is not a loop diuretic, except:
(a) *Frusemide*
(b) *Chlorthalidone*
(c) *Spironolactone*
(d) *Aminophylline*   *Key: a*

> *Which of the following is a loop diuretic:*
> (a) *Frusemide*
> (b) *Chlorthalidone*
> (c) *Spironolactone*
> (d) *Aminophylline* *Key: a*

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

K. Avoid "window-dressing" of the stem. This means writing superfluous and unnecessary words that tend to confuse the student. This point has been illustrated in the following items.

> *With the advancement of statistical methods, there has been concurrently paradoxical simplification of diagrammatic representations. A suitable diagram for depicting continuous quantitative data, such as monthly hospital admission rate would be:*
> (a) *Histogram*
> (b) *Pie diagram*
> (c) *Simple bar diagram*
> (d) *Scatter diagram* *Key: c*
>
> *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, such as "fairly high," "considerable," and "majority" should be avoided. Similarly, words, such as "never," "always," "usually," and "sometimes" should be avoided. These terms are confusing.

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

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

This item could have been better framed as follows:

Which of the following suggests a hemolytic etiology:
(a) *Jaundice*
(b) *Low platelet count*
(c) *High alkaline phosphatase*
(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, especially to the brighter student. Look at some of the examples, where different students can give different answers and yet be correct.

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

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

The most common 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 are distracted by them. Avoid using a "bogey" just to create four alternatives. If you cannot think of any effective distractor, leave the alternatives at three rather than using a distractor which will not distract anyone. The option "d" in the following two 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 g) is:*
> (a) 50
> (b) 100
> (c) 500
> (d) 1,000   *Key: c*

On the other hand, a good distractor will be attractive to the lower ability students. 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 immunization program?*
> (a) *Under 5 years*
> (b) *0–1 year*
> (c) *0–3 years*
> (d) *0–5 years*
>
> *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 mean that now the student is left with only two options rather than four.

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:

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*

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? Probably not.

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

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 recognize 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*

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 (in mL) is:*
> (a) *0.2*
> (b) *0.3*
> (c) *0.4*
> (d) *None of the above*

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

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

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

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

T. Avoid providing clues by way of either singular/plural expressions or by use of a/an, as illustrated below. Length or exclusive precision of the key is another factor which may help the students to make a guess, without actually knowing the answer.

> *Imipramine is an:*
> (a) *Antidepressant*
> (b) *Bronchodilator*
> (c) *Sedative*
> (d) *Stimulant*   *Key: a*
>
> *Water hammer pulse is characterized by:*
> (a) *High volume*
> (b) *Rapid upstroke and descent of pulse wave*
> (c) *Very rapid rate*
> (d) *Low pulse pressure*   *Key: b*
>
> *Protein content of 100 mL of buffalo milk (in g/L) is:*
> (a) *1*
> (b) *2*
> (c) *3*
> (d) *4.3*   *Key: d*
>
> *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.

U. 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

Preference to 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.

V. Often a point is raised regarding the 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 of numbers. Four options (i.e., one key and three distractors) are generally considered satisfactory, although research suggests that even three well-written distracters do not impact the quality of MCQ.

Checklist for Good Items

Checklist for writing good items

- ❖ Does the item deal with one or more **important aspects of the subject?** The minutiae of knowledge are best avoided.
- ❖ Does the item call for **information** that 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 ought to 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 may mislead the student.
- ❖ Can the item be answered simply by reading the stem and without looking at the distracters? Does it pass **cover the options** test?
- ❖ 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 or language comprehension.
- ❖ Is the type of **item the best one for the particular point or problem?** A topic difficult to test by one type of item may be assessed without difficulty by another type.
- ❖ Are **negatives avoided?** An item involving a double negative is usually improved by rewording to a positive form.
- ❖ Is the **item written in conformity with the designated format?** For example, in one best response type of question, the distractors must be grammatically consistent with the stem.
- ❖ **Is each alternative** (distractor) **a plausible response?** Poorly written or irrelevant wrong answers fool nobody and have the effect of reducing the number of choices.

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 emphasizing that the time and effort spent in writing a good item is more than repaid in the long run.

Other types of Objective Questions

One of the common criticisms often leveled against MCQs is that they test only simple recall and do not require the student to reason out, analyze, or synthesize the facts. This criticism is not valid, especially when we introduce you to certain other types of MCQs that 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.

*Adding the
Context*

Conventional Multiple-Choice Question

*Which of the following parameters will be elevated in children with
minimal change nephrotic syndrome?*
(a) Urea
(b) Creatinine
(c) Cholesterol
(d) Albumin

Contextual Multiple-Choice Question

*A 2-year-old child presents with excessive weight gain for the last
7 days. His eyes are puffy in the morning. On examination, he has
pitting edema, minimal ascites, and normal blood pressure. Urine
examination shows proteinuria but no RBCs are seen. You send for
his biochemical tests. Which of the following parameters are most
likely to be elevated?*
(a) Urea
(b) Creatinine
(c) Cholesterol
(d) Albumin

You will notice that the response expected from the student in both
situations is the same. However, while the first one is a simple recall
type of question, the second one needs application of knowledge.

Multiple approach type: 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 guesswork
is reduced to a minimum. They are also called *K-type questions*.

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:

Vaccines given in the neonatal period include:
(a) Tetanus
(b) Polio
(c) Pertussis
(d) Hepatitis B   *Key: c*

Which of the following foods contain proteins?

(a) Cereals
(b) Pulses
(c) Green leafy vegetables
(d) Eggs   Key: d

Which organisms cause meningitis beyond the neonatal period?

(a) Streptococcus
(b) Pneumococcus
(c) E. coli
(d) Meningococcus   Key: c

As you would have noted, these items do not give any credit for partial knowledge and are, therefore, especially suited for higher levels of learning. However, they consume more time for writing or responding and have not been very popular.

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 analyze 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 (g/dL)	1.1	3.5
(b) Carbohydrates (g/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
In breastfed babies		
Infections are less	f, e	
Hypocalcemia is less	c, d, e,	
Bioavailability of iron is better	e	

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

Considering that the aim of testing for knowledge is to help the students to apply knowledge rather than simply recall isolated facts, the format of the question takes the form of a small problem. A medical case is briefly described giving various details such as the patient's symptoms and the results of lab tests, and the student is asked to arrive at a diagnosis.

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 higher-order learning 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*

For each of the following cases, select the microorganism most likely to be responsible:
❖ *A 6-month-old malnourished child with a history of recurrent loose watery stools. Stool examination shows 2–3 pus cells/HPF. Stool culture on previous three occasions has been negative.*
❖ *A 3-year-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 students who do 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 by actually knowing the answer.

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

> ❖ *You are posted at a primary health center and have just seen a 2-year-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:*
> *a. Refer urgently to district hospital*
> *b. Rehydrate and then assess*
> *c. Prescribe ORS and antibiotics*
> *d. Investigate for sepsis and meningitis*

You will appreciate that the 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 types of questions, we are likely to be seeing more and more of such questions being used.

In addition to the types that we have discussed, another type, i.e., relationship-assertion type, is also used in some institutions. However, it does not offer any advantages over the single best response-type questions and is not recommended to be used.

Chapter

17   Test and Item Analysis

LEARNING OBJECTIVES

- ❖ State the importance of test and item analysis
- ❖ Define facility value (FV), discrimination index (DI), and distractor efficiency
- ❖ Calculate and interpret FV and DI of a given item

Learning happens in the minds and souls; not in the databases of multiple choice tests.

Ken Robinson

When you go to the market to purchase a commodity, which shop will you have more faith in—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 assess the knowledge of the students. What will happen if this measure is not standardized—a student will get either more or less marks than she actually deserves. This harms the cause of learning in more than one way—on the 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 standardized 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 learn about item analysis.

Item Analysis

Under this category, we include items of one best response type—in other words, where the student can be marked either right or wrong. This may not be suitable for essay-type questions.

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 into two groups, i.e., higher ability group (HAG) and lower ability group (LAG). If the number of students is up to 50, the groups will include 25 students each, but if it is large, say 200, then you could include 30% top and 30% bottom students respectively in the two groups.

Preparing for Item Analysis

Now, for each item, count the number of students selecting 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 item no. 1, the distribution of options may be something like this:

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

(b is the correct answer. By convention, an asterisk is used to indicate the correct option.)

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

Facility value (FV): Simply stated, FV means, number in the group answering an item right. If 60% of the group answers the item correctly, then FV will be 60%. FV can be calculated by the formula:

Facility Value

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

Coming to the previous example, FV will be:

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

Facility value is a measure of how easy or how difficult an item is. Higher the FV, easier is the item. Remember that FV is also called Difficulty Index. However, to avoid the abbreviation DI being confused with discrimination index, FV is the preferred term.

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

Discrimination Index

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

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.

Range of item analysis indices	
Facility value	*Discrimination index*
Range: 0–100	Range*: 0–1.00
Recommended: 45–60	Recommended: >0.25
Acceptable: 25–75	Acceptable with revision: 0.15–0.25 Discard: <0.15
*Theoretically can extend from −1.00 to +1.00	

The FV and DI are not inter-dependent. An easy item may still be able to differentiate between HAG and LAG students while a difficult item may not. This is she reason to calculate both the indices.

At this stage, we would also like to introduce you to another term called *negative discrimination*. Simply stated, it means that more LAG students are answering the item 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	

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

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

We shall revert to negative discrimination, when we discuss the uses of item analysis.

Distractor efficiency: Do you recall our discussion on distractors in Chapter 16.? It was very strongly emphasized 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 students have been distracted by it. On the other hand, if you look at "c" you find that more students in the upper group have been attracted

toward it than the lower group. This needs to be checked for correctness, ambiguity, or way of writing. Numerically speaking, any option that is not picked by at least 5% of the students is not considered a good distractor.

Utility of Item Analysis

You may be wondering the purpose being served by undertaking these calculations. Item analysis helps in detecting specific technical flaws in the item and provides information for improvement. It improves 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 the 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 is too difficult, then students tend to answer that item more from guesswork than from actual knowledge. Being aware of FV for a particular item also aids in better design of the question paper. As a general rule, the paper should begin with easy items and then progress on to difficult ones. Adopting a reverse sequence may demotivate the students right from the beginning.

Uses

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

Question Nos							
	1		2		3		4	
Students	a	b	a	b	a	b	a	b
1.	+	+	−	+	+	−	+	+
2.	+	+	−	+	+	−	+	+
3.	+	+	+	+	−	−	−	−
4.	+	+	−	−	+	−	−	−
5.	+	+	−	+	+	+	+	+

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

This indicates that the subject area related to the objective of item 1 is well known to the students and does not need further 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 3 earlier but after teaching, they have given wrong answers. This indicates that either the question has not been properly framed or else the teacher has not been able to convey the right information.

(c) For tests that are employed for the purpose of selection, we prefer items with a high DI. Selection tests are meant to pick more students from HAG. Items with a low DI may not be able to serve that purpose. Also remember that reliability of a test is linked to having items with a reasonable DI.

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

The infant mortality rate of India is:
(a) 30
(b) 44
(c) 56
(d) None of the above.

This item 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 item will be:

$$\frac{2\times(8-3)}{20}=\frac{10}{20}=0.5$$

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

$$\frac{2\times(1-4)}{20}=\frac{-6}{20}=-0.3$$

Also, a brilliant student who may have read a very recent reference quoting a figure of say 46 will tick option "d." Thus, test and item analysis will give a clue to a wrong key or improper framing 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 is 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.*

Internal Consistency

You can also calculate *Cronbach's 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 the 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.

Reliability varies 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 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 the reliability of essay questions cannot be calculated. There are tests and formulae available for this also, but they are generally more difficult and require elaborate 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.

Initiating Item Analysis

New Items

We have already emphasized that before we actually use a test, we must have the data 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 items is to give them a trial run as dummies. Thus, in an actual test situation, the first 20 items out of 100 can be new items. The students answer them, they are marked on them, but scores obtained on these 20 items are not used for computing the results. They are used only for calculating the FV and DI, and only when an item has been found to have a satisfactory level of FV and DI, it is used in the actual test situation for subsequent tests.

Chapter

18   Question Banking

LEARNING OBJECTIVES

❖ Explain the concept of question banking
❖ Enumerate the steps in question banking
❖ Set-up a question bank

Concept

Nothing happens quite by chance. It is a question of accretion of information and experience.

Jonas Salk

We have all heard of banks—financial institutions, 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 a collection of a few hundred questions in a file (or may be in a computer). This is what exactly a question bank is not about. Just as having a large amount of money in your cupboard does not it make a bank, same way, having a large number of questions does not make it a question bank. True that a question bank has to contain a large number of questions, but it also has to have a 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 weight measures, question bank provides information regarding the actual use of a 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 allotted
❖ Facility value
❖ Discrimination index
❖ Reference from where the item has been taken

Process

To collect this set of information, the following general guidelines are useful. The first step is to collect a large number of questions/items for the bank. The items 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 item a day for the bank. Another good source of items is training workshops/sessions organized for teachers. Once a large base of items has been created, the next step is to screen the items. Peer review remains the best means of screening questions. Items that are ambiguous, stereotyped, incorrect, or repetitive should be discarded. Experience has shown that approximately half the items are likely to be discarded in this manner.

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

The items 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, facility value (FV) and discrimination index (DI) are calculated as described before. Items with an acceptable FV and DI are retained for final inclusion in the question bank.

Sorting the items: One of the essential features of a item bank is easy retrievability of the items. To facilitate this, the items are written/typed on 8″ × 5″ cards, just similar to those used in a library catalog. 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 item and its FV/DI for that particular examination. Every time the item is used, this data is updated. It can be easily appreciated that although the process appears tedious, once it has been completed, the task of setting an examination paper becomes extremely easy.

Using a computer to store items (in dbase, Microsoft Access, or similar) in the stated format not only makes the task easier, but also helps to pull out items of desired FV and DI.

Item Cards

Side A	
Chapter	Infectious diseases/poliomyelitis
Level tested	Factual recall-application
Stem	Albuminocytological dissociation in cerebrospinal fluid (CSF) may be seen in cases of:
Options	(a) Poliomyelitis (b) Purulent meningitis (c) Tubercular meningitis (d) Postinfective polyneuritis
Key	(d)
Reference	Nelson's Textbooks of Pediatrics

Side B								
Year	*Class*	*No.*		*Options*			*FV*	*DI*
			a	*b*	*c*	*d*		
2018	Final Prof	60	11	16	6	27	45	0.34
2019	Final 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 blueprint of weightage to be attached to different subject areas and different objectives within these subject areas? Thus, it tells you, for example, that out of subject area A, what percentage of items 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. Computerized banks make paper setting even easier.

Advantages

Utility

Question banking will increase the skills of teachers as writers/reviewers of items. 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 items to test

particular outcomes of learning. It will also ensure using the right kind of items for the 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 1,000 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 100,000 questions deserves credit for it!

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

Chapter 19

Oral Examination
(Viva Voce)

LEARNING OBJECTIVES

- ❖ Discuss the advantages and disadvantages of oral examination
- ❖ Suggest ways and means to overcome the limitations of oral examination
- ❖ Conduct an objective oral examination

Concept

The best way to reduce stress of interview is to be well prepared.

Terry Mark

We all have our own feelings and impressions about the oral examinations *(viva voce)* 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. However, many a times, such examinations fall into disrepute due to element of subjectivity. Let us try to look at the merits and demerits of *viva voce* and explore how we can overcome some of the common criticism leveled against it.

Merits of Oral Examination

The main advantages of an oral examination lie in:

- ❖ Providing a direct personal contact with the student during which his attitude and personality can also be assessed
- ❖ Providing flexibility to move from strong to weak areas and *vice versa*
- ❖ Providing an opportunity to find out how the student arrives at a conclusion and therefore her analytical skills and judgment
- ❖ Sampling a wider area of knowledge, although only limited information is sought on each topic and subtopic
- ❖ Improving the ability of students to express themselves effectively and refine their communication skills.

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

Demerits of Oral Examination

The major drawbacks of an oral examination, as currently practiced are:

- ❖ It lacks standardization.
- ❖ It lacks objectivity.
- ❖ It suffers from possible abuse of personal influence.
- ❖ It suffers from undue influence of irrelevant factors.
- ❖ Examiners may not give enough thought to the framing of the questions and may not organize different questions in a methodical order. Sometimes, a very difficult question is asked in the very beginning, and then the student is unable to answer later questions. Often, the same questions are asked repeatedly, and this benefits candidates who take the test later. A candidate unable to answer well may be ridiculed before putting the next questions or she may be asked irrelevant 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 only be a farce with awarding of just necessary pass marks. It may, however, be a worthwhile effort for deciding about the result for borderline cases or to award distinctions.
- ❖ Some students may not be able to perform very well due to language barrier. Conversely, a false impression may be created by a student with fluency and style.

Limitations

What can be assessed by *viva voce*?
❖ Concepts and theories
❖ Breadth and depth of a given topic
❖ Applied problem solving
❖ Interpersonal competence
❖ Interpersonal qualities
❖ Integrated practice
❖ Verbal and nonverbal communication skills
❖ Interviewing skills
❖ Attitudes, professionalism, ethics
❖ Personal abilities

Conducting the Oral Examination

It may be good to consider all the aspects discussed above and organize an oral examination in a relaxed atmosphere. Asking appropriate questions is most important. Including a large number of questions and

Process

encompassing the widest possible content maximize the validity of the assessment. In general, you should begin with simple short questions and proceed to more and more difficult ones. The assessment can be based on the difficulty levels crossed satisfactorily by the candidate. For this purpose, a system of different colored cards may be used with questions of graded different difficulty level from each topic weighted as +1, +2, or +3. Each student is asked questions from different topics with a net score of 20 ($3 \times 2 + 2 \times 4 + 1 \times 6$ or any other combination). This method would ensure uniformity and a level field to all. The students can be given one set each by draw of lots and perhaps an acclimatization period of 5–10 minutes before the start of *viva voce*. Having a large number of sets entails inclusion of a variety of questions and offsets the risk of bias by sheer numbers. It amounts to having 200 questions (based on the assumption of 10 questions per set and 20 such sets) for a paper and would cover most of the core areas including some from non-core ones. It would also offset the risk of eliciting a good performance from the student merely as a result of memorization and would reduce the subjectivity of oral examination.

Another important point to be remembered while conducting an examination is the time factor. Neither should the time be too less so as to be a rapid fire round nor too long. It is also desirable that the student is assessed by all the examiners. You must remember that in case of multiple examiners, the topics/subject areas should not overlap and should cumulatively include the widest possible range of the syllabus.

Attributes as a Tool

The major issues related to conduct of *viva voce* are validity, reliability, and fairness. We have already discussed these concepts in Chapter 13. For a quick recap, let us summarize them again.

Validity: Degree of alignment between what is measured and what is supposed to be measured. In other words, it means that a student should get credit for his subject knowledge and not his language skills.

Reliability: Indicates the reproducibility of results. It would mean that if the process was repeated with different set of questions or different set of examiners, how reproducible the results will be.

Fairness: Implies the degree to which two students with similar knowledge will score similar marks. Fairness entails absence of any bias related to appearance, educational background, class, or gender.

Let us see, how you can build these attributes in your oral examinations.

a. **Validity:** The examination should focus on the capabilities of a student which are best assessed orally, viz. clinical reasoning and

decision-making. The content of examination should, therefore, be decided before the examination by the panel of examiners. What is asked should be commensurate with what is required for that level of medical practice. As far as possible, factual questions should be avoided. Language assessment should be limited to the level required for successful communication with patients or health team.

Experts have cautioned against the tendency of examiners to focus only on recall (or act as "quiz masters"). This not only limits the utility of the examination, but also interferes with its validity. Of late, some universities have started replacing viva with the objective structured practical examination (OSPE), especially in basic sciences. We feel that this is a retrogressive step, which will not only reduce the utility but also create logistic problems (e.g., marks will be added to practical but skills tested are purely theoretical). In any assessment, validity is more important than reliability.

b. **Reliability:** The key dictum for building reliability is adequate sampling to make assessment representative of professional task. It may be useful to avoid topics already covered in the theory examination. It is also important to monitor inter-examiner variations. Any examiner awarding say less than 20% or more than 80% marks should discuss her reasons for doing so. At the same time, the tendency to use the median score (e.g., everybody getting 55%) needs to be checked. Examiner training and examiner calibration help to reduce variability and improve reliability.

c. **Fairness:** The coordinator of the examination or the head of the department should scrutinize the results to look for possible bias. Any extreme of marks should be corroborated by scores in other tools (like case presentations or theory tests). Language difficulty faced by students should be recognized and should not become a limiting factor if the student is otherwise proficient in the subject. Using pairs of examiners has been used as one of the strategies to reduce the degree of unfairness and to improve reliability. However, having two examiners limits the content that can be assessed and may affect reliability. Examiner training and calibration are also important to ensure fairness.

Structured oral examinations (SOEs) have been introduced at many places to promote standardization of oral examinations. Basically, SOE involves prior determination of cases (or practical), questions to be asked by the examiner, acceptable answers, and marking schemes. However, one should be careful against reducing the examination to a test of mere recall.

Formats of oral examinations: Various formats of *viva voce* have been described in the literature. These include interview format (quizzing the student on general topics); clinical format (questions regarding diagnosis and treatment of a particular patient); cognitive format (problem solving around specific issues); and role-playing format (students asked to assume role of a counselor, etc.). You will appreciate that the choice of format is guided by the purpose of examination rather than by perceived superiority or examiner choice of any one format over the other.

Preparing the students is an important consideration. Many a times, students develop dysfunctional anxiety during *viva*. Many of us have faced a similar situation during our student days. Students need to learn about the format of assessment just as they need to learn about many other things. Unfortunately, most of the times, their source of information is the senior students who themselves may be unaware of the process. Formative assessment and internal assessment provide the best opportunity to prepare the students to face a *viva voce*. Explanation of abilities to be tested and criteria for scoring are also useful to allay anxiety. Students should be informed about the importance of *viva voce* examination in the medical curriculum and an awareness created.

On the face of it, oral examinations may seem to be suffering from many problems but in view of the *utility of assessment*, they have a place, specially in our setting. As a teacher, we need to put in thought and effort to make them useful. This requires a careful planning. Rather than allowing it to become impromptu, we should think of possible questions and expected answers at the level of training. Similarly, students need to be oriented to optimally face a *viva voce* so that it adds value for both. Allowing a few practice sessions also helps the students to overcome anxiety and answer questions in a composed manner.

Assessment of Practical/Clinical Skills

LEARNING OBJECTIVES

❖ Explain the rationale of objective structured clinical examination (OSCE)
❖ Write OSCE stations for different skills
❖ Conduct an OSCE in an actual clinical setting
❖ Use a mini-clinical evaluation exercise encounter and provide formative feedback
❖ Assess a case presentation

Concept

The watchmaker to whom one gives a watch that does not run will take it all apart and will examine each of the pieces until he finds out which one is damaged. The physician to whom one presents a patient cannot dissect him to establish the diagnosis.

Pierre Duhem

One of the most important aspects of training a doctor is the acquisition of practical skills—after all, patients do not come to quiz their doctor on the differential diagnosis or management of their problem. Yet, 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 assessment 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—to improve learning. Unfortunately, our conventional examinations do not provide any feedback except stating pass or fail and thus do not provide any opportunity for the student to improve.

Objective Structured Clinical Examination

There have been many innovations to overcome this problem, but the one that we are going to discuss with you is called *objective structured clinical*

examination (OSCE), which has been designed for objective assessment of bedside clinical skills. Let us weigh OSCE in the desirable qualities of an assessment instrument, viz. validity, reliability, and feasibility.

Validity, you will recall, is the ability to measure what is intended to be measured. A practical examination should assess the ability of a student 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, focuses on reporting of findings only, ignoring the "doing" part of it.

Attributes

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 result that inter-observer variation is reduced to a minimum. Thus, any difference in marks is directly attributable to the ability of the students, rather than to extraneous factors. A wider sampling of skills to be tested is a major factor contributing to the reliability of OSCE.

Process

By now you must be wondering about what exactly OSCE is. Let us describe it for you. As the name indicates, it is a form of clinical 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 she may have palpated it standing on the left side of the patient! On the other hand, if she 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:

Components of clinical competence			
History taking	*Physical examination*	*Diagnosis*	*Treatment*
Present	General	Provisional diagnosis	Drugs and doses
Past	Systemic	Differential diagnosis	Non-pharmacological therapy
Birth		Reasons for making a diagnosis	Communication
Family		Investigations	Counseling
Nutrition			Professionalism
Development			Referrals

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

Designing stations: Do not be afraid of designing the stations—they are easy to design if you understand the basics. Generally, stations are of two types—*procedure station* and *question station*. As the name implies, a procedure station requires the student to perform some "procedure" and can be further subdivided into *observed* and *unobserved*. An example of each of these types of stations will make the difference clear. Please note that the same task can be given as observed or unobserved.

Design is the left-margin label for the above paragraph.

- ❖ **Unobserved procedure station**
  Record the weight of the infant.

- ❖ **Observed procedure station**
  Record the weight of the infant.

Checklist is the left-margin label for the following table.

Checklist for examiner	Marks	Marks given
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 g	2	
Total	10	

Versatile is the left-margin label for the following paragraph.

You have rightly noted that on observed procedure station, the student is being observed by an observer using 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 weightage is assigned to each of the acts. The weightage can be equal or differential. Thus, in the above example, if checking the zero-level is considered to be more important than the others, then it is given two marks, while the rest of the points are given one each so that a student who performs all the acts correctly is given six marks for this station. Sometimes, even a negative grade can be built in to test higher levels of learning. For example, if the task is to resuscitate

a meconium-stained newborn and the student uses bag and mark, she gets a negative mark.

It is obvious from the above that any range of clinical skills can be tested by OSCE. Skills such as history taking, physical examination, or bed-side lab procedures require preferably an observed procedure station, while interpretation of lab reports, X-rays, ECGs, pictures, etc. can be done using unobserved procedure stations.

You should not go with the idea that OSCE tests only the "doing" part and ignores the "what" part of clinical competence. The question stations are meant exactly for this purpose—to test the interpretations 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:

Anterior fontanel	*Teeth*
Pallor	*Hair*
Jaundice	*Lymph nodes*
Throat	*Respiratory rate*
Skin	

Followed by:

❖ **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 widening of wrists*   *T/F*

❖ **Procedure station**
Test the urine sample for protein and sugar.

Followed by:

❖ **Question station**
In the sample you have just tested
❖ *Proteins are absent*   *Yes/No*
❖ *Traces of sugar are present*   *Yes/No*
❖ *There is some turbidity which disappears*
    after adding acetic acid   *Yes/No*

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. It is appropriate to have negative marking in T/F or yes/no type of questions to dissuade guesswork.

Planning for OSCE

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

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

In effect, it could mean that there will be three stations on history taking (of 10 marks each), three on physical examination, and so on. Let us also 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, through which all students rotate. For a 20-station OSCE, the total time required, assuming a time of 5 minutes per station, will be approximately 2 hours. You will agree that objectively examining 20 students in 2 hours on 20 different skills will never be possible by a conventional examination.

Planning

Flowchart

Example of a 10 station OSCE

1. Perform physical examination (Observed) → 2. Question → 3. Lab reports of patient

6. Questions ← 5. Perform a procedure (Observed) ← 4. Questions

7. Instrument with demonstration → 8. X-ray with questions → 9. Health education exercise

10. Demonstrate BLS (Observed) → To station 1
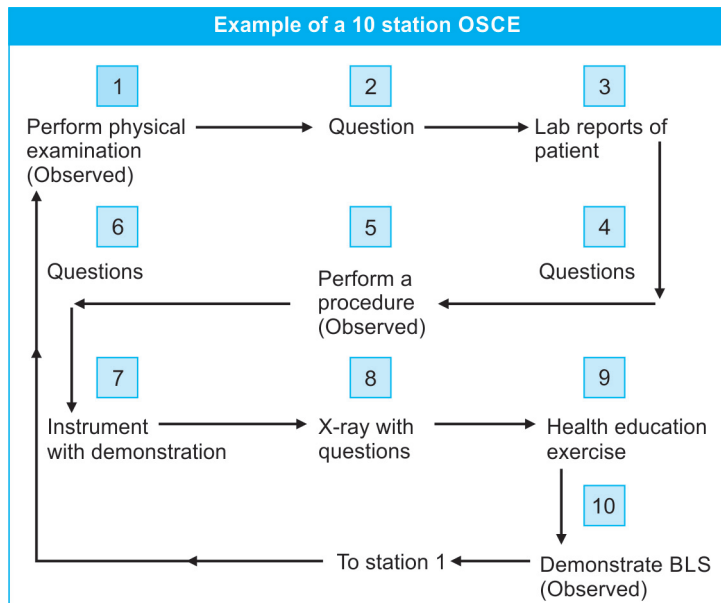
Skills Assessed

Skills Tested

We hope, by now, you are clear about what OSCE is. Can you list some of the skills which you can assess 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. Skills 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 minutes, then the station should be split into two. For example, at one station the student 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 that 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 immunization. By use of appropriate checklists, these skills can be objectively assessed in a very short time.

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

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

h. *Practical procedures,* such as giving an injection or passing a nasogastric tube using models/manikins.

However, keep in mind that OSCE is a test of clinical skills and should not be used primarily for theoretical questions. Interpretation of reports, for example, should be in relation to a patient examined rather than as a standalone question.

Also remember that OSCE is resource intensive therefore, you should not use OSCE for assessment of knowledge, which can be done by cheaper and easier methods.

We have given here a few more OSCE stations as illustrations. You can 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

	Max. marks	Marks received
Introduces herself	1	
Introduces 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**

Determines the immunization status of the child.

Checklist for examiner

Enquires specifically regarding following vaccinations.

	Max. marks	Marks received
BCG, HBV, OPV at birth	0.5 each	
DPT—I, II, III, booster doses	0.5 each	
HIB, Pneumococcus, rotavirus, IPV	0.5 each	
Measles	0.5	
MMR	0.5	
Boosters DPT, IPV	0.5 each	
Typhoid	0.5	
Hepatitis B I, II, III	0.5	
Optional vaccines	0.5	
Place of vaccination	0.5	
Time schedule of vaccination	0.5	
Any documentation or card	0.5	
Looks for BCG scar	2	

Example

❖ **Interpretation station**

A 3-year-old child has been brought with failure to thrive. Record his anthropometric data.

Use the percentile charts and write True or False for the following statements:
- ❖ *The child is 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 station**
Write true or false regarding the child you have just examined.
- ❖ *The upper border of the liver is in the sixth intercostal space.*   *T/F*
- ❖ *The liver is firm in consistency*   *T/F*
- ❖ *The spleen tip is palpable*   *T/F*
- ❖ *Free fluid is present in abdomen*   *T/F*
- ❖ *There is tenderness in the right iliac fossa*   *T/F*

In situations where the examination may be uncomfortable, multiple alternative cases may be used for the station depending on the number of students. However, you should be careful that the question station pertains to the particular case used.

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

Example

Enquires regarding	Max. marks	Marks received
Place of delivery	1	
Type of delivery and indication	2	
Duration of rupture of membranes	1	
Meconium staining of liquor	1	
Duration of labor	2	
Time of cry	2	
Method of cutting of umbilical cord	1	
Total	10	

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 analyzing the checklists, feedback can be provided to the teachers as well as the students regarding the efficiency of teaching. For example, if in the examination 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.

Limitations: It is not that OSCE does not have its critics. The major criticism of OSCE is that it tends to compartmentalize 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.

For pre- and paraclinical areas, a variant of OSCE, i.e., *objective structured practical examination* (OSPE), is used. The basic concept remains the same, i.e., breaking the skill to be tested into parts and then testing each one individually.

Since its introduction about 45 years ago, OSCE has undergone a lot of changes. One of the most important changes in our understanding of OSCE is that its benefits accrue from its ability to sample wider areas of content (you would recall that this helps in building both validity and reliability) rather than to its objectivity. However, in practice and especially when using its OSPE variant, we tend to settle only for objectivity part. In most of the settings, OSPE still retains its five-station format and tests either recall of knowledge or at best analytical skills. In some universities, OSPE has been used as a replacement for *viva voce*. We would like to reemphasize that OSPE is a test of practical skills and using it for testing theory will threaten its validity.

Application

We will also like to point out that OSCE should not be seen as a replacement for some other form of assessment (e.g., long case)—rather, it should be seen as an add-on, which will help us to test different competencies which cannot be tested by existing tools. In clinical settings, for example, OSCE can be used to test isolated or individual skills; long case can be used to test analytic skills while viva voce can be used for reasoning and communication skills.

Suggested format for practical examination			
	Case	*OSCE*	*Viva voce*
1. Medicine and allied subjects	Long case; one or two short cases	Medicine, dermatology, and psychiatry	±
2. Surgery and allied subjects	Long case; one or two short cases	Surgery, orthopedics, ophthalmology, ENT	±
3. Obstetrics and gynecology	Long case; one or two short cases	Obstetrics and gynecology	±
4. Pediatrics	Long case; one short case	Neonatology, emergencies, procedures, etc.	±

Mini-Clinical Evaluation Exercise (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 evaluation, 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 six to eight observed encounters during the year with a *different* observer on a *different* patient for each encounter. Each of these encounters represents a different clinical problem and trainees should sample from each of the core problem groups identified as important (e.g., history taking, physical examination, diagnosis, communication, and counseling). However, not all elements need to be assessed at each encounter. Each encounter takes about 20 minutes, with the first 15 minutes for the encounter and the last 5 minutes for feedback. Immediate feedback is provided after each encounter by the teacher 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 post-graduates, 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 that is most commonly used. The back of the form provides narratives for acceptable performance.

Mini-clinical evaluation exercise mini-CEX

Evaluator:_____

Date:_____

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

Patient Problem/Dx:_____

Setting:	O Ambulatory	O Inpatient	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   Satisfactory

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

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

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

Medical interviewing skills: Facilitates patient's telling of story; effectively uses questions/directions to obtain accurate, adequate information needed; responds appropriately to affected, nonverbal 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 judgment, synthesis, caring, effectiveness, and efficiency.

_____

Source: 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 *https://www.youtube.com/watch?v=hwreA4DGvtw.*

Clinical Case Presentation

We have seen and used case presentation as a method of assessing clinical skills. However, there is a great deal of subjectivity involved and results are likely to be affected by many extraneous factors.

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 pre-determined. Certainly, it would be an exhaustive exercise and needs a thorough study of the case prior to the actual assessment. 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 the assessment is systematic and organized? You will appreciate that by structuring, the objectivity of the case presentation can be significantly improved. *Objective Structured Long Case Record* (OSLER) (sample available at http://medind.nic.in/jac/t01/i4/jact01i4p251.pdf) is an attempt to provide structure to the case presentation.

The major problem with long case presentation, however, is that the student is not observed while taking history or performing physical examination. Some examiners do ask the student to demonstrate one or two signs but most of the other time allowed for working up the case (almost 45–60 minutes) goes unobserved. Another issue with long case is the fact that it samples very small area of content. You can test the student on only one or two cases. Further, all students do not have similar cases and this limits the generalizability of the results. However, in our settings, where long case is still the major tool for the assessment of clinical competence, it may be worthwhile to try some such innovations.

While you can use one of the checklists to make it more objective, another useful input will be to observe the student while he is working up the case. We realize that it may be logistically difficult to implement during university examinations (although it will be easy during internal assessment) but will enhance the educational value of long case. The mini-CEX, which we have earlier described, actually makes use of this

Traditional Long Case

OSLER

concept by directly observing the student during a clinical encounter. Supplementing long case with OSCE, one or two longer (~15 minutes), stations can provide an opportunity for direct observation of history taking and/or physical examination.

Many teachers are skeptical about the value and utility of OSCE and feel that it is too trivial a method of assessment. However, we will like to remind that if a car meets with an accident, it is generally not the fault of the car—the problem generally lies with the driver, the roads, traffic and driving conditions. Same way, having a poor OSCE (which generally results from a poorly given *task* and a poorly made *checklist*) is not an inherent problem of OSCE—rather it is a problem of poor use. Examiner (and student) training improves its value significantly.

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 to prepare. Similarly, making meaningful use of long case also requires extra time and effort. However, this is more than compensated by ensuring a better validity and reliability in the assessment of clinical skills.

Chapter 21

Workplace-based Assessment

Traditionally medical assessment focused on ritualistic endpoint summative assessment, conducted far away from place of work.

Tim Swanwick

You will recall the discussion on the validity and authenticity of the assessment that we had in Chapter 13. The most appropriate way to build authenticity in the assessment process would be to assess the students in the same setting in which they are going to work. The commonly used assessment methods such as objective structured clinical examination (OSCE) or case presentations happen in relatively "artificial" settings.

You will also recall that assessment is concerned with not only proving what the students know (or do not know) but is also concerned—probably in a greater way—about how to improve their learning. We have already discussed that feedback about performance is the single most important factor promoting learning. This formative function of assessment is highly underutilized in most situations.

Imagine for a minute that you have to purchase a scissors from the market. Before you finalize the purchase, you want to check the scissor. How will you do it—by reading the brand name and purchasing or actually try cutting a paper with? Most of us will actually use it to cut a paper or thread or some other disposable item to see if it works properly. Based on that premise is the concept of workplace-based assessment (WPBA) that a student should actually be tested in the real working conditions rather than by some extraneous examinations.

Why WPBA?

There are many reasons for testing the student in actual working conditions. The conventional examinations carried out in the wards or laboratories do not mimic the conditions that a student is going to encounter in real life. No wonder then, that many students who otherwise score good marks in such examinations, find themselves ill prepared to work in a real-life setting. Of course, there are many other educational reasons to use WPBA, which have been discussed below.

With this background, let us introduce you to the concept of WPBA. As the name indicates, WPBA *primarily happens* in the workplace. The second important attribute is that it involves *direct observation* of the student. And, thirdly, that it assesses everything required for *effective functioning in the workplace*. Before proceeding further, let us caution you that WPBA is not a replacement for any other form of assessment— rather it complements the information that we obtain from other traditional methods of assessment. Generally, WPBA is used mainly for formative purposes—although reports of its use even as a summative assessment are beginning to appear.

Rationale

In addition to the fact that WPBA is happening right at the site of action and that it makes use of feedback as a tool for improving the quality of learning, there are other reasons as well that support this modality of assessment. WPBA is concerned with clinical skills that are critical to diagnosis and treatment—and it is generally these skills that are not adequately tested during conventional examinations. In general practice setting, good history and physical examination are enough to make a diagnosis in over three fourths of the cases.

Rationale for workplace-based assessment
❖ Happens at the actual place of work
❖ Based on direct observation
❖ Assesses knowledge and skills in addition to communication, professionalism, and attitudes
❖ Allows the student to reflect on her performance
❖ Conforms to the highest level of Miller pyramid
❖ Uses assessment for *learning*

Soft Skills

In addition to the skills mentioned above, a physician needs to develop a number of soft learning skills, such as empathy, communication, teamwork, and collaboration. Unfortunately, the traditional examination setting does not allow assessment of these skills. Even if we make an attempt to include them, it is difficult to distinguish a student who actually uses good communication in day-to-day work from one who is bluffing. The only way to reliably assess these skills

Authenticity

is the direct observation of students over a prolonged period of time. You may find many of these arguments similar to those advanced for continuous internal assessment.

Traditional assessment of medical students focuses on the *potential* to practice rather than on *actual* practice. Does that remind you of something—yes, you are right: while traditional assessment reaches to the "shows" level of Miller pyramid, WPBA targets "does" or the highest level. As already discussed, the artificial settings of a clinical examination make it difficult for us to predict how this student will behave when she is placed in a very heavy OPD or what influence the availability of facilities (or their absence) will have on her work. These factors make a strong case for including WPBA in the assessment scheme.

Tools for WPBA

Let us now try to look at the tools that are available to us for assessing the students at the workplace. Generally, these tools can be categorized into one of the following categories:

Tools

   i. Documentation of work experience (e.g., clinical encounter cards (CEC), logbooks)
  ii. Observation of individual clinical encounters (mini–clinical evaluation exercise (mini-CEX), direct observation of procedural skills (DOPS), clinical work sampling (CWS))
 iii. Discussion of individual cases (case-based discussion)
  iv. Feedback on routine performance (multisource feedback (MSF), peer assessment).

In addition, knowledge and skills are also tested using conventional tools, such as MCQs and OSCE.

The data obtained from these and other tools are generally put in a portfolio, which serves to maintain the record of progress.

We will now give a brief description of some of the tools and their applicability in our setting.

Work Experience

Documentation of work experience**:** This can be done by using *CEC*. These are small computer-readable cards provided with an instruction booklet. The booklet contains a list of codes indicating the clinical condition as well as a staging system for diseases. The student makes an entry in the card every time she encounters a patient. Same patient seen again is marked on the same card. At the end of the rotation, a list of cases seen by the student is generated. This is reviewed by the teacher and the student together and a plan for the next rotation is made.

Logbooks can offer a replacement for this system if such facilities are not available. Basically, logbooks are a compilation of the cases seen by the students. They come in various types, with some listing only the diagnosis, while others require a complete history, examination, and treatment record for each case.

Many of us will be tempted to say that we also use them in our system. However, as you will realize that the benefit from this accrues not from maintaining the card or logbook but from discussing the progress of the student and providing feedback to her. With competency-based curricula coming in, simply recording the learning experiences in a logbook serves no purpose.

Clinical Encounters

Observation of individual encounters: The major tool for observation of individual clinical encounters is the mini-CEX. We have already discussed the process and utility of mini-CEX in Chapter 20. Six to eight encounters per student per year are generally required for a reliable assessment. The key factor of mini-CEX is the provision of immediate feedback following direct observation.

DOPS works on the same principle as mini-CEX, with the difference that rather than clinical skills, the focus is on individual procedural skills. Both mini-CEX and DOPS require 10–15 minutes of observation and 5–10 minutes of feedback.

CWS is a rating of the students' professional work by peers, teachers and paramedical staff.

Individual Cases

Discussion of individual cases is an important tool for WPBA. It is done using case-based discussion (also called chart simulated recall or CSR in some countries). It is different from the traditional case presentation that we are used to. In a case presentation, the student works up a patient and then discusses what she will do to make a diagnosis or for treatment. Case-based discussion, on the other hand, focuses on what has already been done. For example, case record of a discharged patient is picked up and the student justifies the investigations that were done and the treatment that was given. Contrasted to case presentation which is often on hypothetical situations (what will you do if report shows x or patient develops complication y?), case-based discussion is on what has actually happened.

Feedback on routine performance is obtained using standardized tools. *Mini peer assessment tool* (mPAT) is one such example. Since there is some subjectivity involved in rating process, reliability is ensured by collecting information from more than one data source, giving it its

name, *MSF*. Peers, teachers, paramedical staff, and even patients can be used to get feedback.

Portfolios serve as a tool for collecting and presenting evidence of learning at various levels of training. Portfolios can have a varied content. For example, they may contain a listing of clinical material seen (this is the only similarity with logbooks!). In addition, they contain reflections on those experiences (what did the student learn from that experience), critical incidents, past performance on WPBA tools as well as scores on any OSCE or MCQ tests that the students may have undertaken.

The benefits that accrue from the use of these methods are directly attributable to the reflections by the students and feedback that is provided. We will also like to mention that the content of this feedback is not decided by historical facts but by direct observation. Such feedback has been shown to have a powerful influence on learning. Being descriptive rather than evaluative, avoiding interpretation and advice giving, and focusing on behavior that can be changed, are some other attributes of good feedback.

Our suggestion is to begin using these tools for formative assessment and you are right to say that internal assessment provides the best opportunity for this. Like any other assessment, faculty development is an important input to not only enhance the quality of feedback, but also to maintain quality in WPBA.

It is pertinent to mention here that most of the tools used for WPBA are *subjective* by conventional standards. However, they are high on validity (assessment in actual conditions) and educational impact (reflections, feedback, and learning). Their reliability can be improved by increasing the number of assessors, observations, and contexts. A 1-hour mini-CEX, for example, has a better reliability than 1-hour-long OSCE, by virtue of its authenticity and completeness of the professional task.

You may have noticed that we are suggesting different cases and different assessors for various mini-CEX encounters. Though this improves the validity of the observation, it does make a comparison between students difficult. For this reason, currently, mini-CEX is recommended for formative and internal assessment rather than for summative, certifying, or selection examinations.

Before concluding, we will like to reiterate that most of the tools for WPBA depend on expert subjective judgment. Faculty training, especially pre-assessment discussions on what is an acceptable level of performance, is absolutely necessary to make best use of these tools.

Tools for WPBA

Tools for WPBA		
Tool	*Method of using*	*Remarks*
Logbooks	Documentation of learning experiences, cases seen, experiments performed; projects carried out; marks obtained	Alone, they have limited utility. However, they do provide useful information about learning experiences of the student
CBD	Discussing the cases actually managed by the student. The focus could be on history, examination, differential diagnosis, selection of laboratory tests and antibiotics or any aspect related to the case. The student brings records of 5–6 cases managed by her, out of which the assessor picks up 2 for discussion	Contrasted to a case presentation, which focuses on what the student will do, CBD focuses on what has actually been done. Not a replacement for case presentation as it tests different aspects of clinical competence
Mini-CEX	Direct observation of the clinical encounter using a structured format. Clinical competence is broken into six components (medical interviewing, physical examination, professionalism, clinical judgment, counseling, and overall efficiency), which may be tested in combination or individually. Each skill is rated on a nine-point scale (three points each for unsatisfactory, satisfactory, and superior). Each encounter lasts 10–15 minutes. The descriptors of expectations are listed at the back of the form	Depends largely on expert subjective judgment. To ensure reliability 6–8 encounters per year are needed. The encounters should not be on the same case and with the same assessor. Each encounter is followed by feedback. Before giving feedback, the student is encouraged to rate her own performance. Feedback by different assessors is considered major strength of mini-CEX. High on predictive/ concurrent validity. Reliability can be improved by increasing the number of assessors/ encounters
DOPS	DOPS using a structured format (available from http://www.wessexdeanery.nhs.uk/pdf/DOPS%202010.pdf). The procedural skills are graded on a six-point scale under 11 headings. Not all headings may be useful in every situation. Necessary modifications can be made, depending on the context	Every listed procedure must be observed, preferably on 2–3 occasions or till correctly performed. Each observation is followed by reflections and feedback. To ensure reliability 6–8 encounters per year are needed

CWS	Documentation of the cases/procedures seen/performed and learning experiences undergone. Can be done using a paper logbook or computer-scannable cards	Help to make training systematic by making known the cases not seen by the student
MSF	Collection of feedback about student's performance from various sources such as peers, paramedical staff, and patients. Can be documented using mPAT (format available from https://www.aacom.org/docs/default-source/core-competencies/6-peerassessmenttoolkcumb.pdf?sfvrsn=f3996097_2), or patient satisfaction survey form	Help to get an overall picture of clinical competence from various stakeholders
Portfolios	These are documentation of learning experiences, evidence of learning, and reflections thereon. Considered a very powerful tool for learning by virtue of reflective component	Logbooks can be converted to portfolios by adding the reflections component. Assessing portfolios is time and resource intensive
Knowledge and skills assessment	Done using MCQs, OSCE, case presentation, or other commonly used methods	Assesses learning in context

(CBD: case-based discussions; CWS: clinical work sampling; DOPS: direct observation of procedural skills; MCQs: multiple-choice questions; mini-CEX: mini-clinical evaluation exercise; mPAT: mini peer assessment tool; MSF: multisource feedback)

Chapter
22

Assessment of Non-cognitive Abilities

LEARNING OBJECTIVES

❖ Discuss the importance of assessing non-cognitive abilities
❖ Enumerate non-cognitive abilities relevant to your subject
❖ Design checklists and rating scales for assessment of these abilities

Professional is not a label you give yourself—it's a description you hope other will apply to you.

David Maister

For a minute, think as 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 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 is generally a "No." 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 new curriculum has put a great emphasis on

Scope

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-cognitive abilities of the student. Implicit in this is the provision for providing feedback to the student so that she can improve. Non-cognitive abilities can be grouped into one of the categories given below. You will notice that this list is only illustrative and not exhaustive.

Non-cognitive abilities				
Study related	*Social*	*Communication*	*Others*	*Professionalism*
Knowledge	Teamwork	Peers	Sexuality	Professionalism
Comprehension	Leadership	Teachers	Grief	Ethics
Application	Hard work	Patients	Health economics	
Clinical skills, making a diagnosis, Scientific attitude, Creativity	Punctuality, Study habits	Others	Terminal-Illness, Breaking bad news	

You would also 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 generalizing effect on others. Assessing these skills will be an augmenting factor and will encourage students to learn them.

Assessment

How do we assess, for example, creativity or study 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.

Tools

Communication skills is an important area that needs to be assessed during undergraduate studies. In 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 feasible. You may consider using one of the following methodologies depending upon the situation and your requirements.

A. ***Objective structured clinical examination (OSCE) station:*** Recall that OSCE provides a useful 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 assessed 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	Score
Explains in a language comprehensible to the mother. Does not get annoyed by repeated questions	*+2*
Explains but does not cover everything.	*+1*
Explains without bothering to ensure if the mother has understood	*0*
Explains in a language which the mother is unable to understand	*−1*

This example represents a negative marking scheme that penalizes the student for not performing an important act or doing it incorrectly. There can be another way for this, without using negative marks.

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

Checklist	Score
Explains the importance of handwashing	*1*
Explains importance of fluid replacement	*1*
Stresses the need for fluid replacement	*1*
Explains the need for clean water	*1*
Correctly explains the preparation	*2*
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 that she actually performs. You may also have noted that the checklist is oriented toward communication rather than toward technical details. It may not be out of place to mention here that in both the schemes, some element of subjectivity cannot be ruled out. However, by repeated assessments using different teachers, such subjectivity tends to get diluted.

B. *Peer ratings:* This type of assessment is being increasingly used in many medical schools abroad. The rationale of using this approach is simple—a student is more natural in the 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 assess these aspects because we are afraid of subjectivity. However, if we look at it like this that anything which is assessed will be learnt by the students, we are likely to induce a positive attitudinal change in them simply by assessing these abilities.

Professionalism is yet another quality that needs to be included in the assessment of medical students. Professionalism has many aspects, including, but not limited to, adherence to ethical practice principles, effective interactions with patients, caregivers and colleagues, reliability and trustworthiness, commitment to continued self-development, and development of the system. You will appreciate that none of these lend themselves to assessment by traditional means—you will also appreciate that if we do not assess them, students will have no incentive to learn them.

We have been repeating it frequently and will like to do it again that the best opportunity to assess these skills is provided during internal assessment. Having read Chapter 21, you have a fairly good idea of how to design an assessment for professionalism. Let us help you to consolidate it.

Assessment of professionalism is best carried by using observational methods. Observation of clinical encounters [e.g., mini-clinical evaluation exercise (mini-CEX)], views of peers and teachers, records of incidents of unprofessional behavior, self-rating, patients' opinion, and paper-based tests can all be used this purpose. True that there is some subjectivity involved but the best way to counter this subjectivity is to get multiple inputs (self, peers, teachers, patients, etc.) and inputs on multiple aspects (patient related, interpersonal relations, self-management, etc.). Using *multiple ratings* with *multiple tools* in *multiple settings* is the key to ensure the validity and reliability of these assessments. Also implied in this is the concept of providing feedback to the students in case of any deviations from the accepted criteria.

A new tool, *professionalism mini-evaluation exercise* (P-MEX) has also been introduced to provide a simple way to assess professionalism. P-MEX uses a structured format (available from *https://www.acgme.org/Portals/0/430_Professionalism_MiniCEX.pdf*) and rates the trainee on 19 items using a 5-point scale. It has been found to give valid and reliable results in various studies. Reliability can be improved by *frequent* observations using *multiple* assessors.

Before we conclude, let us point out that all learning is assessment-driven. If the students know that they are being observed, they tend to adopt desirable behaviors. A behavior that is repeated tends to become a part of personality. May be we are still not at a stage where we may hold back a student because he lacks professionalism, but we surely have to build the concept in all stakeholders that becoming a doctor requires much more than mere knowledge and skills.

Chapter 23

Continuous Internal Assessment

If my future was determined just by my performance on a standardized test, I wouldn't be here. I guarantee you that.

Michelle Obama

You must have heard about cross-sectional and longitudinal studies. While the former give us an indication of existing stage of a disease, the latter help us to better understand the epidemiology and causation of the diseases. Most of the examinations in our system resemble cross-sectional studies, where a student is assessed at a given period to mainly test recall of knowledge. However, outcomes of learning are much more than simply being able to recall information. These examinations focus mostly on the product of learning but ignore the process. They fail to distinguish between a student who has been very regular in her studies throughout the year and another one who has put in efforts only during the month prior to examinations. They also do not provide an opportunity to us for providing timely feedback to the students to improve their learning.

Feedback to Students

Why Internal Assessment?

In professional courses, especially medicine, psychomotor and affective skills are very important. Acquisition and assessment 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. Such observation enables us to assess the student as a whole rather than assessing isolated knowledge and skills here and there. Further, there

are many skills like giving injections, performing a lumber puncture, responding to patient queries, and educating patients, which do not lend themselves to assessment in a term-end examination. Even simple clinical skills, such as history taking and physical examination get neglected at the term-end examinations due to time and logistic issues. In the context of competency-based medical education, longitudinal observation and assessment of the student becomes very important. Consistent and judicious use of knowledge, skills, and attitudes for solving a patient's problem (yes, you are right! This is the definition of *competency*) cannot be assessed at final examinations only.

Let us also recall that we have been placing a great emphasis on feedback as a means of improving learning and teaching. Meta-analyses using thousands of studies have shown feedback as having the single most important influence on learning. This *diagnostic teaching* (i.e., the cycle of assessment-feedback-assessment) facilitates constant improvement of the teaching–learning system. However, the mechanism will be fully operational only when this feedback is of a continuous nature. This is in line with the current thinking of the role of assessment in acquiring and developing competencies.

Advantages

Thus, *continuous internal assessment* (CIA) can be viewed as an attempt to gain more and better information about the abilities of the student and use them as the course develops. Traditionally, we have been classifying students as good or bad. CIA tries to replace that arbitrary classification by systematic means. We hope, you have noticed that the adjective "continuous" is prefixed to the process!

Features of CIA

Essentially CIA is characterized by the following:

- ❖ It represents a continuous awareness by the teacher regarding knowledge and development of her students.
- ❖ It emphasizes 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 toward it—not merely of *where* she has got to but also of *how* she got there.
- ❖ It emphasizes both the process and product of learning.

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

Process

Knowledge, comprehension, application, analysis, synthesis, evaluation, drawing skills, ability to handle instruments, communication skills, social skills (teamwork, leadership), personal skills (regularity, hard work, originality, initiative), interest, scientific attitudes, appreciation,

creativity, etc. You would notice that outcomes involve all three domains of learning.

It is possible to break these into precise behavioral terms. Such examples are given below:

❖ Read beyond textbooks
❖ Search/locate material from reference sources
❖ Identify and solve challenging problems
❖ Ask clarifying questions in the class during seminars or case presentation
❖ Engage in teamwork
❖ Indulge in nonargumentative behavior
❖ Exhibit good manners and social grace
❖ Demonstrate good interpersonal skills
❖ Communicate well with the patients and colleagues
❖ Convince the patient regarding desirability of an action
❖ Participate in research, such as ICMR student projects
❖ Participate in activities related to subject, e.g., professional associations, debates, community work, and educational trips.

You would have noticed that these are extremely important processes and can be assessed only by long-term observation in a non-threatening and non-competitive environment.

It is pertinent at this point to make a distinction between various types of assessment that can be employed. You have already learnt about them. To recall, these are given below:

a. *Summative assessment* refers to end of lecture, end of system, end of semester, or end-of-year assessment to know the sum of the students' learning. Contrary to the popular belief, summative does not mean only the university examinations—it only means end of something, be it a lecture, a chapter, a system, a semester, or a year. Summative assessment is generally used for making pass/fail decisions in most setups. It is also known as *assessment of learning*.

b. *Formative assessment*, in contrast, refers to the assessment undertaken to modify teaching–learning strategies and provide feedback to the learner as well as the teachers in order to make learning even better. Its purpose is to make a diagnosis of learning difficulties and take remedial actions. Since, the purpose is to improve learning, it is generally not used for making pass/fail decisions. It is also known as *assessment for learning*.

c. *Internal assessment* means assessment conducted by the teachers themselves without any external (e.g., university's) supervision.

Learning Outcomes

Comparison

Peculiarities

This could be both formative and summative, depending on what is done with the results.

Role of CIA

CIA tends to augment and not replace the present examination system and is an important step toward alignment of all three curricular components, i.e., objectives, methodology, and assessment. 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. Our research suggests that CIA has a significant predictive utility to identify students at risk of performing poorly at university examinations.

A very important fucntion of CIA is to test those abilities, in addition to knowledge and skills, 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 the selected ones. Fortunately, most of this has been done in the competency document released by Medical Council of India. Appropriate tools of assessment should then be used to assess 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.

Issues Surrounding CIA

Issues

There are a lot of issues surrounding the process of CIA in our system, and let us try to address some of them.

a. *Is CIA formative or summative?* It is easy to get bogged down into this debate. Strictly speaking, CIA is summative because it happens "at the end of something," but it provides ample opportunities to both teachers and students to use the results to improve their performance. From that perspective, it becomes formative. Moreover, remember that purely summative assessments promote test-taking behavior, while pure formative may not have many takers among both, teachers and students. Therefore, educationists world over advocate blurring the boundaries between formative and summative functions of CIA to be able to optimally use them.

b. *CIA should be like university examinations:* We hope you remember our earlier reasoning that the purpose of CIA is to document the process of learning rather than the product alone. Also, CIA makes it possible to assess many aspects of learning, which may not be

assessable at university examinations. Therefore, CIA should not simply replicate university examinations—it should be broad based to include as many aspects of learning as possible. Professionalism, communication, ethics, academic honesty, interpersonal skills, etc., are some examples.

Moreover, you should also keep in mind that CIA by default is based on the listed standards—competency based, if you want to use that term. The performance of the student is compared with the standard rather than comparing one student with another.

c. *CIA is subjective and prone to manipulation*: While it is true that CIA is subjective, if properly implemented, it is in no way less reliable than objective assessments. There may be inter- and intra-examiner variability, but it can be countered by increasing the number of examiners. Involving all teachers in the department helps a lot toward this end (in addition to improving the ownership of the process and also providing assessment training to junior teachers, for whom there is no other opportunity available). Similarly, increasing the number of assessments, assessment tasks, and contexts helps in countering variability.

We will also like to point out that most of the components of university examinations (essay questions, viva, case presentation, etc.) are also subjective. Therefore, subjectivity should not be used as a point against CIA.

We had proposed a *Quarter model* of CIA, which meant that no teacher, test, or tool contributes more than 25% to the total. This can take care of many issues related to subjectivity or manipulation.

MCI and/or your university have already given guidelines for conduct of CIA, and therefore, we are not suggesting any plan for you. However, whichever plan you make for CIA should meet the following criteria:

❖ It focuses on the process as much as on product of learning.
❖ It gives due importance to psychomotor and affective skills.
❖ It is regularly conducted.
❖ It involves all faculty members of a department.
❖ Its results are immediately made known to the learner and discussed with her to make the process of learning better.
❖ There is a proper documentation of the results and students should periodically sign the records after being shown their marks.

CIA was given due importance in the 1997 MCI regulations on graduate medical education, where passing in CIA was mandatory. However, due to certain reasons, CIA did not get the due it deserved.

The major reason for this, in our opinion, was lack of faculty preparation. With the new competency-based curriculum coming in, CIA assumes all the more importance because a large number of competencies cannot be tested at the university examination due to various reasons. Detailed guidelines have been issued, and faculty training has been conducted across the country.

The 2019 MCI regulations have proposed that the marks in CIA will not be added to the university examination marks, will be shown separately, and students need to pass separately in both CIA and university examinations. This is a progressive step and should allow you as teachers to exploit the potential benefits of CIA to improve student learning.

Documentation

We will like to remind you that passing CIA is a requirement to appear for the University examinations. It is therefore mandatory that a meticulous record keeping is done and that the records are available to anyone for inspection. The teachers and students should discuss the marks and sign in token of having seen the marks. This opportunity should also be used to provide feedback to the student to improve her learning.

Chapter

24   From Marks to Grades

LEARNING OBJECTIVES

❖   Discuss the advantages of using grades in place of marks
❖   Differentiate between relative and absolute grading
❖   Use grades in your day-to-day work

Don't compare your beginnings to someone else's middle.

Tim Hiller

Problem

We are used to presenting the achievement of our students in terms of a numerical figure most commonly referred to as marks. The sacrosanct nature of marks has been deeply ingrained in our psyche, and we do not hesitate to believe that a student scoring 61 is definitely better than another one who scored 60. Nothing can be farther from truth.

The basic assumption of marking is to place student achievement in various categories. Taking the example of a question paper of 100 marks, we divide performance into 101 categories (i.e., from 0 to 100). We believe that everyone knows the difference between say 49 and 50 or between 74 and 75. We also believe that everyone's understanding of these categories is similar. Then we have some teachers, who award marks in fractions, e.g., one-half or three-fourths, thus expanding the scale further to 404 points.

Research on marking has shown that there can be a difference of 7–18% marks between different examiners marking the same sheet or sometimes even the same examiner marking the same sheet again. In other words, this means that a student with a "true" mark of 60 can be failed by an examiner. We discussed some ways to reduce this error in Chapter 14, but this variation is still unavoidable. Thus, we arbitrarily

Grades

tend to classify students into categories, which is actually not correct. The end result is overdependence on marks that have a high degree of measurement error.

There is a common tendency among examiners to cluster their marks around the pass mark. If pass mark is 35, many students will receive 35 marks; if pass mark is 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 adjust the scale depending on the content. These factors make a true comparison of students' abilities difficult. The problem is further compounded when comparisons have to be made across different colleges or universities.

Advantages: 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 the 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, an 11-point scale may make distinctions too fine. A 7-point grading scheme can be considered as being satisfactory (although many authorities suggest a 10-point scale also). This has the advantage of being applicable to various 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

In essence, grading is replacing the 101-point scale of the marks to a 7-point scale. Dividing the students into seven categories is much simpler and easier than dividing them into 101!!

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 as well as shall discuss below.

Types of grading: Grading can be either absolute or relative. When we grade a student based on her 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 the performance of other students, it is called *relative* grading or norm-referenced grading.

Absolute Grading

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

Absolute grading		
Grade	Range of marks	Points
O	79 and above	6
A	73–78	5
B	65–72	4
C	53–64	3
D	40–52	2
E	32–39	1
F	Less than 31	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 the 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. Her 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

Relative grading		
Percentage of students	Letter grade	Points
3	O	6
7	A	5
22	B	4
36	C	3
22	D	2
7	E	1
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 the 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 either 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 especially useful for practical and laboratory work.

Utility: Grading makes only seven (or five) divisions to which a student's performance is assigned as compared to 101 divisions adopted by conventional marking. Thus, chances of error are considerably minimized. 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.

Now that a large number of competencies are to be assessed and these marks are not be added to the university marks, using grades rather than marks for internal assessment makes a lot of sense. It will allow a better assessment of students' abilities and also cut down on a lot of unnecessary work.

Chapter 25

Coaching and Mentoring

LEARNING OBJECTIVES

❖ Explain the concept of mentoring
❖ Understand the process of mentoring
❖ Act as a good mentor

A leader takes people where they want to go; a mentor takes them where they don't want to necessarily go, but ought to be.

Rosalyn Carter

Do you remember any instance from your life, where somebody helped you to negotiate complicated issues in life with relative ease? We all have encountered such individuals, who have helped us reach where we are today. This kind of relationship is an example of a mentoring relationship. In this chapter, we will look at the issue of mentoring with reference to your role in mentoring students.

You might be interested to know that the term mentor originates from Greek mythology after the name of Odysseus's friend, Mentos, who had the responsibility of looking after the former's son during his absence. Mentorship is an accepted entity in organizations aimed at improving employee well-being and therefore productivity. In educational settings, many institutions have started using this concept to enhance academic success and improve the overall well-being of the students. A number of research studies have been published which suggest that mentoring during medical schooling helps in professional development of students.

What is Mentoring?

Mentoring is most commonly *defined* as a professional relationship, where a more experienced person (e.g., teacher) will help another

Definition

(e.g., student) to develop skills and knowledge that enhance the less experienced person's knowledge and professional growth.

You may have also come across words, such as "coaching" and "counseling." You could have used these words interchangeably. To some extent, these are similar and in another way, these are different. Let us look at each one of them.

Coaching is a term borrowed from sports, where the coach and player work toward an agreed goal. Coaching primarily is directed towards the improvement of performance in specific skills. It is generally a short-term relationship. Learner owns the goal while coach owns the process. Extrinsic feedback is used to provide developmental inputs to the learner.

Mentoring, on the other hand, focuses on the overall growth of the person. It is concerned with identifying and nurturing the potential of an individual. It is a long-term process. Learner sets the goals and owns both the goal and the process. The role of mentor is to enable the mentee to generate internal feedback by way of reflection. Mentoring describes a relationship that is much more than a usual teacher–student relationship.

When you are teaching basic life support to your students, which activity are you doing? Yes, you are right—you are coaching. However, when you are talking to them about making career choices, you are mentoring. You are also right in saying that a good coach will mentor sometimes, while a good mentor will also coach a number of times. From this perspective, coaching is "functional," while mentoring is "relational."

Counseling, or more precisely, academic counseling means helping the student see various courses of action in a given situation and then select the most appropriate course depending on her needs and requirements. Traditionally, counseling is concerned more with psychological aspects of knowledge and skills rather than with skills themselves.

You would have noticed some overlap in the three. None of them, however, ever means solving someone else's problem. They always mean enabling the person to let her *solve her own* problems. If it helps you understand it better, a mentor is like *Krishna*, driving the chariot of *Arjuna* in the battle zone but not fighting himself. Fighting is left to *Arjuna*-or mentee-only. When you mentor a student, you do not become responsible for the academic attainment of that student. It still remains that student's responsibility to reach up to a level where she

will score good grades. This aspect is the key to successful mentoring. A mentor is not to be blamed for the poor performance of a student.

Advantages of mentoring program for students
❖ Psychological well-being
❖ Better study habits
❖ Promoting reflections and learning
❖ Better academic performance
❖ Developing a mentoring culture

Limitations: While it is alright to expect that the mentor will give advice, boost confidence, and help in surviving a crisis, certain things should not be expected. For example, making practical and clinics go well, helping in passing the examinations or bypassing the established routines is not to be expected from a mentor.

Mentors work within certain boundaries. While definitions vary, most student mentorship programs view mentors as supporters and facilitators of students' growth rather than as teachers or clinicians. Similarly, mentors are not expected to solve personal, financial, and psychological problems of the students, for which more expert help may be required.

Formal or informal? Mentoring can be both formal and informal. You must have come across a number of informal situations where someone more experienced helped you when you joined the hostel or submitted your first paper for publication. On the other hand, it could also be a formal situation where your college Dean may have allotted a few students to you as your mentees. Let us look at the difference in these situations:

Types of mentoring	
Informal	*Formal*
Goals not specified	Goals are specified
Outcomes not measured	Outcomes are measured and recorded
Self-selection by mentor and mentee	Formal assignment based on compatibility
Long-lasting relationship	Relationship is goal-oriented
Limited access depending on requirements	Accessible to all under a formal policy

Models of mentoring: Depending on the situation, various models of mentorship can be used for students. The most commonly used is the *one-to-one model*, where one student is assigned to one teacher based on student's requirements and teacher's availability. This, however,

Models

requires a large number of teachers and, therefore, may be useful for specific situations (e.g., for students with language problems). The other model is to have a list of teachers who are willing to act as mentors and students opting for any one of them. This has the advantage of taking students' choice into consideration but can result in maldistribution of students (more for some teachers and none for others). The third is group-mentoring where one teacher is assigned a group of 5–10 students. This *group mentoring* model has the advantage of being able to use peer mentoring as well. Yet another model could be to have *multiple mentors* depending on the needs of the mentee and expertise of the mentors. Whatever model we select, the common thread running through them is the changing paradigm of mentorship. From the earlier concept of mentor as a Godfather, who takes the mentee under his wings and transforms her into his mould, mentor is being seen as someone who helps and supports the mentee to develop her self-image but leaves the final decisions to the mentee.

Process of mentoring: The following steps are needed for effective mentoring:

a. *Initiating relationships*: This involves getting to know each other and laying the foundation for a relationship. This is an important step in the mentoring process and you should give time for mutual trust and confidence to develop before moving further.

Process

b. *Developing agreed course of action*: The next step is to define the roles of the mentor (you) and mentee (student). If, for example, you ask the student to practice some skill before coming for the next session and she does not do it, then proceeding further will be extremely difficult. If required, both should negotiate the expectations to bring more clarity into the relationship. Some people call this a *mentorship contract*. Just like a legal contract, this also specifies the desired action from both the parties, a timeline for completing that action and a "penalty" for not completing the given task on time. It may be better to put this in writing for future reference.

c. *Developing the mentee*: This process takes the longest time. In effect, it involves setting goals, defining end points for those goals and then agreeing on methodology to attain these goals. A number of interactions may be required during this phase.

d. *Review*: This is the time to review the progress and if required, set goals for future periods.

Let us now look at the skills needed to function as an effective mentor.

Skills of mentoring: You will remember that the core principle of mentoring is to build the capacity of the mentee. To be an effective

Skills

Qualities of Mentors

mentor, you need to acquire and use certain skills. Let us discuss those skills:

Listening is the most important skill for a mentee. It helps you to get the fuller picture of the concerns of the student and also provide a useful action plan. We will like to distinguish between hearing and listening. It is rightly said that *hearing is with ears but listening is with mind*. Listening is to give a meaning to what the mentee says.

How can you be a good listener? You can use certain techniques to promote what is also called active listening. These include using open-ended questions (those which cannot be answered as yes/no); acknowledgments (using verbal clues such as *uh …, mm …*, or nonverbal clues, such as looking at the eyes of the person); reflections (paraphrasing and saying in your own words such as *you mean to say …*) and silence (to let the person think and also to let the ideas sink).

Certain other techniques, such as not interrupting, listening for "implied" meaning, looking at the body language, and not talking, will also help you to be a better listener. Remember that unless the mentee fully opens up, you cannot make a good action plan.

Striking a balance between listening and advising is also a key skill. You must have experienced people who offer you a readymade solution from their experience (*In your situation, I would …*). This, however, limits the mentee's creativity. While it is a good idea to share your experiences, more important is to help the mentee develop her own critical-thinking skills so that in future situations, she can find appropriate solution without any help.

Personal qualities: In addition to the skills listed above, mentors need to acquire and develop some personal skills to sustain the relationship. These include a certain degree of warmth (making the student feel welcome), accepting the students as they are (without passing judgments), being natural, ability to sense the feelings of students and empathize with them.

When to mentor? While mentorship is a continuous process, it may be especially needed at certain times. At the beginning of a course, for example, students may be anxious about what lies ahead for them and may require support. Similarly, prior to and after class tests, professional examinations or career choices are situations where mentors have to play a significant role.

Two very common issues with which most mentors are confronted deal with "how to study" and "how to learn difficult subjects." Though both of these questions seem to be a major problem for most students, the

solution is relatively simple. We have listed a number of self-study skills at the end of this book, which should help you to guide your students. Similarly, for difficult topics, the key is to activate prior knowledge or provide prior knowledge if the student does not have it.

We hope that you will be able to use a number of these opportunities and skills to help your students to develop professionally. We have presented the concept in a rather simple way but if you recognize your roles and limitations as a mentor, you should be able to effectively mentor students.

The greatest good you can do for others is not just to share your riches but to reveal to them their own.

Benjamin Disraeli

The delicate balance of mentoring someone is not creating them in your own image, but giving them the opportunity to create themselves.

Steven Spielberg

Chapter
26

Managing the Learning Needs

LEARNING OBJECTIVES

❖ Move beyond your role as an information provider
❖ Use strategies to motivate students
❖ Use scientific principles to deal with difficult topics

Every student can learn, just not on the same day, or the same way.

George Evans

We hope that you have internalized the concept of viewing education as a system. In effect, a system is a collection of entities that influence and get influenced by other components of the system. Systems approach is a very useful methodology to deal with issues that are not straightforward. In this chapter, we will deal with two important areas that can be taken care of by looking at the "system" rather than at anything individually.

Motivating the Students

You must have either heard this very often or even encountered the situation that "the students are not motivated." Generally, we tend to presume that the problem lies only on that side. Let us first look at the basic concepts related to motivation and then try to see what we, as teachers, can do in such a situation.

Generally speaking, motivation can be defined as an effort toward attainment of a goal. Motivation is not a generic construct. We all feel highly motivated in one situation, but totally uninterested in another. A student may appear demotivated in the class, but may be highly

motivated for a cultural event in the college. It can be said that the degree of motivation is the product of interaction of individual with the environment. A corollary is that by making requisite changes in the environment, it should be possible to increase the strength of motivation of a person.

Rewards and punishments are two useful tools to modify the environment; rewards seem to work better in motivating a person. Rewards in this context do not mean physical or monetary ones. Rather, scoring good marks, being praised in front of the class, being able to solve a difficult problem and being able to help someone else can all work as potent rewards.

Let us give you some ideas from the theories of management to deal with the issue of lack of motivation. What we intend here is to convey the basic concepts to you and not burden you with the technicalities of it.

Common theories of motivation	
Theory	*Implication for teachers*
Expectancy theory: It states that strength of motivation is a product of attractiveness of rewards (e.g., high marks); belief that I can do it (e.g., getting enough understanding to go through a topic) and the belief that if I do it then success will follow (e.g., hard work being rewarded at tests)	Tell the students what they are expected to know (i.e., stating clear learning objectives); tell them what the examinations and tests will be like and let them taste success (i.e., neither too difficult nor too easy examinations). Do not go with the idea that if students pass in class tests, their motivation will go down. Fairness in examinations is another factor that motivates students to put in hard work
Core dimensions of tasks: It states that motivation is proportional to the product of task variety (e.g., using multiple approaches to learning); task identity (how much students relate to the task); task significance (perceived importance of task in patient care); and knowledge of results (feedback)	Teach the students using a variety of teaching methods on a variety of problems (do not get married to one method—even a very interesting method overused is counterproductive); tell the students how the topic relates to the future work as a doctor; tell the students importance of the subject in saving human lives; and provide them good developmental feedback. Use integrated teaching
Goal-setting theory: It states that people work better when they have a clear cut goal. Specific goals and difficult goals (up to a limit) increase motivation	Provide specific goals (e.g., learning objectives) for which students have to stretch themselves). Give them more responsibility and more freedom to work toward their goal

You will notice that many of the educational concepts that we discussed in this book are embedded in this framework. Can you pick them? We are sure you have picked up some/all of the following:

- ❖ Involving students in developing learning objectives
- ❖ Providing them autonomy to select an appropriate way to attain those objectives
- ❖ Teaching in context
- ❖ Integrated teaching
- ❖ Using tests which are fair, challenging, but neither too easy nor too difficult, and
- ❖ Providing developmental feedback

We hope now you are able to appreciate the importance of integrated teaching, early clinical exposure, formative assessment, and feedback. You would also be able to make out the importance of having fair, valid, and reliable assessments and using test and item analysis. Newer teaching methodologies such as problem-based learning (PBL) and e-learning are favored for the reason that they provide a number of motivational inputs listed above.

Strengthening Motivation

Motivation is not an inherent trait of an individual. The same student who appears demotivated in one class may show exemplary motivation in another. We also want you to remember that a number of issues compete for the limited time and energy that the students have, and studying is generally pretty lower down the list. Cutting on distractors is a very useful approach to take care of lack of motivation. There is plenty of research support to suggest that if you give them an opportunity of delaying a task (*e.g.,* "*if you do not have the required attendance, then we will arrange extra classes for you*" is a sure recipe to "motivate" students to miss classes; similarly, "*if you cannot appear for the test this time, we will arrange to take the test later on*" is an offer which most students will find difficult to resist), most of the students will do that. In general, cost of missing a test/assignment should be high (e.g., extra classes only during vacations). The importance of being gentle yet firm in dealing with students can never be overemphasized.

Teaching Difficult Topics

Difficult Topics

This is another area of concern for most of the medical teachers. Can you think for a minute and list some "difficult" topics? You must have thought of many topics from your field. We can state the following as an example. Acid–base balance, localizing the site of lesion in a neurological case, diagnosing a case of chromosomal anomaly, etc., are some examples that may be difficult for some students. Did you notice that we said that these topics may be difficult for some students? Again, like motivation, difficulty is not an inherent property of a topic

or subject. There are some important issues that make a topic easy or difficult to understand.

Let us take you back to the characteristics of adult learning. We had discussed with you that learner doesn't come with a clean slate. Rather, learning is cumulative. We know something, we experience new things and then we use the existing knowledge as a base on which we build new knowledge. Yes, you are guessing it right that a difficult topic is one that requires *more* prior knowledge. Let us take the example of immunization schedule *versus* acid–base balance. Immunization schedule requires minimal prior knowledge regarding types of vaccine, the age of maximal susceptibility, and the period between two shots—hence, it poses less difficulty in understanding. Acid–base balance, on the other hand, requires knowledge of physiology of kidneys, lungs, anions, cations, intra– and extracellular composition, sodium potassium pump, and so on. This makes acid–base balance a difficult topic to understand.

From this perspective, the solution is simple. If a student finds a topic difficult, then either she does not have the requisite prior knowledge, or worse, she has not activated her prior knowledge. This is a common problem with purely subject-based teaching. We teach the student about the differences in intra- and extracellular fluids but we never tell him, of what use this information is. As a result, she is not able to activate her knowledge when it is required for understanding newer concepts. So what can be done in this situation? Yes, you are right—some or all of the following will help:

❖ Revise the relevant concepts before moving further (e.g., before teaching the problem of lactation failure, revise the basic anatomy of breasts and reflexes related to milk production).

❖ Ask questions to gauge the level of prior relevant knowledge and provide it if lacking.

❖ Ask the students to read the basic sciences related to relevant organs (e.g., origin of heart sounds and murmurs before a class on congenital heart diseases).

❖ Ask students to solve a small problem related to the topic before the lectures. This helps to acquire new knowledge in context. (This is called *pre-lecture technique*.)

❖ Start your class by using a clinical problem, photograph, or a laboratory report to arouse interest. This uses the principle of "teaching in context."

❖ Use multimedia to increase the amount of information that can be absorbed per unit of time. However, be aware that improperly used, it can adversely affect learning.

Let us, however, caution you that going overboard can also be counter-productive. Human brain has a limit up to which it can process

Prior Knowledge

information. If that limit is exceeded, learning and motivation are affected. Can you think of some situations that will increase the cognitive load on the students?

The most common reason for cognitive overload, in our experience, is the tendency of teachers to "cover" the course. Since human mind is not like a tape recorder, it needs time to process the information. It is better to deal with only key issues of a topic and leave the rest for self-study, rather than dumping the entire content on the students and not letting them learn anything. It has been rightly observed that mediocre teachers "cover" a topic while good teachers "uncover" it. You may like to go through the discussion that we had in the Chapter 8 to see the application of some of these principles.

The other usual reason for lack of understanding and lack of motivation is the over-reliance on PowerPoint, especially if used inappropriately (commonly called *PowerPoint toxicosis*). Remember that students do not attend classes to merely gather information—they have access to recent, better and varied sources of information through books and Internet in the comfort of their rooms. Rather, they prefer a teacher who can share her experiences, tell them what is not available on the net, motivate them and challenge them. Limiting your role to that of an information provider takes away a lot of motivation from students.

In this chapter, we have discussed two of the most common problems faced by every teacher. The reflex response from most teachers is to blame the students for being uninterested or demotivated, but as we have discussed, lack of motivation is often the result of the situation rather than being an inherent problem. You can use some simple techniques to overcome these problems.

The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires.

William Arthur Ward

Chapter 27

Innovative Teaching–Learning Methods

LEARNING OBJECTIVES

- ❖ Explain the concept of distance education (DE), problem-based learning (PBL), and e-learning
- ❖ Enumerate the components of DE and taxonomy of PBL
- ❖ Convert competency statements into learning objectives and select appropriate teaching–learning and assessment methods
- ❖ Understand the concept of self-directed learning (SDL)
- ❖ Promote SDL in your subjects
- ❖ Use educational principles to design electronic-learning modules
- ❖ Explain the concept of simulation
- ❖ Use these methodologies within your subject area

The word 'education' comes from the root e, from ex, out, and duco, I lead. It means a leading out. To me education is a leading out of what is already there in the students' soul.

Muriel Spark

Let us try to look at some of the innovative methodologies being used for medical education. 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 the health professionals poses another challenge that conventional education is unable to meet.

Let us learn about some important innovations in medical education.

1.0 Distance Education

What started as correspondence education, especially for teacher training in our country, has undergone many a changes to be

rechristened as distance education (DE). Let us discuss some of the basic features of DE, how it differs from correspondence education and what can be expected out of it.

Definition

It is difficult to give a precise definition of DE; depending on which aspect of it is being emphasized, experts have given different definitions. The common points that emerge from perusal of these definitions can be stated as any non-conventional learner-centered teaching–learning system that does not rely on face-to-face teaching as the primary mode of instruction but which facilitates academic dialouge between the teacher and the taught by a variety of media, other than word of mouth. You will realize that this definition gives a very wide canvass to DE. In fact, with the advent of cheaper technology, we now have multiple tools at our disposal.

Contemporary Learner

The concept of DE is complimentary to the concept of student-centeredness, which conceptualizes the student to have a non-formal, life-long orientation of her abilities, needs, strengths, and weaknesses. There are no constraints of place, time, space, entry requirements, and pace of learning—rather, it allows the learner and the teacher to work apart without using word of mouth as the only means of communication but using multiple means of communication to continue two-way academic interaction.

Distance education uses non-conventional, learner-centered curricula through multimedia approach, including face-to-face teaching where required. In this way, DE *compliments* rather than replace conventional education. Distance education is cost-effective and efficient as compared to other modes of education—primarily because it can cater to a large number of learners at one go. Interestingly, DE can also be used for traditional campus-based teaching, thus allowing freedom to teachers to engage themselves in other academic pursuits, at the same time, providing autonomy to the students to learn according to their needs. The concept of electives and self-directed learning (SDL) in the new MBBS curriculum borrows heavily from DE.

Distance education generally entails the following processes:
- ❖ Formulation of curricula
- ❖ Production of self-instructional materials (SIMs)
- ❖ Distance teaching
- ❖ Assessment
- ❖ Student support services

Process

Let us discuss them for you.

Curricula

1.1: *Formulation of curricula***:** Distance education 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 professionals, or even self-enrichment. They evolve out of learner's needs; hence, they are better accepted and are able to generate motivation. We hope, you are reminded of SDL and electives proposed under new curriculum, both of which aim to enrich the student learning.

1.2 *Production of SIM*: The teacher is "replaced" (this may not be the correct term, as these materials are also produced by teachers, albeit at a spatial distance) by SIM as the point of contact with the student. As the name indicates, SIMs are self-instructional and, therefore, act as surrogate teachers. Just like a real teacher, they provide information, motivate, inspire, assess, and provide feedback, and guide for further reading. These materials are learner active, i.e., they require some activity on the part of the learner and are not meant for passive reading. These materials can be in printed form or use other media, such as audio, video, and computers. These materials allow us to replicate the efforts of best teachers and make them available to a large number of learners. To keep costs low, most DE programs use print as the primary medium, supplementing it with others. Technological advances have started shifting the material production to electronic form. We will discuss this when we discuss massive open online courses (MOOCs) a little later.

You may be wondering, how SIMs differ from a textbook. Look at the table below for a comparison.

Textbooks versus SIMs		
	Textbooks	*SIMs*
Communication	One way	Two way
Learner	Passive reading	Active interaction with text
Structure	Hidden	Known
Learning	Predecided	Guided based on progress
Mode	Didactic	Conversational
Application	Less	More
Activities	None	Plenty
Division	Chapters/systems	Small chunks
Assignments	None/May be	Provided
Feedback	None/May be	Available

(SIMs: self-instructional materials)

1.3 *Distance teaching:* As we have already pointed out, SIMs include a number of activities and assignments. These assignments have to be

completed and sent to a tutor. The tutor's job is not merely to award marks but to *distance teach*. The purpose of distance teaching is to provide immediate feedback to the student and guide her toward better learning. Distance teaching is done by writing academically useful comments, pointing out 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. In the context of classroom courses such as ours, many activities such as pre-lecture assignments and reflections can benefit from the concept of distance teaching.

Advantages of distance education
❖ Courses designed with students' needs, requirements, and abilities in mind   ❖ Allows non-conventional combination of courses   ❖ Provides flexibility in terms of time, place, and pace of learning   ❖ Generally cheaper and cost-effective compared to conventional education   ❖ Promotes self-directed learning

1.4 *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. Have you noticed many questions in *this* text, which we ourselves have answered? We hope you did.

❖ Self-check exercises, which may require either factual recall or ask the learner to relate a given information to her prior experience. Sometimes, a learner may be asked to use this knowledge in a new situation. Remember, we asked you to design a system of CIA in your subject area. Such application-oriented exercises encourage the learner to think beyond the obvious.

❖ Tutor or computer-marked assignments, usually given at the end of a block and consisting of multiple-choice questions, essay questions, or short-answer questions, aimed at testing factual knowledge.

❖ Project work, aimed at providing practical hands-on experience to the learner so that she can apply her newly acquired skills to actual life situations.

1.5 Student-support services are an important aspect of DE because there may be 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 centers. Basically, these include library facilities, multimedia, peer group interaction, tutor

Assessment

Support

interaction, and counseling. All these aim at breaking social isolation of the distance learner.

2.0 Problem-based learning

Have you ever come across the term problem-based learning (PBL)? Probably your response will be "yes." You might say that you have been always teaching your students, based on problems. You expect them to analyze and synthesize facts that you have taught them, in relation to a particular problem. We are afraid you are only partly correct—what was referred to just now is called problem-solving which is a skill and not PBL.

PBL is a totally different educational strategy, where the problem is posed first and then students acquire the knowledge in the context of that problem. Thus, in contrast to problem-solving, where the student already has the knowledge, PBL means acquiring new knowledge in the context of the problem. With this brief introduction, let us take you through some of the aspects of adopting PBL as an educational strategy.

2.1 Rationale: The contemporary scenario in medical education is radically different from that prevailing say 20 years ago. The pattern of diseases, morbidity and mortality, population explosion, etc., have evolved considerably. Every issue of thousands of medical journals brings new discoveries and modalities of treatment. The existing medical curricula are also showing signs of expansion. In 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.

The 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. Problem-based learning devotes less attention to filling the mind; it aims to prepare and develop it. Developing skills is also built within the curricula.

Problem-based learning is an innovative and challenging approach to medical education—innovative because it is a new way using clinical material to help students learn, and challenging because it requires the medical teacher to use facilitating the supporting skills rather than didactic, directive ones.

2.2 Process of PBL: A collection of carefully designed problems is presented to students in small groups. These problems often consist of a

Need

Approach

description of observable phenomena or events that are in need of some kind of explanation. They are sometimes derived from professional practice (as is the case with problem-based medical curricula); often they refer to theoretical issues, important to the domain of study. The task of the student groups is to discuss these problems and produce tentative explanations for the phenomena, preferably in terms of some underlying process, principle or mechanism. The role of the tutor is to bring the students to the brink of their knowledge and from there on encourage them to acquire new knowledge in context.

You would have noticed that "problems" are the heart of PBL. They are not generated extempore but require careful planning taking into consideration the level of students, their prior knowledge and the desired learning outcomes.

Process Benefits

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 toward self, colleagues, and patients. 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 satisfaction in teamwork.

Advantages of PBL
❖ Uses activation of prior knowledge, elaboration and contextual learning
❖ Provides better integration of basic and clinical sciences
❖ Promotes self-directed learning based on constructivist approach
❖ Promotes acquisition of contextual knowledge
❖ Enhances interest and motivation
❖ Promotes generic learning competencies

(PBL: problem-based learning)

2.3 Variants of PBL: Very few institutions use a "pure" form of PBL. Pure form implies that the entire curriculum is PBL based and there are no didactic lectures. However, a number of modifications have been made to this approach resulting in what is called a "hybrid" form of PBL. This hybrid approach can take any form including delivering a part of curriculum through lectures, delivering only some portions through PBL, or any varying combination. The essence of all these variations remains the same, i.e., to let the students acquire knowledge in the context of a problem. We have seen many a medical schools in India giving a set of questions to the students from a portion that has not

been taught, letting the students learn that portion through various methods and take the same test of questions again. This approach, though superficially resembling PBL, does not serve the intended purpose.

3.0 Competency-based medical education

Competency-based medical education (CBME) is the latest entrant to Indian medical education scenario. It has, however, been extensively used in many countries and across many disciplines. The key concept of CBME is to define the end result of education in terms of competencies and then deliver the curriculum to help the students acquire those competencies. You may be wondering that learning objectives used in traditional education also do the same thing. True, but there are subtle differences and let us explain them to you.

Definitions

3.1 What is a competency? Competency has been defined as a *habitual and consistent use of knowledge, attitudes, and skills for performing a professional task.* Another expert group (International CBME collaborators) views competency as *an observable activity integrating multiple domains, such as knowledge, skills, attitudes, and values.* So, if we look at this, it tells us that both competencies and objectives are observable activities but whereas objectives are confined to individual domains, competencies involve integration of domains. A person who has acquired the necessary competencies is labeled as competent. It is interesting that a competency looks at the interplay of knowledge, skills, attitudes, and values rather than individually stacking them. You would have noticed that in CBME, we are talking of two different types of integration—not only of the *subjects* but also of the *domains*.

Comparing learning objectives with competency	
Term	*Example*
Learning objective	Able to elicit immunization history of an infant
Competency	Able to run a well-baby clinic

3.2 Global models: Various competency frameworks have been proposed and you might have heard of Accreditation Council for

Graduate Medical Education (abbreviated as ACGME), CanMeds, Scottish Doctor, and many others. These frameworks have been proposed by various professional organizations and expert groups to capture the range of competencies required of a doctor to perform efficiently. Medical Council of India has recently come out with the concept of *Indian Medical Graduate* (IMG), which conceptualizes a doctor as "possessing knowledge, skills, attitudes, values, and responsiveness, so that he/she may function appropriately and effectively *as a physician of first contact of the community* while being globally relevant."

Comparison of Conventional and competency-based curricula		
	Conventional	*CBME*
Emphasis on learning	Acquisition of knowledge	Application of knowledge
Content driver	Teacher	Student (and teacher)
Curriculum	Similar for all students	Variable depending on level
Course completion	Time-based	Outcome-based
Emphasis on assessment	Summative	Formative and ongoing
Assessment tools	Indirect/surrogate	Direct observation

(CBME: competency-based medical education)

3.3 Indian Medical Graduate: The IMG is seen as having the following competencies: *clinician*, *leader*, *communicator*, *professional*, and *life-long learner* (LLL). Within each competency, the student must perform certain tasks, which become the source of learning objectives.

3.4 Planning a CBME curriculum: CBME is a classic example of backward planning, wherein we *work backward with end in mind*, i.e., what the student should be able to do > what knowledge and skills are required for her to do so > what should be the learning objectives for her to acquire these > how should we teach her so that she acquires the knowledge and skills > how do we know that she has acquired them.

IMG

Backwards Planning

Conventional v/s backwards planning	
Conventional	**CBME**

Conventional:
- Effects
  ↑
- Teaching and learning, assesment
  ↑
- Content and methodology
  ↑
- Objectives

CBME:
- What will happen when the graduates enter practice
  ↓
- To get the intended effects, what knowledge and skills are required
  ↓
- To give them the required knowledge and skills, what should be though and how
  ↓
- What should be the objectives for our teaching

Have you noticed the difference? In conventional education, we teach the student and hope that she will be able to use all that knowledge and skills to perform a professional task. In CBME, on the other hand, we first decide what the student should be able to do and then decide what and how of teaching. You must have also noticed that in conventional education, the assessment generally focuses on individual domains, but in CBME, the assessment uses a competency framework.

Differences with Conventional

There is little similarity between various competencies and therefore it is important that every competency is individually assessed. This is a key component of *competency-based assessment* (CBA). It stands to reason that using conventional assessment for CBME is not going to provide us the information that we are looking for. And note that since all competencies need to be assessed, the assessment must be moved away from the traditional *end of the year* model to the *longitudinal* on-going model. We will discuss about CBA a little later.

3.5 Teaching for competencies: We told you that competencies form the basis of CBME. Competencies can be broken down into learning objectives, which are then matched with teaching–learning methods and assessment. However, there are no specific teaching methods for CBME—rather, alignment, integration, and skills teaching are used depending on the type of competency.

Teaching for CBME

In many places, competencies are stated in terms of incremental acquisition based on the stage of training; you rightly guessed—these are called *milestones*. Statement of milestones helps in tracking the progression of the learner as well as helps in using appropriate assessment. Another trend is to use the concept of *entrustable*

professional activities (EPAs) to decide the competencies for a given task. Both these concepts have not been used in the Medical Council of India curriculum, though. You can learn more about these from some of the papers mentioned in the further reading section.

3.6 Competency-based assessment (CBA): Broadly speaking, CBME does not use a different type of teaching or instructional methodology. If there is one thing, which differentiates it from conventional education, it is the assessment. As already pointed out, CBA looks beyond the individual domains. CBA does not compare one student with the other; rather it compares the student with the stated level of performance. It is not meant only for pass–fail but also for providing the much-needed feedback to improve the performance of the student. True to its definition *(competency being an observable activity)*, much of CBA is based on direct observation of performance.

Assessment in CBME

If you consider all these points, what emerges is that CBA must be spaced during the period of learning, so that any deviation can be promptly recognized and corrected early. It also means that ongoing assessment (or *continuous internal assessment*) has a much bigger role in CBME than the year-end summative assessment. There should be some rethinking on the role of the University examinations, which due to their logistic issues cannot assess *all* competencies and help the students to acquire them. Competencies are best assessed during the period of training; university examinations should move to become a tool for quality assurance of students who have already been certified as having acquired the competencies during ongoing assessments.

3.7 Limitations: Although CBME is promising in concept, it does have its share of critics. The most common criticism is that competencies tend to oversimplify complex clinical tasks. Many of these complexities cannot be assessed using the conventional "objective" methods of assessment. A valid assessment of competencies may require a lot of expert subjective judgment. Competency-based medical education can discourage the students to engage in exploratory learning and target only strategic learning, i.e., what is listed in the competency document. Lastly, the hidden curriculum can distort the learning. Preparing for PG entrance examinations may push learning of attitudes, communication, and other skills to a much lower priority compared to only memorization of facts.

4.0 Self-directed learning

Let us imagine a scenario—you have to cross a very busy road intersection every day while going to work. There is very heavy traffic

but you do not find any problem because the traffic lights are efficient and control it very well. Say, one day, the traffic lights go out of order. What will happen? Will you hit or get hit by another vehicle? Probably not. Because you will develop your own mechanisms to navigate the chaos. The end point has been defined (the other side), the rules have been defined (the traffic rules)—the only freedom you have is to decide how much time you want to take (start walking or wait for the traffic to ease out) and what method you want to follow (waiting for traffic to ease or use foot over bridge). This is the concept of being self-directed.

In Chapter 1, we discussed the characteristics of adult learners. One of the important characteristics of adult learners is self-directed learning (SDL). You may be wondering why we have picked this one over many others—the reason is simple. Medical field is advancing fast and it is essential to remain "current" in knowledge and skills. In other words, SDL is like developing the capacity to navigate the complexities of learning without direct supervision but within the framework set for the purpose. SDL is also one of the sub-competency of the broader competency of a Life -Long Learner (LLL). Without being a self-directed learner, a student is unlikely to be an LLL. In addition, any method which does not primarily rely on didactic lectures needs the students to be self-directed learners.

4.1 What does it mean? In its simplest form, SDL means the learner taking responsibility for her own learning. However, it does not mean leaving the learner alone—rather she has the constant support of curriculum planners, institutions, teachers, and peers. Self-directed learning is based on several core characteristics of adult learners, viz. readiness to learn (in terms of pre-existing knowledge), motivation to learn, knowledge of results, goal-directed learning, and independence to select learning tools and time.

4.2 Steps in self-directed learning: The process of SDL begins by the learner identifying the learning needs. These learning needs should be in line with the requirements of the curriculum. If the undergraduate medical curriculum aims at developing physician for primary care, but the aim of the learner is to prepare for competitive examinations, then the concept of SDL is distorted. Teachers, mentors, and peers can play an important role in helping the learners to identify their learning needs which are congruent to curricular needs.

Steps in SDL

Having identified the learning needs, the learner needs to spell out a plan for learning, identify learning resources, decide on the criteria for attainment, accomplish the task, compare it with the required

Implementing SDL

standards, and reflect on the results as well as the process. The primary responsibility of learning lies with the learner.

4.3 Translating self-directed learning into practice: We have repeatedly emphasized that SDL is not leaving the learner on her own—rather it is a form of guided learning where primary responsibility for learning is taken by the learner. Think in terms of a missile. The army does not simply fire the missile and sit back. Rather it has sensors and radars to tell it about the trajectory so that any deviation from preplanned course can be corrected in time. On the same premise, for SDL to succeed, there has to be a robust ongoing assessment, both to assess the readiness and the progress of the learning process.

Readiness for SDL is an important prerequisite for this mode of learning. Guglielmino's self-directed learning readiness scale (*Long HB. Item analysis of Guglielmino's self-directed learning readiness scale. Int J Lifelong Educ. 1987;6(4): 1-336.*) is a popular instrument used to assess the degree to which individuals perceive themselves to be ready to be self-directed learners. You may find it interesting to assess your own readiness to be a self-directed learner!

Process of SDL

4.4 The Tasks: Self-directed learning activities should begin with a tangible task. A variety of tasks can be used for this purpose. Some examples include searching for alternative viewpoints, practical applications to put theory into practice, solving a problem, collecting data for specified research, and so on. Learners should develop their own learning objectives *congruent with the gaps in their knowledge*. Teachers can play an important role by encouraging them to develop objectives that integrate not only subjects but which also integrate knowledge, skills, attitudes, and communication. This should be done in a small group format, with responsibilities distributed across to all members. There should be designated teachers to monitor, assess, and provide feedback to the group before a final submission is made. The draft write-ups can also be circulated to the group members for comments and suggestions. Can you relate this to the traffic light example we gave earlier?

What SDL is
1. *Be ready to learn*: knowledge, study skills, time management skills, planning skills, analytical skills, etc.
2. *Set learning goals*: what you want to learn, over how much time, sequencing, learning activities, learning resources, assessment
3. *Learn*: approach to learning, periodic self-assessment, seeking help
4. *Assess*: self, peers, tutor, feedback, reflections

What SDL is NOT
Leaving the students in the library or hostel rooms to "study on their own"

(SDL: self-directed learning)

Assessment for SDL

4.5 Assessment for SDL: Teachers need to share the details of the assessment with the learners. This should include the assessment practices, standards, and criteria for assessment. Depending on the learning needs, the learners are given a task covering the objectives identified for that need. Learners should be encouraged to provide a sample of their learning, explain how this provides evidence of their understanding, and how it compares with the standards set by teachers. At the same time, they should be able to critique not only their work using these criteria but also of their peers. Lowering the stakes on assessment (e.g., in IA) is going to help learners engage in SDL. Does it resonate with the traffic light example? Have you noticed that just as the street has to be crossed within the traffic regulations, similarly the objectives and assessment have to be congruent with the course objectives?

4.6 Feedback and support: You as teachers can provide a lot of psychological support to the learners. Not viewing less marks as failure is important. Similarly, "celebrating" success is equally important. Developing the "I can" attitude is all that is needed for SDL to work! At some stage, learners should also be able to provide feedback to peers also on how to improve their work.

Skills for SDL

4.7 Skills for SDL: Awareness of the goals and their own roles as physicians are the beginning of this process. The learners also need skills for literature search, time management, seeking help, self-assessment, and reflective writing. In addition, they need to have an attitude to function as self-directed learners. Teachers also need to develop skills of mentoring, good communication, providing feedback, and a tolerance for ambiguity. The last one is probably one of the most important aspects of encouraging students to become effective self-directed learners.

4.8 Advantages of SDL: By providing autonomy to the learners, SDL encourages the development of life-long learning skills. Self-directed learners are motivated, persistent, independent, self-disciplined, self-confident, and goal-oriented. Self-directed learning promotes peer-assisted and cooperative learning. Being responsible for own learning, the learner is motivated to learn and learns for the sake of learning, rather than for pros and cons the sake of examinations. This promotes active learning. Self-directed learning in groups also helps in the development of functional teams. Thus, SDL can be considered as the beginning of life-long learning as both require similar skills.

4.9 Issues with SDL: As already stated, the learner in SDL has to take responsibility for her own learning. This means that she has to have the requisite prior knowledge, willing to take the responsibility, and willing to perform self-assessment and take corrective action.

There is no external validation and sometimes, the learning may be totally at variance with stated goals. In addition, it requires good teamwork, good interpersonal skills, positive attitudes, and availability of learning resources. Needless to say that it also requires more time as compared to conventional teacher-centered learning. Formulation of *learning contracts* between teachers and students helps in better coordination. You can read more about learning contracts at *https://sites.educ.ualberta.ca/staff/olenka. bilash/Best%20of%20Bilash/learning%20contracts.html*

4.10 Challenges: SDL is a "relatively" new concept in our settings as it seems to conflict with the common belief that teachers should teach. It emphasizes a shift from teacher-centered to student-centered learning. Many old-time teachers who had not experienced SDL earlier may consider SDL synonymous with leaving some free time for the learner for "self-study." However, as already pointed out, SDL is not leaving the learners on their own—rather it is a form of hand-holding with an increasing delegation of responsibility to the learner.

The biggest challenge for SDL will be to rightly estimate the preparedness to learn, both in terms of existing knowledge/skills and motivation to learn. Teachers need to ensure that the learner is ready to learn before delegating the responsibility to her. Again you are right that an ongoing formative assessment, both in terms of knowledge/ skills as well as in terms of behavioral characteristics, is the basis to make such a decision. Providing good-learning resources in terms of library, Internet connectivity, skill labs, and networking of institutions is also important. Faculty development to equip teachers with the concept and skills needed for SDL will go a long way in making SDL a successful approach.

Faculty development

5.0 e-learning

Let us now talk about electronic learning (e-learning). This term is rather loosely used to indicate a variety of activities. In its simplest form, it would mean a system of learning in which some content is delivered electronically. Others use it to denote learning based on the Internet, while yet others would refer to it as learning using a virtual learning environment. Few others use the term in the context of technology use to help people learn. The basic premise of all these is that it involves using computers or IT for delivery of at least a part of the content and may also involve a degree of simulation of reality. You would notice some similarities of this mode with distance learning in the sense that it becomes easy to electronically deliver content over distance and that there may be some spatial segregation of the teacher and the student. It can include teaching, delivery of information, or expert guidance.

Means or End

5.1 Rationale: E-learning does not have a "theory" of its own and relies on the general educational and distance learning theories. Opinion is divided over the function which technology serves. There is a school that considers e-learning as only a delivery mode. This group feels that the general teaching principles, except that the content is delivered electronically, remain the same. There is another school, however, which feels that interaction with technology can enhance the learning experience. Probably none of them is the gospel truth. The key to successful e-learning is the interaction of learner with the material to construct the latter's knowledge. It requires a skillful integration of media with learning to obtain desired results. In the following discussion, we are going to discuss the various modalities which can be used under the heading of e-learning.

We believe that irrespective of delivery mode, basic educational principles (active learning, engagement, feedback, assessment, etc.) of e-learning and conventional learning remain the same. Let us also put it that in line with adult learning principles, the learner needs to have a certain degree of preparedness to be able to use e-learning. You would have noticed from what we said above that e-learning needs to be differentiated from e-teaching. While the former is in students' domain, the latter is what you would be doing as teachers.

An impression has been created that the younger generation is more computer savvy compared to the older one and that any content presented electronically will result in learning. This is not absolutely true as there are a number of people on either side, who do not fit this stereotyped classification.

5.2 Characteristics: In general, e-learning should have the following features:
  i. *Multimedia:* An optimum mix of text, graphics, animations, visuals, and voice to provide multisensory inputs.
  ii. *Active learning:* Requiring the learner to interact with the material by thinking, creating, doing some activity, etc. Contrary to popular belief, clicking the mouse is not an activity in this sense.

Features

  iii. *Bookmarking:* Allowing the learner to stop and start at his own pace.
  iv. *Management:* Allowing the progress of the learner to be tracked by either a central server or by local tutors.

Depending on the time frame, e-learning can be categorized as asynchronous or synchronous. Let us look at these terms in little more detail.

5.2.1 Asynchronous learning refers to learning that is self-paced and is not dependent on the teacher or peer group being available at the

same time. Most commonly, it happens in the form of mail groups or listserv. The teacher posts the material on the group, which reaches the mailbox of the learners. The learner studies the material and responds as per his convenience. This has the advantage of allowing the learner sufficient time to think and introspect. In addition to Internet delivery, such courses can also be offered through intranet (e.g., through college library) or through CD-ROMs. The biggest strength of this mode is its ability to tide over the problem of collecting people across time zones at one point of time. It also allows experts to address the queries of the students at their own time.

Synchronous Learning

5.2.2 Synchronous learning usually refers to a virtual creation of a classroom. For this reason, it also called virtual learning environment. Students and teachers meet in virtual space through their computers. Audio and video conferencing is a commonly used modality for synchronous learning. Many platforms like Skype, Zoom, Google classes, Say Namaste, etc., are available for this purpose. There can be information sharing, discussions, quizzes, or student group work. Innovative techniques, such as shared whiteboards that allow multiple learners to post their comments are also being increasingly used.

Both asynchronous as well as synchronous learning could be individual or group-based.

5.2.3 Blended learning refers to a mixed mode of learning wherein the content is delivered electronically, but the teacher and the learners physically meet to cover some areas of the curriculum (e.g., practical skills).

Types

5.3 *Types of e-learning***:** In its simplest form, creating a PowerPoint presentation and uploading it on the college library computers could be called e-learning. However, slides alone in the absence of the teacher's narrative may not help all students. Free sites and software have solved this problem to a certain extent by providing an audio-recording facility. Recording of live lectures and dividing the time to partly show the teacher and partly the slides has also been popular. There can be different viewpoints about using each of these approaches. What is undisputed is that if not properly designed, such slides or lectures only help to duplicate the problems of traditional classrooms. However, well-designed slides and succinctly delivered lectures can be easily duplicated and shared by a number of institutions. They may not be a replacement for traditional teaching, but they can help the students to review and revise the content as required.

Tools

5.4 Online reading resources using *hypertext* could be the next step in e-learning. Hypertext refers to non-linear pages, which are electronically linked and clicking on a link takes the learner to another page. Thus, we may start the page on myocardial infraction and create a hyperlink to anatomy of the heart so that when a student wants to learn more about it, he can take a detour, read the relevant portion and then come back to the main page. In principle, this mimics the *spiral curriculum* model and with ease—as the student is provided with an opportunity to review the relevant portions of basic sciences. It can be a disadvantage also as the learners can get lost in the maze of information or move in a direction that is totally unintended by the teacher. Learner motivation plays a large part as does the material design.

5.5 Offline materials can follow the same principles with the difference that the entire material is presented on a CD-ROM rather than on a webpage and can be useful in case of nonavailability of good Internet connectivity. Often called *computer-aided* learning, this method has the advantage of limiting the material but has the disadvantage of making the material outdated in a short time span. A hybrid model with core material on the disk and external links to optional reading can also be used.

A lot more is possible and is being already done in the arena of e-learning. We will not discuss all that—as it may probably require a whole book devoted to the topic! Given below is a sample of various tools that can be used for e-learning.

Tools used for e-learning	
Tool	*Example*
YouTube	Video sharing, skills demonstration
Google Docs	Collaborative projects
Skype	Messaging, telephony
Prezi	Nonlinear presentations
Moodle	Course management system
SlideShare	Presentation sharing
DropBox	File syncing across users
Wikipedia	Collaborative encyclopedia
LinkedIn	Professional networking
Edublog	Blogging
WhatsApp, Telegram	Educational chats, resource sharing
Zoom	Online classes
GoToWebinar	Webinars
Say Namaste	Webinars

This is only a sample of various tools presently available. By the time, this book reaches you, many more may be available. A number of apps are also available for Android and Apple devices.

6.0 Massive open online courses

Massive open online courses (MOOC) can be considered an operational variant of distance and e-learning. As the name indicates, they cater to a large number of learners, are freely accessible and available online. You are right to presume that they are open, i.e., they do not have restrictions of any predefined experience or qualifications to use them. They can be seen as an evolution of distance learning, which was initially delivered by post, and later by email, Google Docs, Facebook, and listservs. Advances in online delivery techniques have broadened the scope and reach of such courses and made it possible to use them in a synchronous manner.

6.1 Types of MOOCs: Broadly, MOOCs are classified as *connectivist* (cMOOC) and *extended* (xMOOC). The former promotes the generation of new knowledge between what is known and what is new, while the latter focuses mainly on duplication of knowledge. Connectivist massive open online courses regroup and mix study materials and promote interaction among learners to find answers to the posed problems. xMOOCs, on the other hand, are like conventional courses, which duplicate knowledge, making it available to a large number of learners. They are primarily targeted to individual learning.

Massive open online courses provide very useful and cost-effective opportunities for self-improvement, both formally and informally. Informally, they provide opportunities to learn areas that may be outside or not permissible within the conventional course boundaries (e.g., a medical teacher wanting to learn about human resource management or a medical officer wanting to learn about stores management). They can also be used formally by learners who may not have the time, opportunity or finances to enroll for regular courses. India Council for Technical Education under Ministry of Human Resource Development of Government of India has started MOOCs under 'Study Webs of Active-Learning for Young Aspiring Minds' portal (https://swayam.gov.in/), providing hundreds of open courses to students, with an option of transferring the credits earned by students through these courses into their academic record.

6.2 Application: Massive open online courses can be used for medical education, mainly for continuing medical education in the form of online continuing medical education (CME) and webinars, wherein conferences and workshops at one institution can be virtually attended by almost

anyone. They also provide opportunities for skill enhancement, not only by online courses but also by blended programs where the learners can approach designated skill centers to learn and practice skills. This can be a real boon for the skills training component of many medical curricula. Massive open online courses are also useful for faculty development for fostering soft skills and research skills. In India, for example, PG students will be learning research skills through an online course.

6.3 Benefits: Similar to distance learning, MOOCs can target large numbers, are easy to deliver, cheap and do away with constraints of time and place. They are self-pacing, can promote creativity and group learning. Creation of such courses, however, is costly and time-consuming. Thus, they may not be suitable for low demand subjects. High dropout rates can be a real problem in the absence of a robust learner support system. Certification is again a challenge as is their acceptability to potential employers.

7.0 m-Learning

A relatively recent addition to the concept of e-learning is m-learning (or mobile learning). Easy availability of high-end smartphones and mobile devices is responsible for the popularity of this medium as a learning tool. Laptops, tablets, personal digital assistants (PDAs), digital media players, and mobile phones are the types of devices currently available. The common feature of all these devices is their ability to upload/download learning content. They can also access the web and provide a window of opportunity for the student.

Mobile Devices

Personal digital assistants are commonly used in many countries (sometimes even compulsorily) as they allow a number of books, quick reference cards, video demonstrations of clinical skills, and drug references to be readily available. Net-enabled PDAs also allow the students to access PubMed database. Podcasting is another tool commonly used and involves broadcasting of an audio or video file. Availability of software to reduce file size while maintaining quality has added to their popularity. With the costs of these devices going down and better technology for file compression and mobile net connectivity becoming available, we are likely to see more of m-learning in the near future.

8.0 Simulations

Simulations are being increasingly used to train medical students in diverse clinical skills. They help us to replicate situations that may not be possible to get in real settings or where it may be logistically difficult to work on real patients. Let us illustrate it by a simple example. A pilot

can be trained on a real aircraft in a number of situations, but it may not be possible to provide him the real experience of what do if the engine fails. Such training is provided on simulators. In medical education, a number of skills are difficult to impart in real life but can be effectively taught using simulations.

8.1 What is simulation: Simply stated, simulation means recreating the medical realities in virtual space. Initially, the simulation focused on psychomotor skills but gradually their use is being extended to cognitive and affective skills as well. They have the advantage of being targeted to various levels of expertise and thus provide individualized experience. The major impetus for use of simulations came from the need to train doctors in all situations before being certified to practice and more importantly, non-availability or un-willingness of real patients to participate in the training process.

An important concept in the use of simulations is their fidelity. Fidelity refers to the degree of closeness that simulation generates with real life. Asking a student to perform a resuscitation on a static dummy will be a low fidelity because it may not show the change in color that should happen with ventilation but a high-end manikin may replicate the effect of treatment in terms of blood pressure, heart rate, and other parameters.

8.2 Simulated patients: Simulated patients (SPs) are being increasingly used in most educational settings. SPs are people especially trained to simulate reality and have been used in various settings, such as communications skills, physical examination, noninvasive procedures, and professionalism. Standardized patients have a particular history or physical signs and are trained to present themselves in a consistent manner. They help to provide systematic training to the students. They are also trained to provide developmental feedback to the students. Their other major use is to make assessments comparable. Most high-stake examinations make use of standardized patients.

Use of e-learning and simulations is relatively low in our country. Non-availability of technology (so far), costs involved, and non-accepting mindset have been responsible for this state. However, things are beginning to change and a good number of medical schools have established digital libraries, skill labs, and simulators. The coming years should see more and more application of technology in medical education.

SPs

Chapter
28

Microteaching

LEARNING OBJECTIVES

❖ Explain the concept of microteaching
❖ Understand the role of feedback in improvement
❖ Use microteaching to improve your skills

Concept

Teaching is not a lost art, but the regard for it is a lost tradition.

Jacques Barzun

Our teaching skills improve gradually over the years as we gain experience and continue practice in different kinds of teaching–learning situations. We, however, have techniques that can help us refine our teaching skills at an earlier stage, as well as help us continue our development later on. One such technique we have at our disposal is called *microteaching*.

You may be wondering, what is *micro* about it. Well, the name comes from trying to improve a *small* part of your teaching skills at a time. In addition, it requires *small* time to practice, *small* content area to be covered, and *small* number of "students" to be taught. Let us elaborate it for you.

Our overall teaching competence is formed by a number of subskills. You are right—delivering a lecture, engaging the students, use of audiovisual aids, assessment, counseling, guiding for further learning, etc., are some such examples. It stands to logic that it is easier to improve on these skills one at a time. Microteaching means delivering a small content area to a small group of observers, focusing on a small number of skills and then getting feedback on how to improve these. In effect, it means breaking the teaching skills into subskills and then trying to improve them individually.

Technique: The technique of microteaching is very simple. Suppose I want to improve a particular teaching skill. I will prepare a small presentation of 5–7 minutes (depending on the content area, it could be using the blackboard, overhead projector (OHP) or projector) and request a group of observers to witness my presentation. If the skill that I wanted to improve is how to bring interactivity, then I will request the group to focus on the way I try to bring interactivity in my presentation and then give me feedback on *how I did* and how *I can make it better*. If required, I can repeat the presentation after incorporating the suggestions and feedback received from the group, although that is not necessarily done immediately. A period of reflection will help to make the presentation even better. We want to emphasize here that since microteaching involves change in the behavior of the teacher, the teacher herself is the best person to initiate the process. It may be difficult to gain maximum benefits from externally imposed sessions. The key to maximize the benefits of this activity is to create a climate of mutual trust and support.

Technique

We can diagrammatically represent the activity as follows:

Microteaching cycle
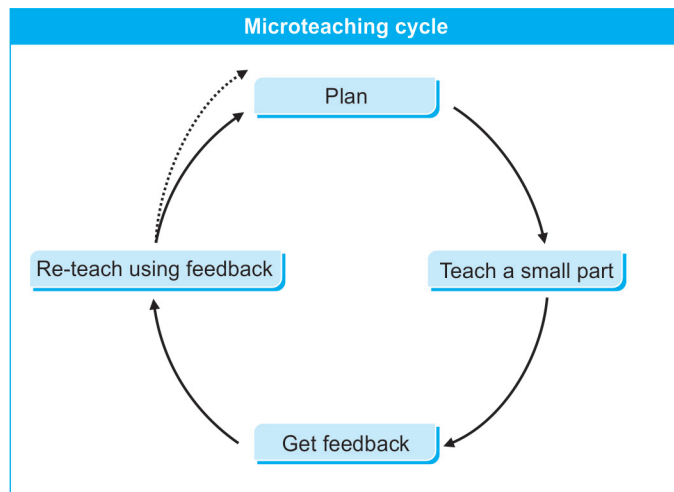
- Plan
- Teach a small part
- Get feedback
- Re-teach using feedback

Getting feedback: Feedback is the process of getting an impression of others regarding our actions and behaviors. To be useful, the person seeking feedback should be willing to change and this is the key to the success of microteaching. If we approach microteaching session as a ritual, then probably it will not be effective. This is one of the reasons, why we said earlier that the teacher herself is the best person to initiate the session. Acceptance for feedback is likely to be much more in this case than for a session initiated by say the Head of the Department or the Dean.

Feedback

Who should give feedback: The answer is anybody! It is a matter of trust between the teacher and those who are giving feedback. If the teacher perceives these people as ones who are there to help him improve, feedback is more likely to be sought and accepted. On the other hand,

if they are perceived as people who are out to criticize, a degree of defensiveness comes in and may make the whole exercise useless. Colleagues, seniors, juniors, or even students can give educationally useful feedback if we are able to create the right atmosphere. Sometimes, delivering a presentation in front of a mirror or (audio or even video) recording it and listening/viewing later on by self or colleagues have also been used as sources of feedback.

New Model

Traditionally, microteaching has been seen as an activity where the teaching skills of a teacher are criticized. In some of the workshops that we had conducted, participants even viewed microteaching as a process wherein the teacher's actions are scrutinized under a microscope (and thought, that is why it is called microteaching). Implicit in these beliefs is the view of microteaching as a fault finding exercise. This type of conceptualization has made microteaching as something which provokes anxiety and makes teachers reluctant to use it for improving their skills, especially if they happen to be at a senior level. We, on the other hand, prefer to view microteaching as a *facilitating* rather than a *controlling* technique. Properly used, it can be fun and helps in improving the skills of teachers at all levels of seniority.

What microteaching is:
- ❖ An exercise in self-reflection and peer feedback
- ❖ Providing positive reinforcements for tasks done well
- ❖ Akin to net practice in cricket!

What microteaching is not:
- ❖ An exercise in faultfinding
- ❖ Putting the teacher under the microscope!
- ❖ A ritual for the sake of completion

Rating Forms or Open-Ended?

Should feedback be structured or unstructured? There are a number of checklists available (some of them with as many as 60 points) for providing feedback following a microteaching session. Readers of previous editions of this book would remember a form which had 11 points on which the presentation was to be rated. We find a number of issues with using such or any other form for this purpose, which are discussed below:

- ❖ It is presumed that we are able to capture all aspects of good teaching behavior in a checklist, which is not true. Good teaching is much more than a combination of delivering a lecture, asking questions, and summarizing.
- ❖ Teachers get an impression that good-teaching behavior must incorporate all the points listed in the form irrespective of the content, scope, or purpose of the lesson. In some of the training sessions that we conducted, we saw teachers beginning their presentations with inappropriate jokes or humor, simply because

it was listed there on the form. Microteaching aims at developing a dynamic teacher, not a robotic one.

❖ All the points mentioned in these forms cannot be covered within the span of 5–7 minutes (the usual duration for which a microteaching session will last) and this, therefore, goes against the very concept of "micro."

We now advocate the use of an open-ended feedback focusing on two major issues. The first is to tell the teacher, *what was done well*. Anything good, which is reinforced, becomes part of the behavior and is likely to be repeated in the future. The second is to tell *what could have been done better*. It improves the acceptability further if we ask the presenting teacher to assess her presentation herself first. As you would appreciate, there is no fault-finding or criticism involved in this process. This approach is likely to make microteaching more acceptable as a teacher training tool than viewing it as an occasion to criticize one's teaching behavior. Allen, the originator of microteaching, started with a checklist-based approach in 1969 but moved to the present approach in 1996. In the box at the end of this chapter, you will find a transcript from an actual microteaching session to give you a better idea of how it works.

Models of providing educational feedback		
Model	*Methodology*	*Remarks*
Sandwich model	❖ Start with what has been done well, bring criticism of what needs improvement and follow it with praise again ❖ The criticism is "sandwiched" between layers of praise and is likely to be more acceptable	❖ Needs a proper balance between praise and criticism ❖ Praise, especially inappropriate, makes people skeptical about intentions ❖ Most of the times people anticipate the "bad news" as soon as you start praising, more so if you have not been complimenting them otherwise
Pendleton's model	❖ Ask the person what he did well ❖ Discuss what went well, offering your comments ❖ Ask the person what went less well as what differently he would do next time ❖ Discuss what went less well and offer suggestions for improvement	❖ Beginning with self-appraisal makes feedback more acceptable ❖ The focus is on strengths rather than on weaknesses ❖ Allows the person to reflect on what has been told

Do I Use All Feedback?

Should all feedback be used? Probably no. There are three things we can do with any feedback. We can either use it straight away; we can retain it and reflect on it to decide future action or we can simply discard it. It is for the presenting teacher to decide what he/she wants to do with the feedback. Our suggestion is to use the middle option—rather than taking hasty decision, the teacher should *reflect on the feedback* to find its utility and then decide what should be done with it.

Process or Content

Should observers focus on content? Often there is a feeling that the observers should focus on the content also while giving feedback. We do not advocate this for two reasons—one that observers need not be subject experts and second that it is difficult to assess the content of 45 minutes of lecture in a 5-minute session. Of course, if there is something striking about the content, it can be pointed out, but for most sessions, the focus should be on technique. It is good to remember that if actual teaching is like a one-day cricket match, microteaching is like *net practice*. And no one keeps a score during net practice!

In essence, microteaching is like taking 'formative' feedback before the class or as some would call it, *feed-forward*. In that sense, it differs from student feedback, which happens after the class.

With simple technology being easily available, a newer model *(Microteaching3)* has also been proposed. It involves making a recording of the teacher while teaching, using a mobile phone. After completion of the teaching period, the teacher views her performance and reflects on what she did well and what could have been better. This is followed by sharing of observations and feedback by the peer group.

Microteaching is a simple tool that can help all of us—irrespective of our experience or seniority to improve our teaching skills. Why it has failed to become a part of routine teaching activities is the concept of criticism that has been inadvertently built into it. But if we see and use it as a tool that helps us to become better in our teaching, more and more teachers are likely to accept this tool. Let us finish this discussion by a simple example: you are ready to go out for a party and ask your spouse whether your tie is looking good with your suit. If your spouse tells you that it may be better to wear a red tie instead of blue because it will match well with the shirt too, you are likely to use this simple trick in future also. However, if your spouse takes out a checklist, puts some ticks on it and starts criticizing you for your poor dress sense, you will never ask her again! This is what makes the difference between *facilitation* and *control.*

Transcript from a microteaching session

GK has recently joined as a lecturer in a medical college and has been allotted certain topics for undergraduate students. She has taken some classes as a demonstrator but does not feel very comfortable with engaging students in the course of her lecture. A few days later, she happens to meet her Head of the department DS in the staff room during tea time and here is the conversation which goes.

DS: So GK, how are your classes going on?

GK: Thank you for asking, Sir. I have taken two lectures so far and still have eight more to go.

DS: You look a bit tense.

GK: Sir actually I am feeling a bit anxious. As a demonstrator, I used to come and give my lecture using PowerPoint but I feel that now I should be able to get the learners involved with the content so that they learn better.

DS: That is a good idea. What you plan to do for it?

GK: I tried asking questions during my lecture but I am not satisfied with the way things went. I will like to improve my questioning skill. Can you help me with this? Tomorrow I will arrange a session.
(Next day, GK calls three other lecturers—JN, AM, and PS from the department and delivers a 10 minutes lecture, asking questions during the course of the same. The conversation proceeds after she has finished her mini-lecture. JN records the mini-lecture on her mobile.)

DS: That was a good attempt, GK. Can you please play the recording, observe your performance, and tell us what you felt about your questioning skills.

GK: Sir, I feel I was able to include some important issues in my questions but somehow the answers are not coming. I had to give all the answers myself.

DS: It was good that you included a number of important points in your questions. Your questions were also thought-provoking, which should make them think. Regarding not getting answers, I feel that one of the tricks to elicit a response from the students may be to give them some time to think. So next time you ask a question, allow some silence—may be 20–30 seconds before starting to answer it yourself. Will you like to add something JN?
JN: I agree with what you said. What I will like to add is sometimes rephrasing a question is likely to get a response faster.

AM: You could also try to leave some questions unanswered and ask them to either look for them in a book there itself or may be in the next class.

DS: Why not try some of these suggestions. Repeat this mini-lecture and incorporate some of these suggestions to see if you feel more confident.

GK: I will do that. Thank you for your help. (GK repeats the presentation next day)

DS: What comments you have now?

GK: I thought over the suggestions that came yesterday. In today's presentation, I felt being silent for some time and if still the answer is not coming, rephrasing it is more likely to help.

DS: Try it in your next class and see if it actually works.

GK: Thank you everyone for your help.

Chapter

29

Teacher Evaluation

LEARNING OBJECTIVES

❖ State the importance of teacher evaluation
❖ Use an appropriate tool to evaluate own teaching
❖ Develop an attitude to accept critical feedback for self-improvement

Assume all teaching to be ineffective till there is evidence to contrary.

Robert Mager

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 viewpoint is going to have its own share of supporters as well as critics. However, there is no disagreement over the fact 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 Chapter 13 the whole concept of assessment is based on feedback to improve the quality of the final product. There is no reason why we teachers should keep ourselves out of bounds from feedback about our own teaching.

The Need

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 favorably predisposed toward the teacher, they are not likely to learn. By obtaining feedback, you can identify areas to improve your acceptability as a teacher.

Need

Sources of Feedback

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 countries, teachers use electronic devices to monitor their own teaching. Since they are not viewed by anybody else, they can be quite nonthreatening. In addition, they have the advantage of providing a 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.

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 behavior.

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 questionnaires have been published and we do not intend to go into all of them. However, by selecting important points from many them, it is possible to draw a scale that is brief yet fairly wide in its coverage. We have given a sample at the next page.

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 a few peculiar personality traits. Also remember that even though you may be rating yourself poorly on some of these points, just by rating, you are likely to induce a positive change in yourself (this is what psychologists

Electronic Feedback

Peer-Review

Self-Evaluation

Self-Improvement

call *Hawthorne effect*) if you evaluate yourself regularly on this or any similar scale.

Sample teacher self-evaluation format
❖ I prepare objectives for my teaching based on national health needs
❖ I use principles of adult learning to plan my classroom and clinical teaching
❖ I provide opportunities for students to select varied learning experiences
❖ I provide learning experiences which offer challenges to students and stimulate them for further study
❖ I encourage every student to participate during seminars and small group teaching
❖ I use audiovisual media to make instructions more meaningful rather than as a prompter
❖ I encourage students to practice what they learnt
❖ I provide opportunities to develop practical, communication and affective skills in addition to imparting knowledge
❖ I encourage students to practice self-directed learning
❖ I encourage students to draw on additional learning 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 seek student feedback on my teaching
❖ I engage in continuing education programs to keep my subject knowledge up-to-date
❖ I conduct educational research

Student Feedback

Student feedback

The last but not the least important source of obtaining feedback is 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 student ratings are consistent with those given by more experienced colleagues. In many institutions, promotions and career advancements have student ratings as one of the criteria.

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

While the design of the questionnaire will be guided by purpose, as a general rule, students should not be asked what they cannot answer (e.g., teacher was knowledgeable or he used appropriate assessment).

While the current opinion is in favor 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. It is also a good idea to triangulate the results of student feedback with other inputs like self-appraisal or feedback from peers.

Sample student feedback format			
Please tick the appropriate column	*Skillfully*	*Satisfactorily*	*Poorly*
During all teaching sessions for the course the teacher was able to: 1. Create and maintain an atmosphere for learning 2. Speak with a loud and clear voice 3. Explain the relevance and utility of the matter taught 4. Arouse an interest/curiosity in the subject 5. Explain clearly the importance of this knowledge 6. Provide examples 7. Summarize before moving on 8. Pose thought-provoking questions 9. Encourage the students to share ideas 10. Detect the confusion and misconcepts in the class 11. Provide relevant notes 12. Guide for further learning			

Before concluding, let us also caution you that while student ratings are valid and often reliable, they always need to be triangulated with other sources of information like self and peers. It is also important to see these as ratings rather than as evaluation, which has a judgmental connotation.

Chapter
30
Reflective Writing

LEARNING OBJECTIVES

❖ Understand the concept of reflections
❖ State advantages of reflections
❖ Teach students how to reflect
❖ Reflect in day to day practice

To read without reflecting is like eating without digesting.

Edmund Burke

This quote aptly summarizes the importance of reflections in educational processes. You would have come across this term many times in this book, especially in the context of newer methodologies and wondered what are reflections? In this chapter, we will take you through the concept of reflections, how to write them and how to teach students to reflect on their learning.

Imagine a scenario, where you had planned some important event. Unfortunately, the event did not go well and there were lot of lacunae between your planning and actual event. After some time, you are asked again to organize a similar event. Before you start planning, you sit quietly, thinking about what you had planned, what went wrong and what could have been done differently. Yes, you are right—you were reflecting! Conversely, the event went on very well and you were to organize another event. Again you would be thinking about the good points which you will like to incorporate and how to make them even better. Again you are reflecting!

Let us begin by asking what reflections are. As the name indicates, they are an image of what has happened. However, rather than being a passive image of a learning event, they are structured-deliberately-to maximize learning. There are many definitions of the term available in literature and we do not want to go into those details. The gist of these definitions is that reflections are a kind of *metacognition* (learning to learn, that is) to help learners to mentally revisit their learning experiences, actions and decisions. Additionally, they also involve the future course of action based on this activity. In other words, reflections allow the learners to revisit the learning experiences to extract the main learning points and use them to build connections between new and existing knowledge. From this perspective, they help in construction of knowledge. They also enable the learners to use the results of previous experience in dealing with same or similar situations in future.

Process of Reflection

Most of the reflective framework is based on Kolb's (1984) framework of reflections. Kolb gave a cycle of action → experience → reflection → conceptualization → action. As you would have noticed, this cycle can have many iterations with each action teaching you something new or different. Let us add that reflections can happen before, during or after the action. Let us also hasten to add that this is only one of the many frameworks described in literature but has the benefit of simplicity and familiarity.

Reflective Cycle

Framework of reflections

Action

Conceptualization — Reflective process — Experience
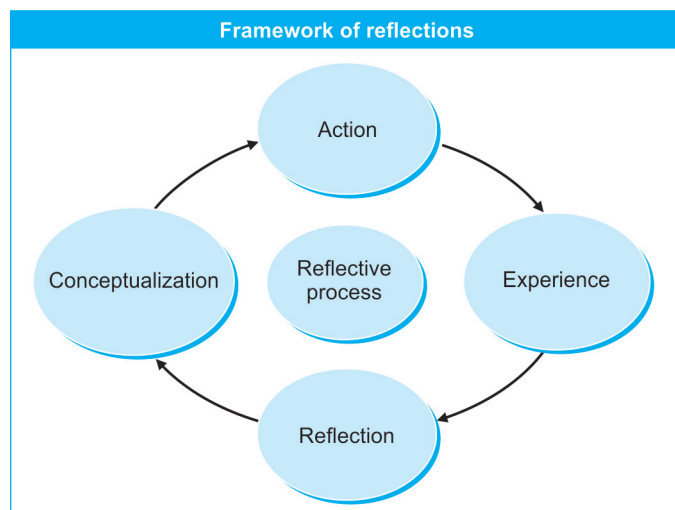
Reflection

(Kolb, 1984)

Advantages

Why Reflect?

As stated in the definition, reflections are a meta-cognitive activity, i.e., they help the learner to learn about learning and optimize it. Here are some of the stated advantages of reflections:

❖ Help in finding the gaps in knowledge and identify learning needs.
❖ Analyze communication and interpersonal relationships.
❖ Awareness of how we make decisions.
❖ Make learning permanent and retrievable.
❖ Allow us to learn from past mistakes.

You would have noticed that reflections provide a wonderful opportunity to start the process of self-directed learning! In addition, they also help the learner to consolidate the gains from such an approach. From that perspective, reflections are a part of self regulation of learning.

How to Reflect?

Process

While there are no hard and fast rules, still, most of the times, some unsaid rules are followed when writing (or orally stating) reflections. Reflections are always written in first person with lot of 'I' statements. This helps to take ownership of the process and allows us to learn from them. A corollary of this is that reflections are about yourself and how you reacted in that situation. It is usually better to try to answer the following questions when writing reflections:

1. *What happened?* Try to describe the situation from learning perspective. What was the context, who all were involved, who did what, what was your role, what went well, what needs improvement and so on.
2. *So what?* Here describe how the situation was different from what you knew or anticipated, what were the differences in approach, what were the results and what have you learnt from it.
3. *What next?* This section is based on the previous two. You have noted the differences; you have learnt something, so how are you going to use this information in future. If you face a similar situation again, what differently will you do and why.

Try to be as honest as possible. Do not write what is socially acceptable. Try to be as elaborate as possible. The more you open up while reflecting, more the chances of learning happening.

We are giving you examples of refelctions. One was written where a positive learning happened and another where a desired result was not obtained. Both are valuable and add to growth of the learner.

Reflections of an undergraduate student

What happened?

I have done two rotations in medicine. Today was the time to go to the emergency with the unit in-charge, Professor Deva. The case in question was a 17-year-old girl brought with history of altered sensorium since last 1 hour. There was no significant past history. Physical examination was essentially normal. Having seen few such cases, I thought that she is a case of functional disorder, considering the gender and age. I remembered what we had experienced in the last case that we saw—try to rouse the patient by painful pressure over sternum or upper orbital edge (eyebrow area) and if it does not work 'use a swab of liquor ammonia' over nostrils and its inhalation used to give the results within seconds. When I saw the emergency medical officer (EMO) doing the same, I was happy that I know how to manage such cases. However, this happiness was short lived when I heard the EMO telling Professor Deva that the patient did initially respond to few commands but is not doing so now. Looked like we were not on the right track.

Then I saw Professor Deva taking control and examining the patient. Suddenly he paused and started sniffing over her face and started observing her breathing; I was a bit confused as to what he is doing! He broke the silence and asked the EMO 'come here and sniff her breath'. EMO tried 'sir I am not able to get any smell.' Sir said 'try again, there is some fruity smell in it' and then he turned to us 'you also try and see if you get any smell in her breath'. With a little apprehension, I also tried but could not perceive any smell. Sir said 'No problem. Call her relatives, make arrangement to transfer her to intensive care unit (ICU) and you escort her to ICU, this is not functional!' He continued 'collect and send her sample for urgent blood sugar, catheterize and take a urine sample for sugar and ketones and start intravenous (IV) saline. Tell the resident in ICU to check her sugar and inform me at the earliest.' When we later went for rounds, we found that the blood sugar was 340 mg%, there was marked metabolic acidosis and ketones were positive. A diagnosis of diabetic ketoacidosis had been made and treatment started. The patient had again started showing responsiveness.

So what?

I learnt that everyone presenting with altered sensorium of short duration is not 'functional'. We need to be vigilant and check out for other causes of the symptoms. I also learnt that ketoacidosis can be the first manifestation of diabetes without any other symptoms being present.

What next?

A complete work up is essential before labeling a patient as 'functional'. I will make it a point to be on the lookout for any ketone smell in patients presenting with altered sensorium and confirm/rule out DKA. I also need to read more on other causes of sudden onset altered sensorium, especially in young adults, which may not be presenting with any physical finding.

Courtesy: Dr Anil Kapoor, Bhopal, Madhya Pradesh, India.

Reflections of a postgraduate student

What happened?

I was in to the fourth month of Junior Residency in the Department of Anesthesia and penning down my experience of my first unsuccessful lumbar puncture at that time. To start with, beginners luck smiled on me as my first two attempts of lumbar puncture were on young lean patients and I did them quite successfully. But my third spinal, a primigravida posted for Cesarean Section was the real learning experience. My consultant instructed me to scrub. With some knowledge of theory and two successful blocks under my belt, I approached her perhaps a little overconfident and bloated with ego. With flair, the anesthesia assistant was ordered to position the patient on her left side. Even after multiple attempts, the CSF eluded me. To make matters worse, the patient kept complaining about the uncomfortable position. All my enthusiasm vanished and I was tense and demoralized. At this juncture, a third year resident was asked to take over. She palpated meticulously and announced that she was unable to feel the spinous processes.

At this point, the consultant took charge. The assistant was asked to seat the patient on the operating table. This simple step eased the situation and the patient stopped complaining. She was asked to bend on the pillow kept in her lap with the assistant gently supporting. As he introduced the needle, even I could appreciate it enter the sub-arachnoid space while observing the procedure. It all looked very elegant.

So what – lesson learnt (at that time)

Next day my teacher sensed my frustration and asked what I had learned from the experience. I replied—not to be overconfident and get exalted by the beginner's luck and always give priority to patient's comfort. Moreover, call for help if needed. He patted affectionately on my back and advised me to read—Lumbar Puncture and Spinal Anesthesia by Sir Robert Macintosh. I would not say that reading this book made me an expert but I surely started learning from my mistakes, and I must admit they were numerous.

What next – lesson learnt for life (impact)

I made it a habit to consult a good book about the procedure before actually attempting it. I practiced a lot on dummies and simulators. I realized that patient is more worried about the forced knee chest position than the actual needle stick; so I made it as my routine to explain the procedure properly to the patients and give sedation whenever possible. It was a life-time learning for me that the sitting position is better tolerated and with every prick, patient becomes more apprehensive and less cooperative—so be very sure about the point of entry and projection before the puncture. I learnt when to stop and not to get depressed by failures. And cherry on the cake was my self-realization that 'learning is a continuous, life-long process'.

Courtesy: Dr Rajiv Mahajan, Bathinda, Punjab, India.

Where All You Can Reflect?

The answer is practically everywhere. We come across new situations or new problems everyday in our life and each such event is an opportunity to learn. You must make it a habit to reflect on all events that you experience. Look at some of the examples below:

❖ Daily versus alternate day drugs for tuberculosis. Consider the shift from regular drugs to drugs based on their half life and suppression of bacterial growth.

❖ A patient behaving strangely. Consider the reasons for such behavior. How should you behave in such a situation?

❖ Declaring death of a child in the ward. Consider how did the parents react? Were they aggressive? What could have been the problems for such aggressiveness? What could you have done to avoid this unpleasantness?

Application

You must be thinking that most of the students have not learnt the art of reflection in our setting. You are right—but as teachers, you can help the students to learn reflective writing and gain from this modality. One of the best and effective methods is to be a role model by reflecting yourself frequently, especially with odd or unusual situations. This can be in the form of thinking aloud in front of students. In a formal way, you should clarify with the students the objectives of such an activity. Reflections should not be for the sake of it but for the sake of learning. Reflections become powerful learning tools only with feedback.

Students should be given the liberty to write structured or unstructured reflections, as long as they have answered the three questions mentioned above. It is also useful to create a learning environment where students would not feel threatened to share their reflections, as strong emotions might be involved at times. Provide them feedback so that they can improve their reflective skills.

How to Assess Reflections?

Reflections are not unmonitored activity. They need to be assessed. In many of the soft skills, they may be the only form of assessment used by teachers. Also, in most such situations, assessment of reflections will be formative with the objective of providing feedback rather than to award marks or grades.

Reflections provide a wonderful opportunity to consolidate learning and let the future events be guided by past experiences. In a way, they are the perfect example of 'learning from our mistakes'! You yourself can reflect on the process of teaching and reflections in your daily teaching practice.

Chapter
31

Faculty Development

LEARNING OBJECTIVES

❖ Enumerate the roles of a teacher
❖ Discuss the changing roles in sociocultural context
❖ Define faculty development (FD)
❖ Discuss the levels of FD

Teacher's Roles

Everyone who remembers his own education, remembers teachers, not methods and techniques

Sidney Hook

Do you remember the quote that we put at the beginning of this book? It was by Rabindranath Tagore, who said, "*a teacher can never truly teach unless he is learning himself.*" In no other branch of education, this need is as important as in medical education. In this chapter, we will discuss the abilities that we need to develop in a medical teacher and how the socio-cultural evolution demands this development process to be dynamically oriented. The purpose of faculty development (FD) is to bring out the *good teacher* in you and you are very right in saying that a good teacher is the one who helps the students learn.

Role of a teacher: Can you take a minute and think of all the activities that you perform in your role as a teacher? All the activities that you could think of can be grouped into the following broad areas (researched by Harden and Associates). These include:
1. Provision of information
2. Assessment of students' learning
3. Curriculum planning and implementation
4. Facilitation of learning
5. Creation of learning resources
6. Role modeling

You would have observed that you devote most of your time in the initial activities rather than on latter ones. You also must have noted that there is a change in what you do today and what you used to do say 10 years ago (that is if you have this much teaching experience!). Much of this change is in fact a result of sociocultural influences on medical education. There are many such influences, but we will mainly discuss the role of technology, changing expectations of the society and changing medical practice. Each one of them has influenced medical education in a substantial way. In our subsequent discussion, we will also look at the implications of such changes on the way you teach students.

Changing Trends in Education

a. **Technology:** Rapid and easy availability of technology coupled with easy availability of money for certain classes of people made the position of doctor as healthcare provider rather shaky compared to the "Godliness" that he enjoyed a few decades ago. Information technology would probably do the same for medical teachers. Students have easy and unlimited access to a host of most current information and the teacher can no longer claim to be the "master" of the subject. Rather than being an information provider, his role is changing to guide the students about where to look for the *right* information and how to make the *best use* of this information.

Medical teachers have to make increasing use of technology. In fact, the task of providing basic information can be safely left to technology, allowing the teacher to devote his time to creation of learning and developing assessment tools. Communication within and across institutions will also help in developing collaborative approaches and resource sharing. The focus of FD should not be simply to enable teachers to produce more slides or videos but to help them to apply the principles of learning in designing e-learning material. We have discussed this aspect in Chapter 12.

Changing Paradigms

Much of the information available on the net is unauthentic and students need to develop the capability of separating grain from the chaff. The venue for study is also gradually shifting from the wards and libraries to the students' rooms. To an extent, such self-study may be useful but it has to be matched by an effective quality control in the form of an assessment program that will not allow undeserving students to pass through that filter.

b. **Teaching approaches:** The teaching approaches have also been undergoing a major change. From strictly discipline-based teaching, we are moving into an era of integrated, competency-based and

**Changes
in Medical
Practice**

self-directed learning. To ensure the success of these approaches, we need to make a judicious use of in-training assessment, internal assessment and workplace-based assessment, more than what we have been doing at present.

c. ***Changing medical practice*:** The utility of teaching hospitals has already undergone a major change, especially in the private sector. They no longer attract patients for normal delivery or for treatment of hernia, hydrocele, and a host of other common conditions that need to be taught to an undergraduate student being prepared as doctor of first contact. This requires that the venue for training has to move out from the tertiary hospital to the community and secondary hospitals. Skill learning also has to move away from bedside to skills labs and simulations. Training standardized patients may soon be on our agenda. Similarly, the very place for a doctor without specialization has become questionable. Students spend years sitting at home preparing for the pre-PG examination causing loss of man-hours. Rather than making teaching oriented to the current trend of such examinations, the need is to make entrance examinations more representative of what a graduate needs to know and do.

(For those of you wanting to read more on this aspect, we strongly recommend a well-written paper by Harden—*Twelve roles of a medical teacher*, and another by Benor—*Faculty development: twenty years from now*. We have provided references to these in the further reading section).

The major roles of medical teachers that are going to be of paramount importance in the coming years are as *managers* of learning needs and *assessors* of students' learning. The popular saying, *from sage on the stage to guide by the side*, says much about this change. It is imperative that we start preparing medical teachers for these roles.

Emerging roles of a medical teacher
❖ Helping students to set meaningful objectives
❖ Guiding to appropriate resources
❖ Engaging the students
❖ Assessment for learning and feedback
❖ Skills training, assessment, and feedback
❖ Role modeling for communication, interpersonal skills, ethics, and professionalism
❖ Coaching and mentoring
❖ Use of technology and simulations   *(Harden; Benor)*

Faculty development

Let us look at one of the definitions of FD. Faculty development is defined by Steinert and associates as *activities designed to improve an individual's knowledge and skills in areas considered essential to performance as a faculty member*. In essence, it implies that FD is a planned, ongoing process with the objective of developing and refining teaching, research, interpersonal, and administrative skills. A perusal of this definition also tells us that FD involves not only *teaching expertise* but also *domain expertise*, although, by convention, FD has almost become synonymous with expertise in teaching.

Training or development? Many of the teacher training programs were started during the 1970s and mainly focused on providing the core components of teaching, viz. setting objectives, selecting appropriate teaching methods and resources, and assessing students for attainment of objectives. The underlying paradigm was *training* where an "untrained" teacher was required to attend a training program and his status changed to "trained." There was no effort to follow-up such training and there was no emphasis on ensuring that what is learnt is actually applied on the job back home. Many of the contemporary programs in our country are still in the same mode.

The other paradigm that emerged during the 1990s was the *development* paradigm. This paradigm recognizes training as an important input but follows it up with reflective practice, allowing teachers to experiment with new knowledge and skills and helping them discover the hidden truths. Such *experiential* learning takes time and cannot be hastened. The workshop formats of the earlier approach gave way to longitudinal programs that allowed the teachers to develop at their own pace. You will appreciate that though sounding theoretically better, the development paradigm requires much more time, effort, and resources. However, many such programs are now being offered in India

Levels of faculty development: Without undermining the importance of educational methods, we need to strike a balance between what can be known and what a medical teacher realistically needs to know. A phased approach to FD is most likely to succeed, more so in our country, given the number of medical teachers. This approach can be viewed in the shape of a pyramid with four levels. The lowermost level (*basic course*) is formed by the basic educational concepts and instructional skills. A workshop of 3–5 days should be sufficient for this purpose. Almost 100% of the medical teachers should be at least on this level.

Levels of faculty development

Research

Degree course

Advanced course, Fellowship, Diploma

Basic course
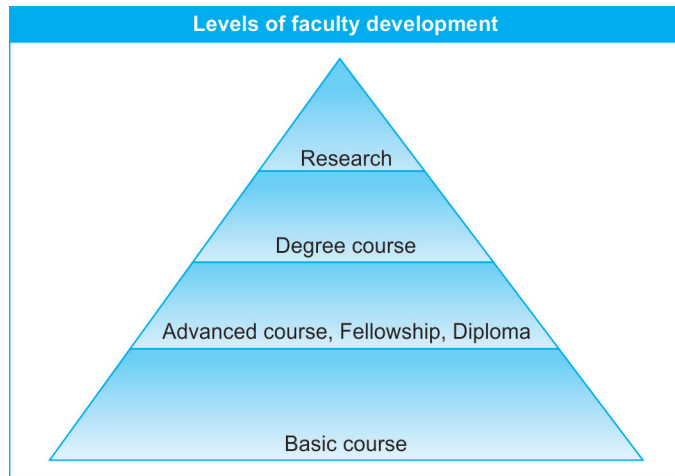
The next level (*advanced course, fellowship, or diploma*) is to provide more specialized training in key areas (assessment, instructional design, clinical skills teaching, program evaluation, etc.). It should also include some of the management issues such as change management, conflict management, and educational leadership which need to be taught in the context of an educational innovation project. This level will require a longer training of 10–15 days and needs to be followed up longitudinally for 6–12 months through distance mode. About 25–30% of the teachers need to be on this level.

The third level, which should cover 10–15% of the teachers, targets to provide a *degree in medical education* and requires intensive coverage of areas mentioned above. It should preferably include a thesis and an elective component for participants to develop their expertise.

The last level is for teachers occupying leadership positions. It should cover 3–5% of the teachers and, in addition to various areas discussed above, should include *research* in medical education. Such tiered approaches are working extremely well at many universities. You have guessed right that the present book is an attempt to address the base of this pyramid.

Dynamic faculty development: Medical education is not static. As we have discussed, it gets influenced by the evolving social realities. Recent changes are a perfect example of this relationship. The 1997 Medical Council of India regulations brought integrated teaching and internal assessment. They also brought newer assessment methods such as OSCE and all this needed a focused training.

**Dynamic
Program**

The proposed 2019 MCI guidelines have brought yet another important set of approaches like competency-based education, integration, electives, early clinical exposure and clerkship model of training. Implied in this is the fact that the contents of FD programs have to reflect these ongoing changes. Additionally, the contemporary changes in medical education make certain areas more acceptable. It is likely that by the time this book is in your hands, we may have a few more concepts waiting to be covered.

While contemporary changes will guide the content of FD programs, many areas will retain their position albeit with some change in emphasis. Assessment is one such example. Your role as an assessor is not going to change, but the emphasis has already changed from the assessment *of* learning to assessment *for* learning. Similarly, we are also moving more toward competency-based assessment and workplace-based assessment as much as we are beginning to re-realize the importance of expert subjective judgments in student assessment. The role of feedback in making learning better is yet another example of an important field for FD.

It is interesting to conceptualize FD as an immunization. As newer concepts emerge, they have to be included in our FD program. The effects of such interventions take time to manifest and can be *augmented* (e.g., organizational development) or *retarded* (e.g., no freedom to apply newer skills).The effects may wane off after some time and periodic boosters may be required.

Faculty development is recognized world over as an important input for making medical education better. Unlike clinical interventions, FD does not produce immediate results (just as bad teaching also takes time to show its effects), but a large body of research is accumulating to show that more than anything else, FD changes the way teachers look at learning and therefore at the way they should teach. The very fact that you are reading the fifth edition of a book on medical education is in itself testimony to the acceptance of the science of medical education in India. We do hope that many of you will advance to the next tier of FD and help in making a better quality of doctors that we produce in our country.

*If we teach today's students as we taught yesterday's,
we rob them of tomorrow.*

John Dewey

Appendix 1

How to Study

One of the most common questions faced by most teachers from their students is How should I study?. Educationists have suggested a number of approaches for effective learning. We are going to discuss some of the 'tricks' to make learning more effective. If you search the Internet, you may come across many more ideas also—however, the common thread running through all of them remains the same, i.e., interaction with the material. The more the processing, the better is retention and better is recall. It is pertinent to mention here is that the human brain is not like a tape recorder, which will verbatim record and replay whatever you read or hear. Rather, it processes the information, takes the gist out of it and records that gist. It is one of the reasons why different people understand differently though the source of information may be the same.

Let us first look at the model of information processing. Whenever, we get new information, it goes to our working memory. Working memory is like the 'cache' memory of a computer and can store only 5–7 facts at a time for only about 20–40 s. If the information is not processed, it is lost (just as you are sitting on at fast-moving train, you read the name of a station just crossed, and by the time the next one comes, you have already forgotten the previous one). However, if you make an effort to process this information, then it is transferred to short-term memory. As the name indicates, this can retain information for a few minutes (similar to RAM of a computer). If no further action is taken, the information will be lost. On the other hand, if you process this information, it is transferred to the long-term memory (like the hard disk of a computer).

Information Processing

Information in long-term memory is retained for a longer period of time, and depending on how much processing has gone in, it can stay there for years. For most students, the problem is not about storing something in their long-term memoy—rather it is retrieving that information when required. That is the difference between those with "good" memory and those with "poor" memory. A student with a good memory can retrieve the information and use it to solve the given

problem at hand. Another student who is unable to solve a given problem has not been able to activate his prior knowledge. You will remember this aspect in the context of difficult topics that we discussed in Chapter 25.

From this perspective, the key concept to better learning is to transfer the information to long-term memory and then remember where that information has been stored. Unfortunately, our brain does not have a *file allocation table* to tell us where the information has been stored. Like computers, the information is liable to get corrupted over time and needs repeated saving in correct format.

Improving Retrieval

So how do we take care of these? The key concept would be to process the information as much as possible. Information that has not been processed is of no use. Again talking of computer language, simply copying the printer software to your laptop will not allow documents to be printed. Rather, you have to "install" that software, meaning that the computer has to form an association between that software, operating system and other programs for the printer to function. You are right-processing is like installing software rather than simply copying it. Processing helps us to integrate new knowledge with existing knowledge. It is just like tying a number of clothes together in a cupboard so that when you pull anyone, the others also come out. If you do not tie them together, then you have to search for each cloth individually. Incidentally, this is the difference between experts and novices. Novices have to search their memory for each piece of information separately, while experts have "tied" all relevant information together and therefore are more efficient in retrieving and using information for problem-solving.

SQ3R Technique

You can use the SQ3R technique when reading a book to improve the processing of information. This allows you to retain information in response to a self-posed question, it allows you to process information, and it uses planned repetition to makes retention longer. This technique has been in use for many years now and has stood the test of time.

Reading from Books

You will have a look at this technique in the following table. Let us emphasize it here that the model makes a liberal use of *planned repetition* to increase retention and retrieval. Can you recal *Humpty dumpty sat on a wall* or other nursery rhymes still? The secret lies in repetition which our teachers made us do.

You may also come across some variations of this model and the most important one is to make notes. However making notes does not simply mean copying the text rather it means processing the information and putting it in your own words. We will discuss this later.

SQ3R Technique	
Action	***Example***
Survey	Before you start reading a chapter, survey the: ❖ Title ❖ Captions ❖ Figures ❖ Review questions ❖ Introduction ❖ Summary to get an idea of what is being discussed and to what extent
Question	Turn the title, headings, and subheadings into questions: ❖ What do I know already about this topic? ❖ What did the teacher tell about this topic in the class?
Read	Look for answers to questions that you framed Look for all bold, italicized, or underlined words Relate diagrams and figures to the description Read only a small part at a time
Recite	Close the book and verbally answer the questions that you posed Recite in your own words rather than verbatim Make relevant notes in your own words Quadruple learning (seeing, saying, hearing, writing)
Review/Reflect	Close the book and try to compare what you read and what you recited/noted Reread the parts forgotten or not well remembered Underline or highlight important parts Review frequently. It is better to have four spells of 30 min each rather than one spell of 2 h (also called *spaced practice*)

SQ3R Technique

Time Management

One of the biggest culprits for poor study is poor time management. Like any other aspect of life, good management of time is crucial for success in studying. It is difficult but manageable. Let us give you some tips for better time management.

Managing Time

a. Creating to-do lists: These help you to allocate your time meaningfully to different activities. Most such lists make an hour as the unit, but it may be better to make a week as the unit (e.g., I will finish topic "A" within this week). This has the advantage of allowing some flexibility and still making it possible to reach the objective. Traditionally paper and pencil have been used for this but now you have a number of other tools to not only create lists but also remind you of them. Your mobile phone can be a good friend as can be some of the personal information managers. A Google Calendar can send reminders on your mobile and help in time management. We also find Microsoft Outlook a very useful scheduling and reminding tool. In addition, a number of free software are available on the net to help you plan your time.

Group Study

b. Avoiding procrastination: This is one of your biggest enemies. Procrastination is at its worst with unpleasant tasks, e.g., reading a difficult subject, and requires a lot of effort to be overcome. However, the benefits far outweigh that effort.

c. Developing self-discipline: This is related to procrastination. Self-discipline can be considered a type of selective training, creating new habits of thought, action, and speech toward improving yourself and reaching your goals.

You would have noticed that all the three points discussed above are interrelated. Task scheduling promotes self-discipline which in turn promotes completing the tasks on time.

Studying with Friends

Group or peer learning in a very useful activity. On one hand, it motivates each member of the group to learn, and on the other, it allows you to build on each other's knowledge. Cooperative or collaborative learning is a team process where members support and rely on each other. Each one of you will have a different style of learning with peers and what works for you is the best style. However, we will like to mention only one common drawback of such activity. Whether you are learning individually or in groups, the objective should be that each one learns everything. Do not fall in the trap of dividing the subject into parts and learning only one aspect of it. You can also effectively use jigsaw technique. Each member of the group prepares one part and then discusses it with the others. Active listening and questioning will help you to make the best use of it. You can read more about jigsaw technique in Chapter 8.

Taking Notes in the Class

This is an issue with which teachers as well as students are concerned. It has the advantage of providing useful clues to the students and recording facts that may not have been given in books but also has the disadvantage of students diverting their minds only to writing at the cost of understanding. We have discussed this aspect in the Chapter 8.

Cornell note-taking system is recognized as a useful method for note-taking especially in higher education. It allows students to process the information and does not encourage passive writing. In essence, this method requires some changes in the way we understand and some changes in the way we write.

Especially printed notebooks for this method are available but even common notebooks can be effectively used. Here is a sample of notebook used for this method of note-taking.

Sheet for Cornell note-taking system

Cornell Note Taking
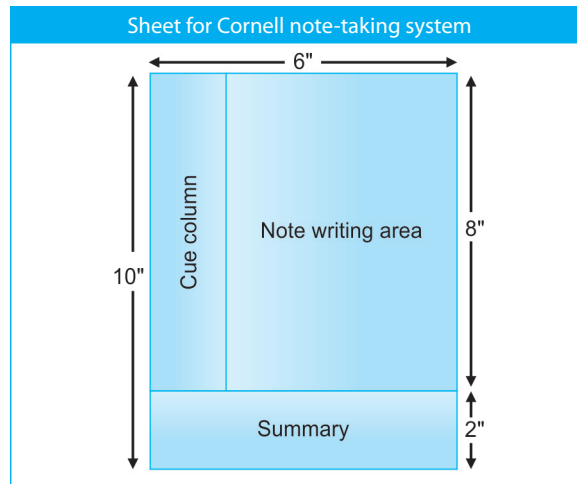
The note-taking area is to be used during lectures. You should concentrate on the main ideas rather than on details. Try to write as briefly as possible (do not use a sentence where a phrase would suffice and do not use a phrase where a word would do). You can develop symbols and abbreviations to efficiently record the notes.

Most of the forgetting occurs in the immediate post lecture period. Use this period to maximize the benefits of a lecture. Reduce the main facts to questions or key phrases and write them in the cue column. This will help you to revise the information without having to go through the entire notebook. These phrases also act as "pegs" on which you can hang the new knowledge.

Now you should recite the lecture by using only the cue area and covering the note-taking area. Recite aloud and in your own words. Compare it with what is written in the note area. Correct yourself if you went wrong at someplace.

Reflect on the ideas and add your own ideas or other material from the books. Try looking for the big picture. How does it fit with what you already know? Other ways to promote reflection are the three questions, namely—what happened; so what and what next.

Make a summary of what is recorded on the page and what you have thought after reflection and put it in the space marked summary. Do it separately for each page. This will help you during the revision process also. You would have noticed that the reading and note-making techniques discussed above depend a lot on the mental processing that you do. They help you move away from passive reading or writing. Why not try them in your next class? Making students aware of these techniques will help you as well by making your subject better understood.

Another technique to prevent conflict between understanding and writing in the class is to give time to the students to create notes when you are not speaking. We have discussed this technique in Chapter 8.

Memory Enhancers

Many a times, students use drugs in the belief that they will improve memory. Commercial advertisements of medicines or supplements often add to this belief. As discussed earlier, the difference in good and not so good students lies in the *management of memory* rather than to the size or quality of their brain! Some drugs, in fact, could interfere with mental processes by stimulating or depressing the mind and may do more harm than good.

Regular *spaced practice* and *planned repetition* are the keys to long-term memory.

करत-करत अभ्यास के जड़मति होत सुजान
रसरी आवत-जात के, सिल पर परत निशान*
*Practice makes a man perfect.

Appendix 2
Theories of Learning

We have given a broad overview of the common theories of learning. Although they originated at different periods of time, no theory is superior to others. People learn by various modes and each of the theories plays a part depending on the learners, subject matter, and context.

Theories of learning		
Theory	*Basic premises*	*Examples*
Behaviorism	a. Learning is a change in behavior	Role of the teacher is to produce the desired response to sustain it
	b. Environment shapes behavior	All assessment is essentially behavioristic
	c. Reenforcements can be used to shape desirable behavior	Rewards and punishments can be used to shape behavior
Cognitivism	a. Memory system is an organized processor of knowledge	Role of mind in learning Cumulative learning Concept of cognitive load
	b. Prior knowledge plays an important part in learning	Adult learning is largely based on cognitivism
Constructivism	a. Learners construct their own knowledge based on learning experiences	Learner is an active partner in knowledge construction
		Learning is discovery. Role of the teacher is to help the learner construct new knowledge. Role of feedback
Social learning theory	a. People learn from interaction with each other	Group learning importance of social situations in learning

Experiential learning	a. People learn in a cyclical manner of concrete experience, reflective observation, abstract conceptualization, and active experimentation	Role of the teacher is to provide varied learning experiences. Individual differences in learners regarding the mode of entry in the learning cycle
Situated learning	a. People learn differently in different situations b. Learning transforms understanding and responsibilities c. Emphasis on participation	Importance of communities of practice Apprenticeship model of training Role of feedback

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