

# SECTION 4: PLANNING AND WRITING A UNIT OF LEARNING

## OVERVIEW OF SECTION 4

This section, on planning and writing study units, is the longest one in the handbook. That is not surprising, since writing study units is by far the most time-consuming aspect of creating ODL materials.

### Structuring a unit

Section 3 ended with a course specification and a course guide. The specification defines the course content and may also divide it up into study units. Once the content has been allocated to units, it has to be turned into a unit of learning. Whereas in a textbook this would largely be expository material, in ODL, 'content' includes activities, examples, feedback, self-assessment, summaries and so on. This part looks at the function of those items and how they are combined to create a coherent unit of learning.

### Writing activities

The most important device used in ODL learning materials is the activity. In this part we look at why activities are so important, what types of activities there are and how to create and structure them.

### Using examples to promote learning

Although most instructional designers would probably rate activities as the most important ODL device, learners attach even more importance to examples (Martens, 1998). In this part we look at how to create effective examples, particularly to reinforce the learning of concepts, principles and methods.

### Illustrative devices

ODL materials tend to make greater use of illustrative devices than do traditional textbooks. Even words themselves are laid out with the aid of bullets, diagrams, tables, flow charts and so on. This part introduces the main illustrative devices used in ODL and provides some guidelines for their effective use.

## Access devices

The term 'access devices' refers to devices in the text or on the screen that help learners find their way around the material. At the simplest level are contents lists and headings, but ODL instructional designers have created a wide range of devices for both text and the web.

## Diversity issues

ODL materials are often used by student groups whose makeup is more diverse than what would normally be found in class-based groups. This means that extra care needs to be taken to ensure that the materials are understandable and accessible to all potential learners. In this part, we look particularly at gender, age, ethnicity and religion and the diversity issues that they raise.

## Estimating the study time for a unit

The final part in this section looks at estimating study time. The need to avoid overloading ODL materials has already been discussed, and this part introduces some ideas on checking how long a piece of learning will take.

# 4.1 STRUCTURING A UNIT

## 4.1.1 INTRODUCTION

Most ODL courses are subdivided into units, sometimes corresponding to a week's work. In print, each unit is like a chapter of a book. On the web, units usually correspond to one subdivision of the course web site.

This part looks at the structure of a typical unit and the components used to achieve that structure.

### Issues for instructional designers

1. How should the content be organised for, say, one week's work?
2. How should this content be presented to the learners?

## 4.1.2 THREE MAIN STAGES OF A UNIT OF LEARNING

An old adage of teaching says, 'I tell them what I am going to teach them. Then I teach them. And then I tell them what I've taught.'

Whilst the emphasis on ‘telling’ in this adage shows that the saying belongs to another era, words do highlight the three key stages of all good teaching:

1. Explain what the session will be about.
2. Conduct the session.
3. Remind learners what the session was about and check that they have learnt it.

Most ODL study units – whether print, computer-based or web-based – follow this approach generally. It is a good basis for beginning to structure any course unit.

### 4.1.3 COMPONENTS THAT FORM THE THREE-PART STRUCTURE

#### Stage 1: Explain what the session will be about

In the first stage, it is important to tell learners what the unit is about. Most ODL courses do this in more than one way, including (at the unit level): an introduction, a contents list and a list of learning objectives. Some also include an advance organiser (Ausubel, 1960). Advance organisers, as discussed in Section 3, are devices for giving learners a high level view of what they are about to learn. They can be done in one of two forms:

- **expository** – In this case, the learners are shown a high level view of what they will learn.

*Example:* When teaching how to create a web page, first show learners some simple pages and say ‘I am going to show you how to create a page like this’. This high level view provides learners with a reference point that helps give meaning to the new bits of knowledge they are going to acquire.

- **comparative** – In this case, the teacher reminds learners of something they already know that will be useful in helping them understand the new teaching.

*Example:* When teaching learners how to find a percentage difference, the teacher can first remind them how to calculate a percentage.

#### Stage 2: Conduct the session

The second stage is usually the bulk of the unit, whether in print or on the web. It is where the teaching and learning mostly take place.

Usually Stage 2 is subdivided into topics based on the learning objectives. So, if the unit has five learning objectives, Stage 2 would normally be divided into five parts. In each part, the instructional designer presents new material (examples and explanations) and sets activities based on this material.

### Stage 3: Remind learners what the session was about and check that they have learnt it

The final stage is the one where learners are reminded of what they have learnt. Two common ways to do this are to provide a self-marked end test and to give a summary of the key points in the unit.

The typical components used at each of these three stages are summarised in Table 14 (Lewis, 1990).

**TABLE 14.** The typical components of a unit of learning

Stage in the unit	Typical items	
1. Introductory material	<ul style="list-style-type: none"> <li>• unit number and title</li> <li>• an introduction</li> <li>• contents list</li> <li>• statement of pre-requisite knowledge (or a pre-test)</li> <li>• learning objectives for the unit</li> <li>• list of any equipment needed for studying the unit</li> <li>• other resources needed for the unit (e.g., a textbook)</li> <li>• time required for the unit</li> </ul>	
2. Teaching and activities	<ul style="list-style-type: none"> <li>• examples</li> <li>• explanatory text</li> <li>• activities with feedback</li> <li>• diagrams and illustrations</li> <li>• topic summaries</li> </ul>	This stage is usually divided into topics, each topic matching one learning outcome
3. Closing material	<ul style="list-style-type: none"> <li>• unit summary</li> <li>• self-test based on the unit learning objectives</li> <li>• link forward to the next unit</li> </ul>	

## 4.2 WRITING ACTIVITIES

### 4.2.1 INTRODUCTION

Activity is the most important part of learning. Even to learn something as basic as the days of the week requires the learner to actively repeat the days in order to remember them. As learning tasks become more complex (e.g., playing a piano sonata or solving complex equations), activity becomes more and more essential to learning.

This need for a high level of activity is a problem for instructional designers of print and web materials since both media are essentially passive. Much effort is needed to overcome the problem of passivity. This part looks at how to do that.

#### **Issues for instructional designers**

1. Why do I need activities in self-instructional texts?
2. How many activities are needed?
3. What are the various types of activities?
4. How do learners use activities?
5. What is the best structure for an activity?

### 4.2.2 WHY DO WE NEED ACTIVITIES IN SELF-INSTRUCTIONAL TEXTS?

We know from both cognitive and constructivist theories of learning that learner activity plays an important part in successful learning. This point is also emphasised between deep learning (learning to understand) and surface learning (learning for rote recall) (Marton and Säljö, 1976).

Numerous laboratory studies have demonstrated that inserting questions before, within and after texts can improve learning in various ways. (A useful summary of these studies is provided in Lockwood [1992].) These studies, however, suffer from being carried out in artificial conditions, so it is hard to generalise from them to real learners on real ODL courses. Despite these reservations, ODL instructional designers are unanimous in their belief that promoting active learning is a key part of their task. Furthermore, learners seem, on the whole, to consider that they benefit from such activities (Lockwood, 1992).

Other useful supporting evidence can be found from research on traditional lecturing. In a review of all the studies comparing lecturing with other teaching methods, 'other methods' were generally found to be more effective than lectures. On the whole, those 'other methods' were more active than attending a lecture. For example, where the aim of a piece of teaching was to 'promote thinking', discussion was more effective than lectures in 91% of studies (Bligh, 1998).

At a practical level, Rowntree reminds us of two important reasons for including activities in ODL texts: 'They are meant to keep learners purposely engaged with the material. ... Without such activities, our learners might assume that the only objective was to memorise the information we set before them' (Rowntree, 1990).

### 4.2.3 TERMINOLOGY IN ACTIVITIES

Some writers use other terms than 'activity', including 'in-text questions' and 'self-assessment questions'. Sometimes these words seem to be synonyms for 'activity'; at other times a distinction seems to be intended. In this handbook, only two terms – activities and self-assessment questions – are used to distinguish between two very different processes: formative learning (done in activities) and summative learning (done in self-assessment).

### 4.2.4 TYPES OF ACTIVITY

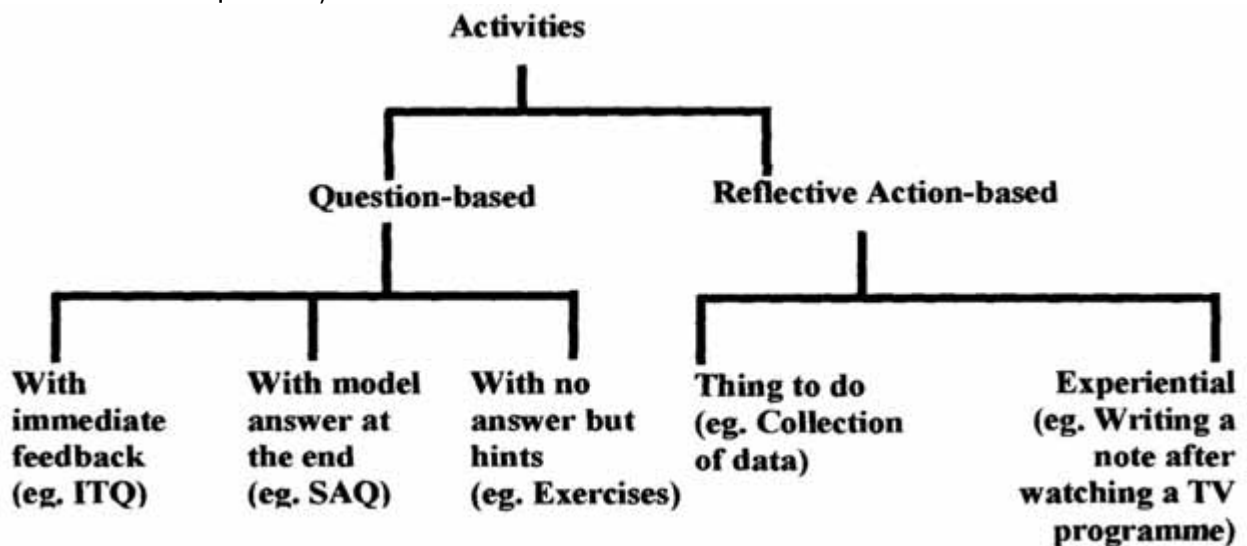
There is very little agreement among researchers over how best to classify activities.

Rowntree (1990) offers a simple list of five types:

- report own observations,
- restate facts, principles, etc.,
- distinguish between examples of concepts and principles,
- give own examples, and
- apply new concepts and principles.

A more sophisticated set of distinctions is offered by Indira Gandhi National Open University (IGNOU) (Mishra and Gaba, 2001), as shown in Figure 8.

**FIGURE 8.** The IGNOU taxonomy of activities (ITQ, In-text question; SAQ, Self-assessment question)



And a much more complex view is provided by Kember and Murphy (1994), who distinguish between 34 types of activity in learning materials and a further 19 types for group meetings.

## 4.2.5 HOW MANY ACTIVITIES ARE NEEDED?

To answer this question, it is necessary to return to the distinction between two approaches to ODL course design: tutorial-in-print and reflective action guide (see section 1.4, 'Types of ODL Instructional Design').

### Tutorial-in-print

In the tutorial-in-print approach, there are usually well-defined learning objectives and the course materials seek to teach a well-defined body of knowledge. In these circumstances, the following guidelines are a good basis for beginning to consider how many activities are needed:

- Every learning outcome should have at least one activity.
- Most learning outcomes should have several activities.
- Learning outcomes that have more than 10 or so activities are perhaps too large and should be split into smaller outcomes.

### Reflective action guide

If you are writing a reflective action guide, the number of activities is much harder to predict. That is because the learning outcomes tend to be broader and more personal and the knowledge

involved less well defined than for a tutorial-in-print. As a result, the activities tend to be longer, more discursive and often related to several learning outcomes at once. The following guidelines will help you judge how many activities are needed:

- Every learning outcome should be covered by at least one activity. (Note: This does not mean that every outcome has to have its *own* activity.)
- It is better to have too many activities than too few.

## 4.2.6 WHAT TYPES OF ACTIVITIES ARE THERE?

There are many types of learning activities. A sample list is shown in Table 15.

**TABLE 15.** A possible typology of activities

Type	Outline example
1. Report on own observations or experience	From your own experience, recall some occasions when you found it difficult to control some pupils in your class. (For a course on classroom management techniques)
2. Recall what has been taught	What do the initials ABC stand for in resuscitating a person? (For a course on first aid)
3. Give or explain examples	Which of the following are good examples of good irrigation practice and why? (For a course on basic irrigation techniques)
4. Give examples from own experience	From your own experience, give three examples of effective ways of managing your time. (For a time management course)
5. Apply new concepts or principles.	Convert the following passage from direct to indirect speech. (For a course on minute taking)

Source: Based on Rowntree (1990)



## 4.2.7 EXAMPLES OF ACTIVITIES

Activities based on the learner's experience

### EXAMPLE 19. Sample activity based on the learner's experience (a)

#### ACTIVITY 1

Try to come up with your own ideas in order to answer the question above. Make notes in your journal about ways to address the following in distance courses:

- (1) oral traditions
- (2) learning as a group affair
- (3) rote learning as a cultural norm

*I hope that you have been able to come up with a number of ideas that illustrate that a well-designed course at a distance can address cultural differences. Here are some real-life examples.*

*In **Guyana**, learners who live far away from the institution, use audio-conferencing to supplement print materials. This is done because the Guyanese culture has a strong oral component. The course integrates the print and audio conferencing meaningfully.*

*The **University of the South Pacific** also uses audio-conferencing to create communities of learners at a distance, because its learners come from countries where there is a strong tradition of group interaction for learning.*

*And in **India** there is a traditional tendency (habit) towards passive learning. Thus the **Indira Gandhi National Open University** uses carefully designed interactive print materials together with face-to-face support to stimulate new approaches to learning (COL 1995:11).*

Source: *Introduction to Materials Development in ODL*. ODL103-H, p.3 (UNISA)

**EXAMPLE 20.** Sample activity based on the learner's own experience (b)

Look at the statements in the quiz below. Tick the ones that you feel best describe you. Be honest with yourself!

	Tick for yes
I learn best by doing, seeing or hearing things first-hand	<input type="checkbox"/>
I learn best by finding new ways of doing things	<input type="checkbox"/>
I learn best when I feel I am in a 'safe' environment	<input type="checkbox"/>
I learn best when I am relaxed and calm	<input type="checkbox"/>
I learn best when I can see the 'big picture'	<input type="checkbox"/>
I learn best by working it out as I go along	<input type="checkbox"/>
I learn best when I have a plan with goals and targets	<input type="checkbox"/>

Source: *Introducing Counselling Skills* (National Extension College)

## Activities to help learn principles and concepts

### EXAMPLE 21. Sample activity to practise using principles



#### ACTIVITY 1.3

**STUDY** pars 2.20–2.31 of the textbook and then do the following:

- 1 List two exceptions to the general rule that a partnership is not regarded as a separate entity. Write these exceptions down.
- 2 Rhamjee, Pule and Constance formed a partnership. Rhamjee then becomes insolvent and his estate is sequestrated. Pule and Constance want to know the effects of Rhamjee's insolvency on the partnership. They come to you for advice.

*Make sure that you understand the legal nature of a partnership before you start answering this question. You should tell Pule and Constance that the partnership estate and their personal estates will be sequestrated, but that Rhamjee's creditors will first be paid from his personal estate before the trustee will look at the partnership estate. A further consequence is that the partnership will dissolve, since the insolvency of one of the partners is a ground for the dissolution of a partnership. I will tell you more about this in study unit 4.*

Source: *Entrepreneurial Law*. MRL101F, p. 4 (UNISA)

**EXAMPLE 22.** Sample activity to help learners apply new concepts**ACTIVITY 2**

Tick the appropriate box to say which of the following are assets and which are liabilities.

	Asset	Liability
A car	<input type="checkbox"/>	<input type="checkbox"/>
A bank loan to buy the car	<input type="checkbox"/>	<input type="checkbox"/>
Office furniture	<input type="checkbox"/>	<input type="checkbox"/>
Raw materials	<input type="checkbox"/>	<input type="checkbox"/>
Debt owed for raw materials bought	<input type="checkbox"/>	<input type="checkbox"/>
A building	<input type="checkbox"/>	<input type="checkbox"/>
The mortgage used to buy the building	<input type="checkbox"/>	<input type="checkbox"/>

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*Compare your answers with ours, at the end of this module.*

Source: *Essential Book-Keeping* (National Extension College, Cambridge)

## Planning activities

### EXAMPLE 23. Sample activity based on action-planning

#### **How adults learn**

##### **Introduction**

Our knowledge of how adults learn is, to say the least, incomplete. It is not even clear that all adults learn in the same way. At present, the best we can do is to set out what seem to be the most-widely accepted characteristics of adult learners and then to deduce from these what seem to be the guiding principles for the design of post-school learning materials. Whatever the weaknesses of this approach, at least at the pragmatic level, designers who follow these guidelines consistently produce ODL courses that lead to high quality courses.

##### **Issues for instructional designers**

1. How are adult learners different from school-age learners?
2. What implications do these differences have for instructional design?

##### **Characteristics of adult learners**

Various writers have maintained that adults possess certain characteristics that affect how they approach learning and how they learn. Perhaps the most commonly quoted summary of these ideas is that of Knowles (1990), who identifies six characteristics of adult learners:

###### **1. The need to know why they are learning**

School children may accept the school curriculum without question, treating it as part of the 'natural' world of being a child. Adults are less accepting and, when faced with a new course or curriculum are more likely to ask questions like 'How will this help me in my job?' or 'How will this help me bring up my children?'

This leads to an important observation about adult learning: adults are likely to put more effort into a task if they think that they will benefit from it. This implies that ODL curricular should concentrate on what is beneficial to adult learners, i.e. what can be practicably applied at home and at work.

###### **2. Adults see themselves as responsible, self-directed persons**

Adults tend to see themselves as being responsible for directing their own lives: deciding what job they want; deciding how to bring up their children; deciding what leisure pursuits they wish to follow. In education, this manifests itself as a desire to make their own choice of courses and to exercise some autonomy within a course. In educational terms, we can say that adults like to set their own goals and choose their own learning tasks. This criterion is hard to meet when designing ODL courses: materials-based courses are necessarily more pre-prepared and more rigid than courses delivered in a classroom.

## Practical activities

### EXAMPLE 24. Sample practical activity

#### Practical Activity taken from Physical Science IGCSE

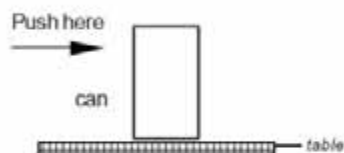
When does an object topple over?

**What you would need:**

1 empty can  
sand

**What you would do**

Place the empty can on a table and try to push it over, by applying the force at the top as shown.



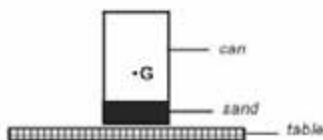
Let us look at some positions of the can.



The can topples over when the vertical line through the centre of mass falls outside its base!!

Place some sand inside the can. Try to push it over. Did you feel that it is much more difficult to make it topple over? Why?

The centre of mass was lowered by adding sand to the can.



Now try the next self mark activity to see if you understand the Centre of Mass.

## Reading activities

In study guide ODL courses, activities are often built around readings of the accompanying texts.

### EXAMPLE 25. Sample reading-based activity

#### 3.4 LIABILITY OF PARTNERS



##### ACTIVITY 3.6

**STUDY** pars 5.32–5.34 of the textbook and write down the difference in liability before and after dissolution of the partnership.

In principle partners are jointly and severally liable for partnership debts. The meaning of joint and several liability can best be explained by way of an example: Say a partnership has three partners, namely, Martin, Kutlwano and Lesedi. If Kutlwano, acting on behalf of the partnership, undertakes to pay Pick and Choose CC the sum of R600 monthly for the electric stove, Kutlwano binds herself (as principal) to pay Pick and Choose CC the said sum, whilst she also binds Martin and Lesedi (acting as their agent) to pay Pick and Choose CC R600 per month. Consequently, Pick and Choose CC may claim the R600 from Kutlwano, or it may claim the R600 from Lesedi, or it may claim the R600 from Martin. Alternatively, it may sue Kutlwano, Martin and Lesedi together for the R600. In other words, the most that it can claim is R600 and it may sue any of the partners or all of them together for this amount. If Pick and Choose CC decides to claim the whole amount of R600 from Kutlwano only, she may recover R200 from Martin and R200 from Lesedi.

Source: *Entrepreneurial Law*. MRL101F, p. 22 (UNISA)

## Scenario activities

A very common type of activity involves tasks based on a given scenario.

### EXAMPLE 26. Sample scenario-based activity

Read the scenario below and then answer the following questions:

1. In planning his changes, what things did Robert Ruthless omit to do?
2. What factors might explain the problems with the computer system, staff absences and resignations?

If Robert Ruthless had called you in at the start to help him plan a change programme, what advice would you have given him?

Robert Ruthless had decided to re-organise the sales and marketing office. Ever since he could remember, it had been organised around sales areas. As the product range had grown and the products had become more complex, he saw staff having more and more difficulty coping with the technical aspects of what they were selling. The solution came to him in a flash: re-organise the staff around product groups. Since the sales software was area-based, he thought this was a good time to have a new computer system; staff were always telling him how antiquated the current system was.

So, Robert closed his office door, wrote a specification for the new system and sent it off to his pet ITC company. Whilst the programmers got to work on the new system, Robert planned a high-powered presentation on his new working arrangements and wrote a detailed staff manual.

A few weeks later, he was ready to announce the changes. In great excitement, he went through his presentation. At the end there was silence – not a question or comment.

Not long after, Robert was off sick for a long time. From the first day of the new system, everything seemed to have gone wrong: the staff had endless problems with the computer system; staff absence seemed unusually high; there had been several unexpected resignations; and customer complaints were at record levels.

Source: *Entrepreneurial Law*. MRL101F, p. 35 (UNISA)



## 4.2.8 ACTIVITY TASKS

The precise task set can be in one of many formats, such as:

- a short answer task
- an extended answer task
- a true-false task
- a multiple-choice task
- a matching task
- a fill-in-the-blank task
- a 'put in order' task
- a complete the graph/diagram/table task
- a create something task (e.g., type a paragraph of text using your word processor)
- a collect data task (e.g., observe traffic, interview a person).

The variety is limited only by your imagination.

### Ideas for activities

A good source of examples of a wide range of activities is Kember and Murphy (1994).

## 4.2.9 WHAT IS THE BEST STRUCTURE FOR AN ACTIVITY?

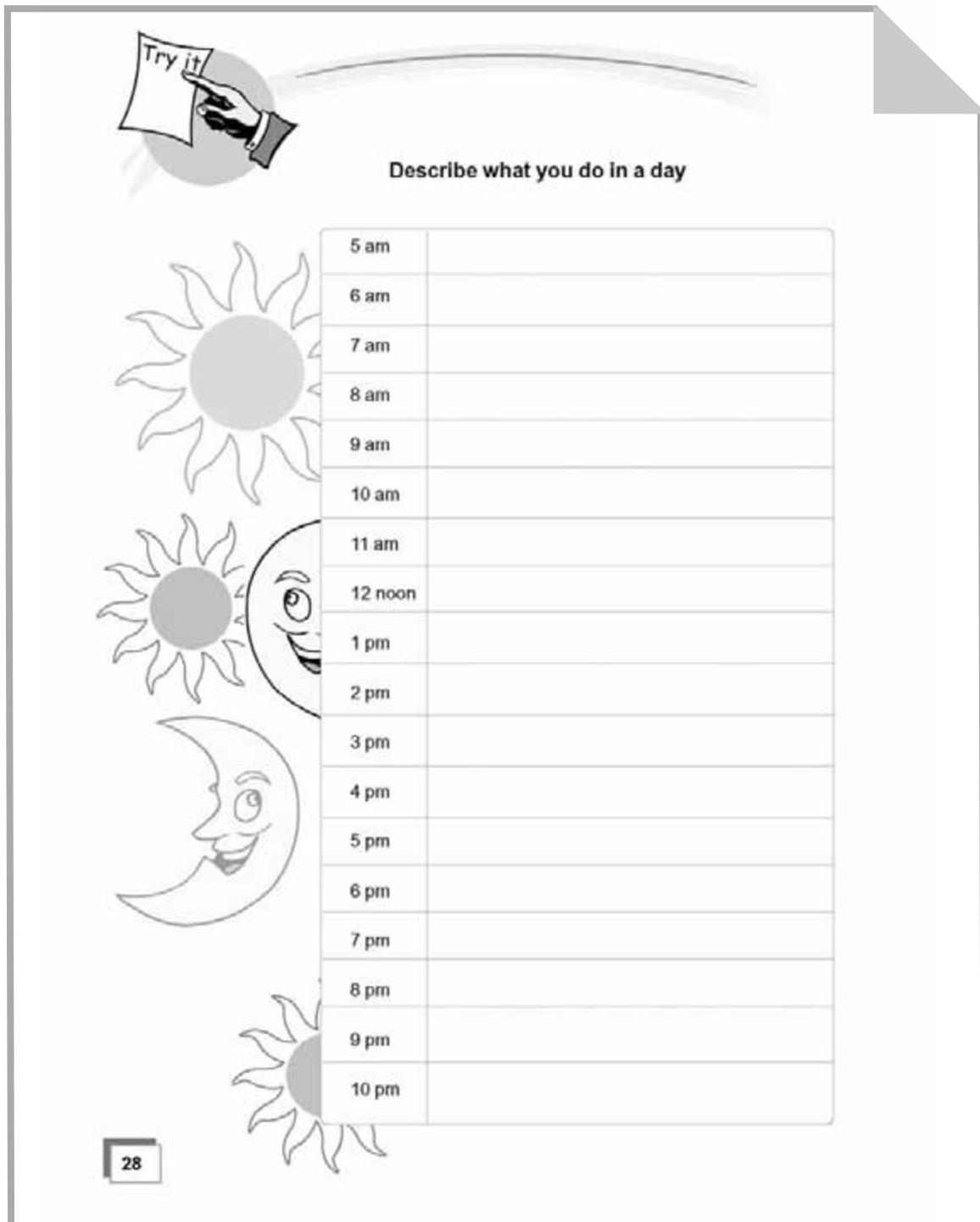
Any casual survey of a range of ODL materials will reveal a wide range of approaches to the precise format of an activity. In some materials, an activity is no more than a question; in others it is an elaborately developed task. Lockwood (1992) has argued that the research that he reviewed points towards a particular recommended format for ODL activities (Figure 9). (The example in the figure is based on an activity to teach the use of apostrophes with singular words.) Each feature of the format in Figure 9 follows from one or more of the research results that Lockwood reports and, hence, there are good reasons to believe that this format should be adopted.

**FIGURE 9.** A recommended format for activities

<b>Activity 1: Apostrophes with singular words</b>	<b>Purpose of this element:</b>
This activity will help you improve your use of apostrophes to show possession.	Motivational introduction
<p>Rewrite each of the following to use an apostrophe. We've done the first one for you.</p> <ol style="list-style-type: none"> <li>1. the palace of the Queen</li> <li>2. the book of my friend</li> <li>3. the computer of Charles</li> <li>4. the surface of the Earth</li> </ol>	Task/ instructions
<ol style="list-style-type: none"> <li>1. <u>the Queen's palace</u> _____</li> <li>2. _____</li> <li>3. _____</li> <li>4. _____</li> </ol>	Answer grid and example if needed
Take no more than 5 minutes over this.	Time guide
<p><b>Feedback to Activity 1</b></p> <p>Your answers should have been as follows:</p> <ol style="list-style-type: none"> <li>2. <b>my friend's book.</b> If you wrote 'my friends' book' then your answer refers to a book owned by more than one friend.</li> <li>3. <b>Charles' computer</b> or <b>Charles's computer.</b> If you wrote 'Charle's computer' then you should note that the apostrophe never goes inside the original word. It is always after the word.</li> <li>4. <b>the Earth's surface</b> If you wrote 'the Earths' surface' then you are referring to more than one Earth.</li> </ol>	Feedback  Includes comments on likely wrong answers

Three examples of answer grids are given in Example 27, Example 28 and Example 29. In each case, the answer grid both helps learners think clearly about the task to be done and provides them with clear guidelines for the structure of their answers.

### EXAMPLE 27. A simple answer grid



**Describe what you do in a day**

5 am	
6 am	
7 am	
8 am	
9 am	
10 am	
11 am	
12 noon	
1 pm	
2 pm	
3 pm	
4 pm	
5 pm	
6 pm	
7 pm	
8 pm	
9 pm	
10 pm	

28

Source: Institute for Adult Basic Education and Training (UNISA)

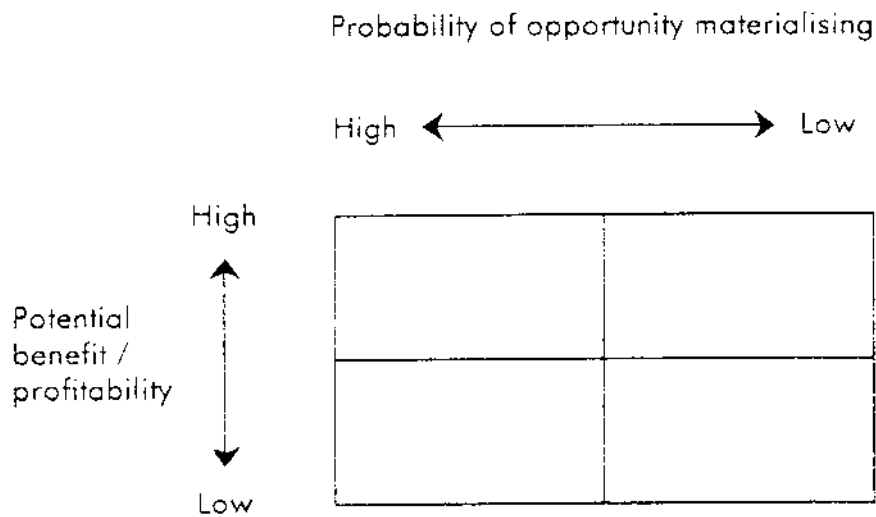
## EXAMPLE 28. Sample answer grid that structures the learner's thinking

### ACTIVITY 3: Using the opportunity matrix

See if you can label the quarters in the matrix in Figure 2, using the same three labels (high priority, low priority and zone of uncertainty) as in the threat matrix.

*This activity should not take you longer than about five minutes.*

**Figure 2: Opportunity matrix**



Source: *Introduction to Distance Education*. M2 (International Extension College, Cambridge)



## 4.2.10 HOW DO LEARNERS USE ACTIVITIES?

Although some students report not doing activities, there is good evidence from various studies that most students do perform them. To maximise activity completion, it is important to make sure that answer grids are provided and that activities are not more demanding than is needed (see Table 16). It seems likely, also, that activities are more likely to be completed if they are interesting. There is also emerging evidence that, on web-supported courses, activities that require learners to report their results to an online group are more likely to be completed than when the same task is not for reporting.

**TABLE 16.** Some key findings on learner use of activities (Lockwood, 1992)

Finding	Implications for instructional design
The activities at the beginning of a course are used by more students than those later in the course, especially when students are short of time.	<ul style="list-style-type: none"> <li>• be careful not to put too much material into the course</li> <li>• be careful that the later units of a course are not longer than the early ones</li> </ul>
Including an answer grid as part of an activity leads to activity completion levels of 80–100%. Not having an answer grid gives completion levels of 30–50%.	<ul style="list-style-type: none"> <li>• provide an answer grid when it is practicable to do so</li> </ul>
The more demanding the activity, the lower the response.	<ul style="list-style-type: none"> <li>• be careful not to make activities more demanding than they need to be for learners to achieve the relevant learning objective.</li> </ul>

## 4.2.11 FEEDBACK IN ACTIVITIES

An important function of activities is to give feedback to the learners. In the classroom, the teacher provides feedback in response to learners' questions, errors and so on. It is hard to reproduce the same level of feedback in ODL materials, and especially so in print, but it is essential to look for ways of doing so. (Feedback is more easily incorporated into computer-based courses.) The prime method of providing feedback is through activities, although some feedback comes from tutors and fellow students.

According to Ausubel and Robinson (1971), feedback is thought to be most effective when it:

- is continuous (especially for concept learning),
- is immediate (to prevent errors becoming embedded),
- is full (not just an answer of 'right' or 'wrong'), and
- is explained (learners are told why their answer was wrong or what the logic is behind the correct answer).

## 4.3 USING EXAMPLES TO PROMOTE LEARNING

### 4.3.1 INTRODUCTION

In a study of learners' use of embedded devices, the most popular device was found to be examples (Martens, 1998). It is therefore odd that many texts on writing ODL materials have no discussion on examples. Says Romiszowski (1986), 'The power of example is often underrated in education and training. Teachers spend too much time "telling" and not enough time "showing".'

In this handbook, examples are considered to be of similar importance to activities and it is recommended that instructional designers include as many examples as are feasible in any given piece of ODL.

#### **Issues for instructional designers**

1. What sort of things do I need to provide examples of?
2. What makes good examples?

### 4.3.2 WHAT SORT OF THINGS NEED EXAMPLES?

Examples are most important at the comprehension and application levels of Bloom's taxonomy (see section 3.3, 'Setting Aims and Objectives for Your Course').

At the lowest level, knowledge, examples are not possible. If you are trying to teach the fact that the name of the ocean to the west of Africa is the Atlantic Ocean, all you can do is state that fact. You cannot give an example of 'Atlantic Ocean', although you can show the ocean itself.

At the comprehension level, examples are used to help learners understand new ideas and methods. At the application level, examples are used to help learners use the learning that they have acquired. Table 17 summarises the use of examples at these two levels.

**TABLE 17.** Where examples are most needed

Category	Material for which examples are needed	Purpose of examples
Comprehension	Concepts	To aid understanding
	Rules	
	Principles	
	Procedures (algorithms)	
Application	Use of concepts	To develop proficiency in application
	Use of rules	
	Use of principles	
	Use of procedures (algorithms)	

### 4.3.3 HOW TO GIVE EXAMPLES OF CONCEPTS

#### Concrete (primary) concepts

Concrete concepts are ones that refer to real things or situations and that cannot be broken down into further concepts. Examples of concrete concepts include colours, distance and light.

The following steps should be used to teach a concrete concept (e.g., the concept of blue):

- Show some examples of things that possess the property 'blue' alongside some things that do not possess this property. Make sure that all the blue objects are clearly blue and all the non-blue things are clearly not blue (i.e., avoid cases where it is hard to say whether the object is blue or not).
- Test the learners by presenting some further (clear-cut) examples of blue and non-blue objects.
- Once the learners have mastered the basic concept, continue presenting finer distinctions up to the point of understanding that you wish to reach.



## Defined (secondary) concepts

Defined concepts are ones that are made up of other concepts. Examples of defined concepts are triangles, money and house.

There are two main ways of teaching defined concepts:

1. **example-rule method** – This method should always be used with children and can also be used with adults.
  - Show some examples (e.g., some triangles) and non-examples (e.g., some other shapes).
  - Ask the learners to work out what the rule is that makes the concept (e.g., 'triangles have three sides').
  - Test for understanding.
  - If the learners' definitions are not exactly correct, challenge them by presenting some cases that do not work under their definition.
  - Continue to refine until learners reach the degree of discrimination that you require.

To see instances of teaching by the example-rule method, see Examples 30, 31 and 32.

2. **rule-example method** – An alternative way of teaching is to first state the rule and then to give examples (Romiszowski, 1986; Rowntree, 1990). This method should only be used with learners who have a reasonable capacity for learning in an abstract way.
  - State the definition and give some examples and non-examples.
  - Test for understanding by presenting further examples and non-examples.
  - Continue to refine until learners reach the degree of discrimination that you require.

### EXAMPLE 30. Finding rules from example data

#### Discovering the exponential rules

In algebra classes, learners get very confused trying to remember the rules of exponents. For example, when you raise numbers to powers, do you add or multiply the exponents? It is important to explore working with exponents on whole numbers rather than with letters or variables. By doing so, learners are able to deal directly with the concept and actually generate the rules themselves.

Try to discover the exponential rules by doing the following activity:

#### Activity 3

- (1) If  $x = 3$ ,  $y = 2$  and  $w = 5$ , find:
  - (a)  $5y^2$
  - (b)  $(5y)^2$
  - (c)  $2x^2$
  - (d)  $(2x)^2$
  - (e)  $xy^2$
  - (f)  $yx^2$
  - (g)  $yw^2 - wy^2$
  - (h)  $(w-y)^2$
  - (i)  $2w - y^2$
  - (j)  $w^2 - x^2$
- (2) First write the following out (expand) and then in short form.
  - (a)  $a^{13} \times a^2$
  - (b)  $a^{24} \times a^2$
  - (c)  $a^{33} \times a^5$
  - (d)  $3a^4 \times a^3$
- (3) Write in short form:
  - (a)  $a^5 \times a^7$
  - (b)  $a^8 \times a^{12}$
  - (c)  $a^{40} \times a^{50}$
  - (d)  $n^{30} \times n^{70}$

#### Exponential rule 1

- To multiply powers of the same base, add the exponents

(1)  $3^4 \times 3^3 = \dots\dots\dots$

(2)  $y^4 \times y^2 = y^{4+2} = y^6$

(3)  $a \times a = \dots\dots\dots$

In general,  $a^m \times a^n = \dots\dots\dots$

**EXAMPLE 31.** A well-presented example being used to teach rules

<b>Theodoric Office Furniture</b> ①			
19 High Street, South Reading, Berkshire RG1 2NH Tel: 0118 954 4156 Fax: 0118 954 4178 VAT REG NO 352-2327-75			
<b>INVOICE</b>			
② To: Wentworth plc 56 Highbury Industrial Estate Reading Berks RG2 9PQ		③ Date & Tax point: 31 October 1998 ④ Our ref: 7812/3 ⑤ Your ref: O/No. 0943A	
⑥ Qty	⑦ For	⑧ Cat.	⑨ Price £
14	Grey office chairs @ £89	OC4G	1,246.00
3	Teak 3-drawer desks @ £315	TD2N	945.00
			2,191.00
Less discount 2%			43.82
Sub-total			2,147.18
VAT @ 17.5%			375.75
Total			2,522.93
⑬ Terms: 30 days net monthly			
⑭ E&OE			

This invoice shows the name and address of the sender ① and the recipient ②, and the date ③ – these are all straightforward. It has two references:

- the sender's reference ④, which is the invoice number and will be used to identify the invoice on a statement and in the accounts
- the recipient's reference ⑤, which in this case is the number of the order that Wentworth sent to Theodoric Office Furniture.

Putting the buyer's reference on the invoice makes it easy for the buyer to find the right order and check the invoice against it. Invoices which don't match any order won't be paid as there is no evidence that the organisation ever ordered the goods.

The main part of the invoice shows what Theodoric has supplied. The first column shows how many of each has been sent ⑥, the next describes the goods and

**EXAMPLE 32.** An example being used to teach a method

**Example**  
Solve for  $x$  and  $y$ :

$$\begin{aligned} x - y &= 5 \dots\dots\dots (1) \\ x^2 + y^2 &= 97 \dots\dots\dots (2) \end{aligned}$$

**Solution**

$$x = y + 5 \dots\dots\dots (3) \quad \text{(Solve for } x, \text{ using the linear equation (1).)}$$

$$(y + 5)^2 + y^2 = 97 \quad \text{(Substitute (3) into (2).)}$$

$$y^2 + 10y + 25 + y^2 = 97 \quad \text{(Solve for } y.)$$

$$2y^2 + 10y - 72 = 0$$

$$y^2 + 5y - 36 = 0$$

$$(y + 9)(y - 4) = 0$$

$$y = -9 \text{ or } y = 4$$

(Now find  $x$  by substitution for  $y$  in (1).)

If  $y = -9$ ,  $x = -4$       If  $y = 4$ ,  $x = 9$

$\therefore$  The solution is  $(-4; -9)$  or  $(9; 4)$ .

Source: *Trigonometry, Algebra and Calculus*. NPD030-A, p. 94 (UNISA)

## Frequency of use

Before we leave concept learning, it is useful to note that the more connections that learners are asked to make between a new concept and other concepts, the better the concept will be learned (Bligh, 1998). This means that you need to offer students multiple opportunities for making further reference to that concept as the course progresses. The spiral curriculum (see section 3.5, 'Methods of Ordering Content') is an effective way of doing this.

### 4.3.4 HOW TO GIVE EXAMPLES OF RULES AND PRINCIPLES

Rules and principles basically take the form:

if A, then B

where A and B are each concepts (or collections of concepts). Some examples of these are given in Table 18.

**TABLE 18.** Some examples of rules and principles

Example	Concepts involved <sup>1</sup>
If you cut yourself, you should wash and disinfect the wound.	A: <u>cutting yourself</u> B: <u>washing</u> and <u>disinfecting</u>
If there is traffic coming, you should not cross the road.	A: the <u>arrival</u> of <u>traffic</u> B: <u>crossing</u> the <u>road</u>
If a plant flowers on last season's growth, prune it straight after flowering.	A: <u>flowering</u> on <u>last season's growth</u> B: <u>prune</u> <u>after</u> <u>flowering</u>

<sup>1</sup>Each underlining is a separate concept, hence 'cutting yourself' involves two concepts.

Rules and principles are generally easy to learn, provided the underlying concepts are well understood. To teach rules and procedures (Romiszowski, 1981):

- State the rule or procedure.
- Give some examples.
- Ask learners to apply the rule or procedure to some other examples.

### 4.3.5 HOW TO GIVE EXAMPLES OF PROCEDURES (ALGORITHMS)

A procedure (also known as an algorithm) has the following characteristics:

- It is used to solve a well-defined class of problems.
- It has a set series of operations, applied in a defined way.
- The operations are (individually) fairly simple.

Examples of procedures include:

- calculating an average,
- baking a cake to a given recipe, and
- diagnosing appendicitis.

One of the common features of procedures is that they represent accumulated, consensual knowledge of the best way to approach a given class of problems. There are two ways to teach procedures:

- **inductive** – Show the learners the steps.
- **deductive** – Expose the learners to some simple examples from which they discover the procedure.

### Inductive teaching of procedures

The steps in the inductive method are set out in the left-hand column below. The second column shows how this would work for teaching ‘calculate an average’.

Step	Example
Explain the procedure to learners.	This is how you calculate an average. You add up all the numbers ... etc.
Demonstrate the method with one or more examples. The examples must be very straightforward.	I will find the average of 3, 7 and 5. First, I add up the numbers: $3 + 7 + 5 = 15$ etc.
Ask the learners to apply the method to some straightforward examples.	Now you try this example ...
Repeat (if needed) with more complicated examples.	

This is thought to be the better method to use for procedures that learners will use frequently.

In some cases, procedures may only be presented as information, rather than taught in more detail. Example 33 illustrates this approach.

## EXAMPLE 33. Inductive teaching of a procedure

**Registered Manager's Solution** Theme 4: Managing operations

It is vital that you have a written Fire Procedure that everyone understands and is familiar with. An example of a Fire Procedure is shown in Figure 1, below.

**IF A FIRE BREAKS OUT:**

- 1 Sound the alarm
- 2 **Call the Fire Brigade (999)** – better to be safe than sorry!
- 3 Locate the fire – using the panel at the base of the stairs, if necessary.  
**Always feel the back of the door or the door handle – using the back of your hand – before you open a closed door. If hot, DO NOT OPEN, and GO INTO PHASED EVACUATION IMMEDIATELY.**
- 4 Attack the fire, if it is safe to do so, using the fire extinguishers and the fire blanket.
- 5 If the fire can't be contained, then go into a phased evacuation.

**PHASED EVACUATION PROCEDURE:**

*Phase 1*  
If you decide to enter the room in which the fire started, move people from the room, closing the door behind you.

*Phase 2*  
Evacuate residents by way of the staircases or other routes as necessary. Take residents to other unaffected areas within the building, closing all doors behind you.

*Phase 3*  
Total evacuation of the Home to a place of safety outside the building – preferably the pre-arranged assembly point at the front of the building.

**ADVICE FOR MOBILE RESIDENTS:**

- 1 Leave the building by the nearest exit. **DO NOT** stop to collect any belongings.
- 2 Close all doors behind you.
- 3 Report to the assembly point which is **AT THE FRONT OF THE BUILDING.**
- 4 **DO NOT RE-ENTER THE BUILDING FOR ANY REASON** until you are told it is safe to do so.

Figure 1: Sample Fire Procedure

### First Aid arrangements

In accordance with the Health and Safety (First-Aid) Regulations 1981, workplaces should have First Aid provision. Ideally:

- when people are at work (including nightshift) there should be at least one appointed person who can take charge in an emergency situation – e.g. calling for an ambulance
- the appointed person should receive HSE-approved emergency First Aid training, plus Refresher Training every three years
- a First Aid box should be provided and should contain only the items that a First-Aider has been trained to use – the First Aid box should not contain medication of any kind
- all incidents should be recorded by the appointed person – name of the casualty, date, time and circumstances of the incident, the injury sustained and the treatment given.

## Deductive teaching of procedures

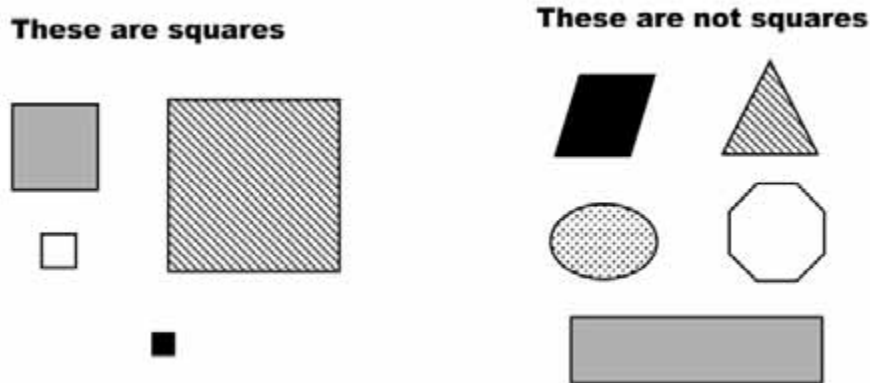
- Explain the problem to the learners (e.g., how can an average be calculated?).
- Give the learners some very simple data/examples to work on.
- Ask the learners to deduce the procedure.

This is thought to be the better method to use for procedures that learners will use rarely (Romiszowski, 1981).

### 4.3.6 THE USE OF NON-EXAMPLES

When teaching concepts, it is important to give both examples of the concept and non-examples of the concept. For instance, Figure 10 shows how to teach the concept 'square'. Four squares are shown on the left-hand side, but these alone are not enough to avoid misunderstanding. Learners might think that square-ness has something to do with position on the page, colour, shading, and so on. The provision of the non-examples on the right-hand side clearly shows that the only difference between squares and non-squares is shape.

**FIGURE 10.** Showing 'square-ness' by giving examples and non-examples



#### **Examples must be ...**

Most of the time, examples should be chosen with the following criteria:

- They should be short.
- They should be clear-cut.
- They should be self-explanatory.

However, where you need to teach about the complexities or subtleties of particular situations, examples will need to be less well defined.



## 4.4 ILLUSTRATIVE DEVICES

### 4.4.1 INTRODUCTION

Graphics and illustrations have been shown to ‘aid recall of the textual material that they illustrate’ (Hartley, 1994). They are therefore a valuable aid to the instructional designer. However, it is important that they be used well since they ‘*attract or distract* the reader’ (Hartley, 1994) (original emphasis.)

#### **Issues for instructional designers**

1. What are the purposes of illustrations?
2. What methods can I use to illustrate learning materials?
3. How can illustrations be made effective?

### 4.4.2 PURPOSE OF ILLUSTRATIONS

According to Hartley (1994), illustrative devices are best used when:

- something is too abstract to explain in words,
- something is too complex to explain in words, or
- you want the learner to look at more than one idea at the same time.

However, these general guidelines need to be broken down into something more detailed. This is done in Table 19 where 11 types of instructional purpose are identified and matched against the various types of illustrative device. For example, tables of words are good for showing relationships and pattern, showing structure, and showing sequences.

**TABLE 19.** Guidelines for matching illustrative devices to instructional purpose (after Lewis, 1990, and Kember, 1991)

Illustrative device	Instructional purpose										
	1	2	3	4	5	6	7	8	9	10	11
	Show what things look like	Show how some-thing works	Show quantitative relationships	Show change over time	Show relationships / pattern	Show structure	Show sequence / process	Simplify	Motivate	Convey emotion / feeling	Add emphasis
Tables of words					◆	◆	◆				
Tables of numbers			◆	◆	◆						
Maps					◆			◆			
Diagrams		◆		◆	◆	◆	◆	◆			
Graphs			◆	◆	◆		◆	◆			
Bar charts			◆	◆	◆		◆	◆			
Histograms			◆	◆	◆		◆	◆			
Organisational charts					◆	◆					
Flow charts					◆		◆	◆			
Cartoons									◆	◆	◆
Drawings of objects	◆	◆				◆		◆			
Photographs	◆								◆	◆	
Icons						◆					

In addition to the purposes identified in Table 19, illustrative devices can also be used for reasons other than directly promoting learning. For example:

- decoration
- amusement
- expression (to convey emotion or feeling).

### 4.4.3 TYPES OF ILLUSTRATIVE DEVICES

A wide range of illustrative devices can be used in ODL. The most common are shown here.

#### Tables of words

Tables of words are often used to present detailed information in a clear way and to show relationships between different ideas. In Example 34 you can see how a table helps to clearly present the tasks in a project plan.

#### EXAMPLE 34. Use of a table of words to demonstrate a planning process

<b>Project objective: One day training course for new staff</b>		
<b>Project deadline: One month from today</b>		
<b>Project organiser: Self with help from Lillian Grover</b>		
Task	Who to complete	Deadline
Fix exact date for course	ST	end of week 1
Find out budget available	ST to negotiate and agree with LG	
find out number of attendees		
Research possible venues	ST to ring round and obtain literature and draw up table of alternatives with facilities and costs	middle of week 2
Get LG to agree venue	ST to discuss alternatives with LG	middle of week 2
Plan programme for day	ST to ask LG to complete	end of week 2
Book venue	ST to write and book	end of week 2
Invite speakers (in-house)	ST to e-mail	end of week 2
Ask in-house staff to prepare notes	ST to e-mail	middle of week 3

Source: *Administration of Business Level 3* (National Extension College, Cambridge)

In Example 35, the tabular format encourages learners to use a particular analytical approach to thinking about student support needs in ODL.

### EXAMPLE 35. Using a table of words to demonstrate a method of analysis

STUDENT ISSUES		RESPONSE
<ul style="list-style-type: none"> <li>• knowledge</li> <li>• cognitive skills</li> <li>• literacy</li> <li>• numeracy</li> </ul>	intellectual cognitive academic	TUTORING
<ul style="list-style-type: none"> <li>• time management</li> <li>• job/family issues</li> <li>• planning study</li> <li>• handling paperwork</li> </ul>	organisation	COUNSELLING
<ul style="list-style-type: none"> <li>• motivation</li> <li>• self esteem development</li> <li>• stress management</li> <li>• assertiveness</li> </ul>	emotional affective	COUNSELLING GUIDANCE

Source: *Introduction to Distance Education*. M1 (International Extension College, Cambridge)

### Tables of numbers

Tables are frequently used to present numerical data. In Example 36, the table not only presents the data on rents, but shows learners how to calculate cumulative frequency. This is much clearer than a purely text explanation.

**EXAMPLE 36.** Use of a table of figures to show learners how to calculate cumulative frequency

Rent in £ (to nearest £5)	Frequency (town A)	Cumulative frequency
30	5	5
35	9	14
40	11	25
45	8	...
50	6	...
55	4	...
60	3	...
65	1	...
70	2	...
75	<u>1</u>	<u>50</u>
	50	

$$14 = 5 + 9$$

$$25 = 5 + 9 + 11$$

$$= 5 + 9 + 11 + 8$$

Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

## Maps and plans

Maps and plans are included in ODL texts both to teach how to construct them and to provide data to analyse. Example 37 shows a typical plan from a maths course.

**EXAMPLE 37.** Example of a floor plan from an ODL text

Trace these 'scale plans' of pieces of kitchen equipment.

Cut them out and use them to find your best layout for this kitchen.

Choose more items of your own.

Include them in your kitchen layout.

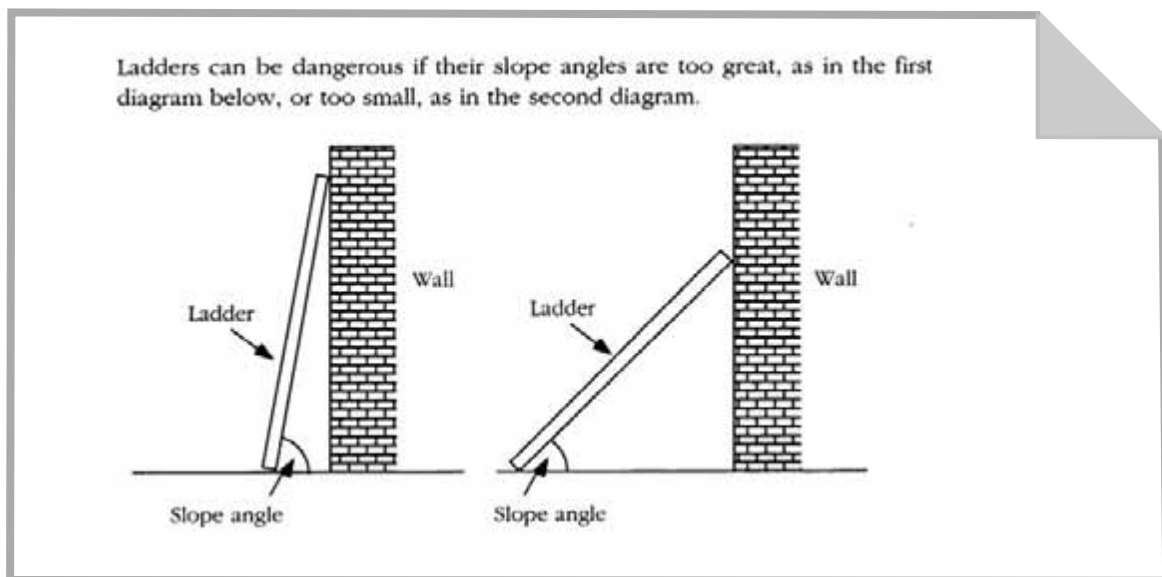
The image shows two sets of kitchen equipment scale plans on a grid. The first set includes a Table, Tall cupboard, Sink, and Chairs. The second set includes a Washing machine, Cooker, Worktop, and Refrigerator.

Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

## Diagrams


A wide variety of diagrams is used in ODL courses. Effective diagrams usually involve a degree of simplification to draw learners' attention to the aspect that is to be studied. In the case of Example 38, the ladder and wall are simplified versions of real ladders and walls, allowing learners to concentrate on the angles and distances. Example 39 illustrates the concept of time.

### EXAMPLE 38. Use of drawings to teach the concept of 'angle'



Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

**EXAMPLE 39.** Use of drawings to teach the concept of time




## Activity 17

### Telling The Time

Write the time in words in the spaces provided. Draw the correct time in watches 3, 4 and 7.


1



.....

.....

2




.....

.....


3

Draw time: 10:35




4

Draw time:  
Quarter past eight




5



.....

.....

6




.....


.....

7

Draw time: 5:55




8



.....

.....

Assess the learner's ability to Tell the Time, based on the following criteria.



Mark	Criteria	Date: _____
4	All answers correct.	
3	Only 1 or 2 errors.	
2	3 – 5 errors.	
1	More than 5 errors. Learner to try this activity again.	

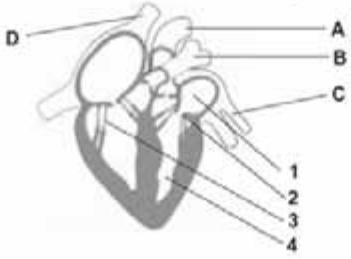
30

In Example 40, the heart is not really like that shown. Rather, it has been reduced to a few essentials in order to concentrate students' attention on the four parts of the heart to be learnt.

### EXAMPLE 40. A simple diagram to show a real-life object

**Self Mark Activity taken from Life Science JSC**

1. The diagram below shows a section through a mammalian heart.



a) i) On the diagram, label the parts 1 to 4  
ii) State whether the parts labelled A, B, C and D are arteries or veins.

A .....

B .....

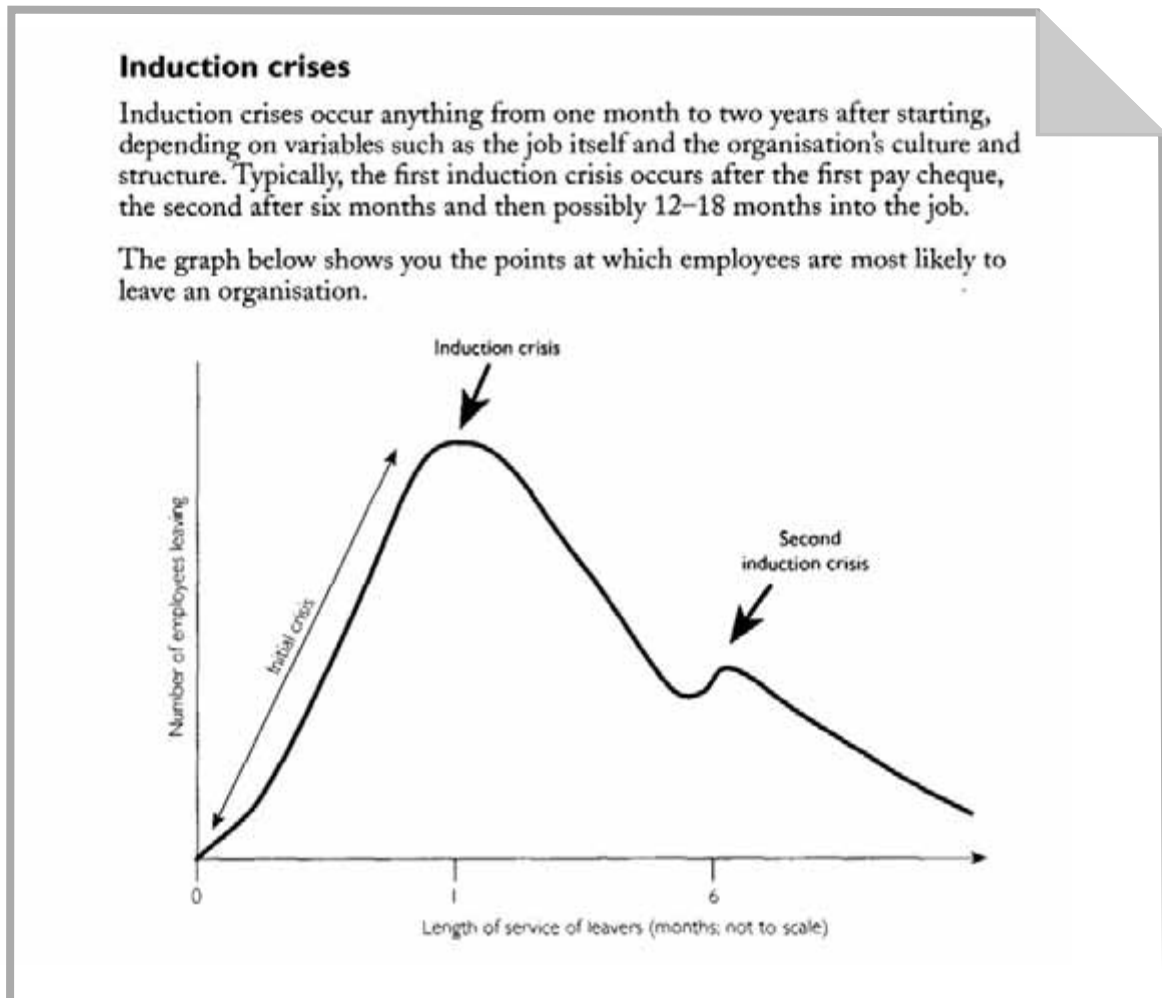
Source: Namibian College of Open Learning (NAMCOL)

## Graphs

Graphs are a very effective way of presenting the relationship between two or more variable items. For instance, in Example 41, 'number of employees leaving' is plotted against time. From this it is easy to see that employees are most likely to leave at two peak times.



**EXAMPLE 41.** An example of a graph used to illustrate the notion of 'induction crisis'

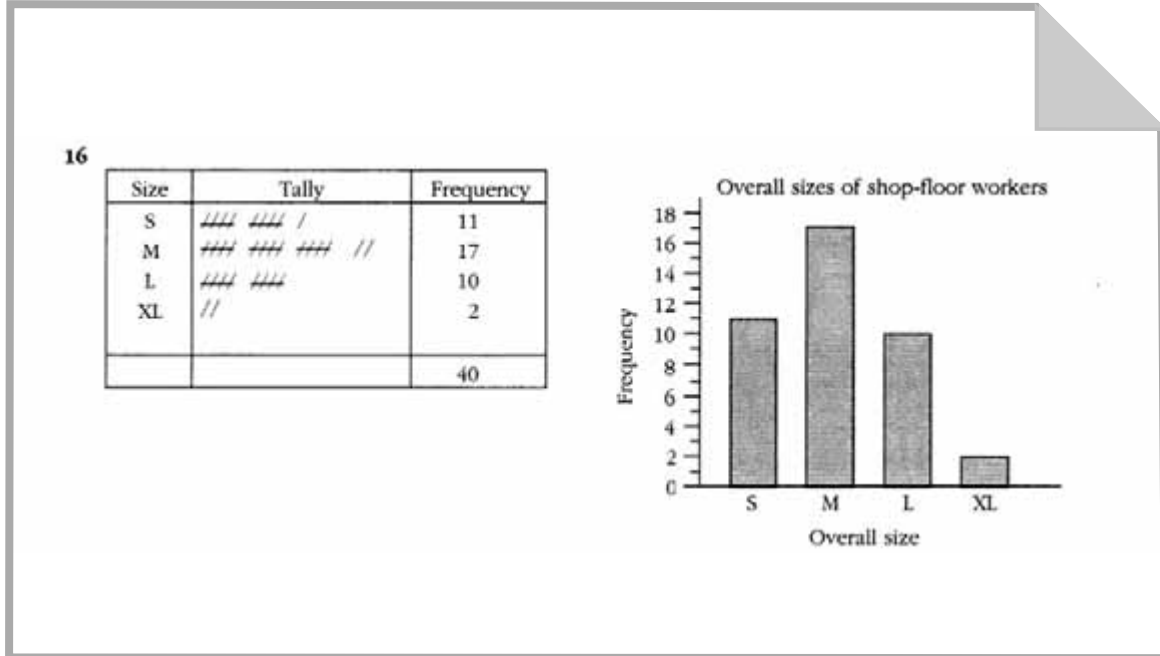


Source: *Managing for Success*. DM46 Recruitment and Selection (National Extension College, Cambridge)

## Bar charts

Bar charts are frequently used to present categorical data, as in Example 42.

### EXAMPLE 42. Example of a bar chart in an ODL course

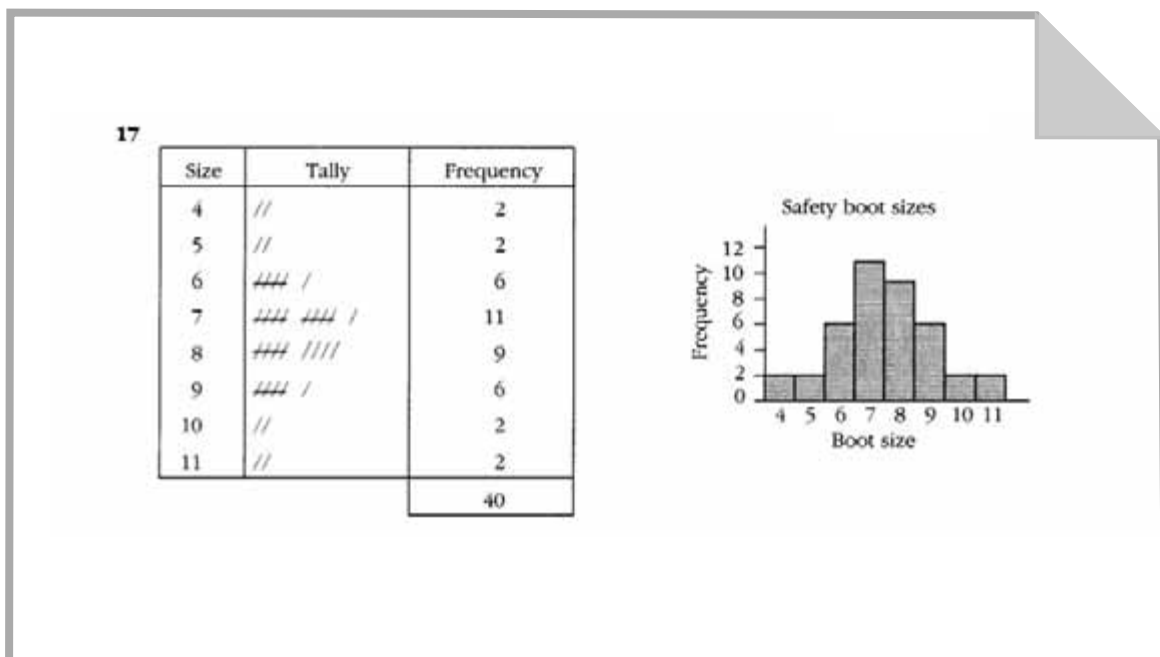


Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

### Histograms

Histograms are also used (as in Example 43) for the summary of continuous data.

### EXAMPLE 43. Sample histogram in an ODL course



Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)



## Flow charts

Flow charts are a good way to show processes, particularly ones in which decisions lead to a choice of actions. Strictly speaking, flow charts should use international standard symbols, such as those shown in Figure 11 – but in practice, because few learners understand such symbols, a more informal approach is often taken, as in Example 45.

**FIGURE 11.** Some standard flow chart symbols



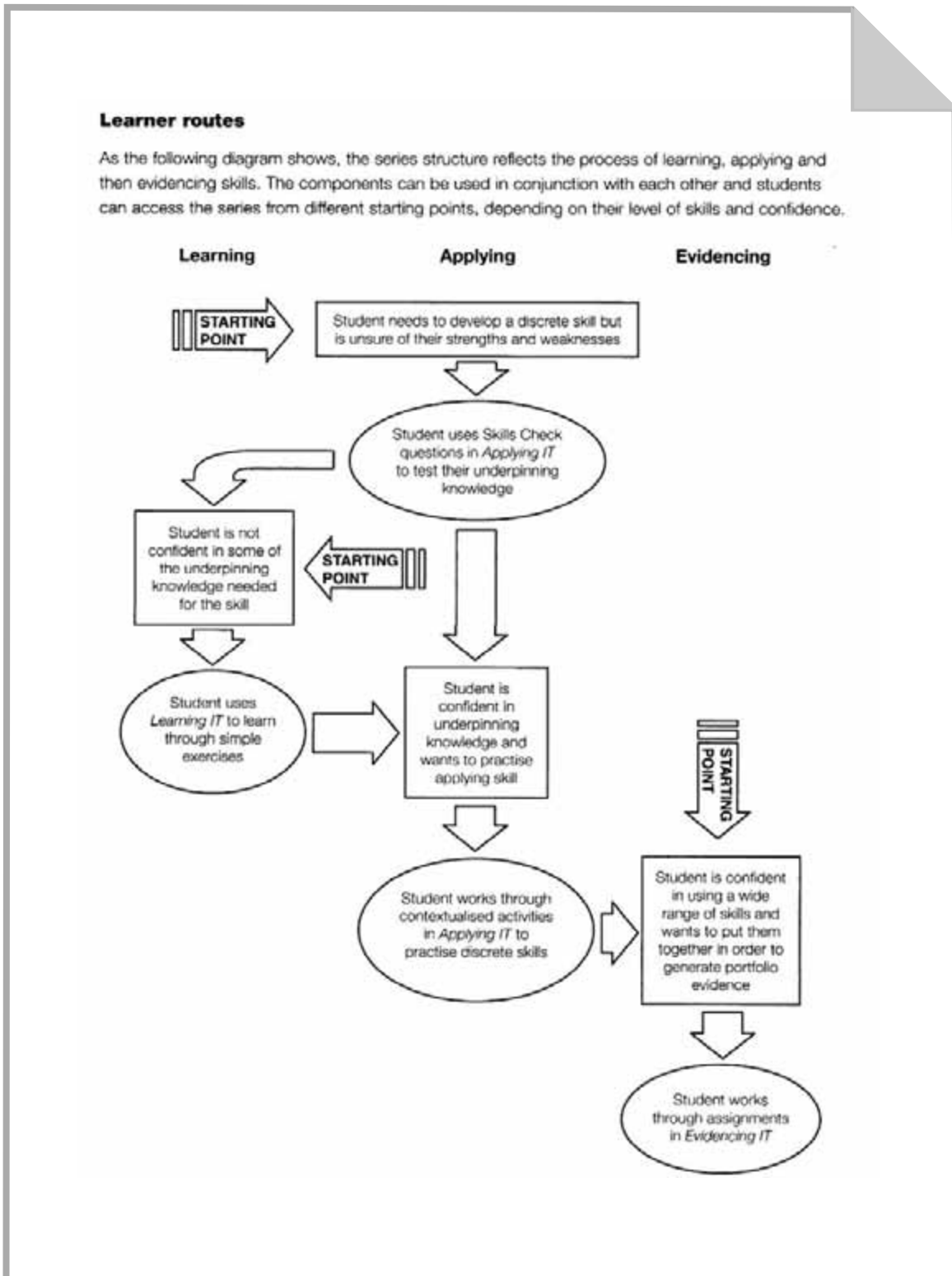
## Cartoons

Cartoons as jokes are not much used in ODL, partly because different students react to humour differently (and cartoons are frequently criticised when courses are piloted). However, cartoon-style drawings are often used, particularly to represent people who talk to the student (see Example 46).

## Photographs and drawings

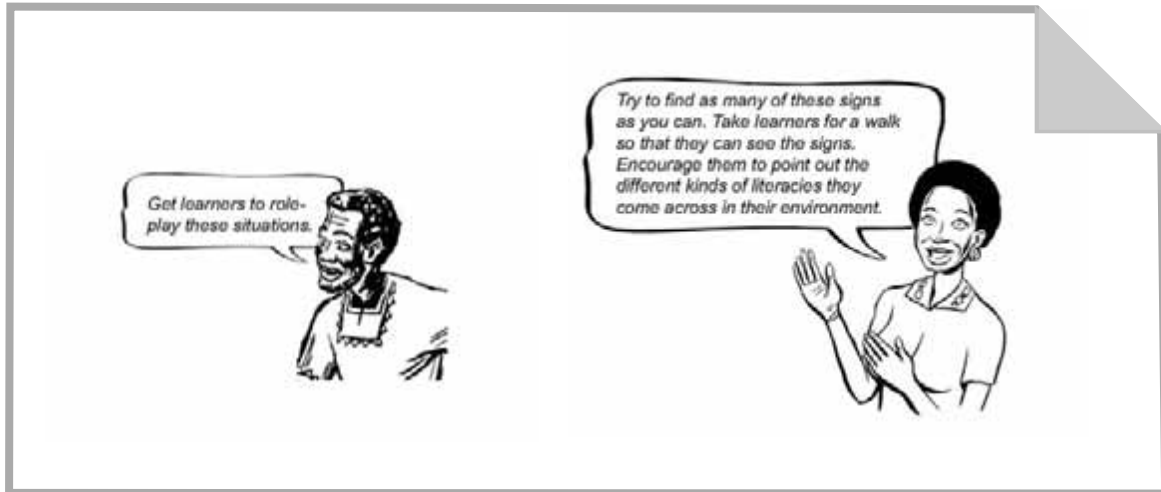
Photographs are not often used in ODL texts for two reasons. First, photographs often reproduce poorly with the sort of printing processes available to ODL organisations. Second, photographs usually contain too much detail and so make the learning point hard to pick out. Often, instructional designers choose to use drawings instead, as in Example 47.

**EXAMPLE 45.** A flow chart that illustrates a process in a clear, accessible way



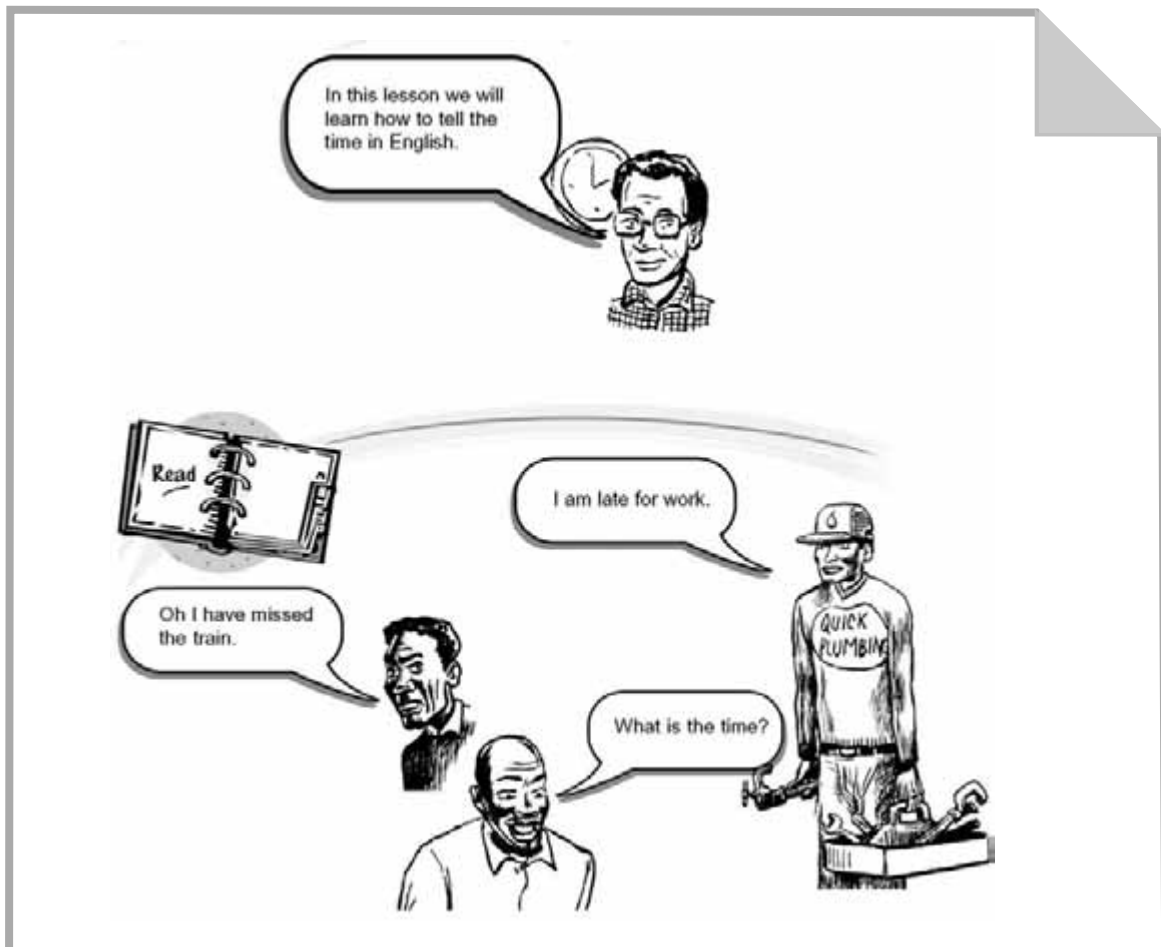
Source: *Administration of Business Level 3* (National Extension College, Cambridge)

### EXAMPLE 46. Use of cartoons to address students



Source: Institute for Adult Basic Education and Training (UNISA)

### EXAMPLE 47. Drawings of people

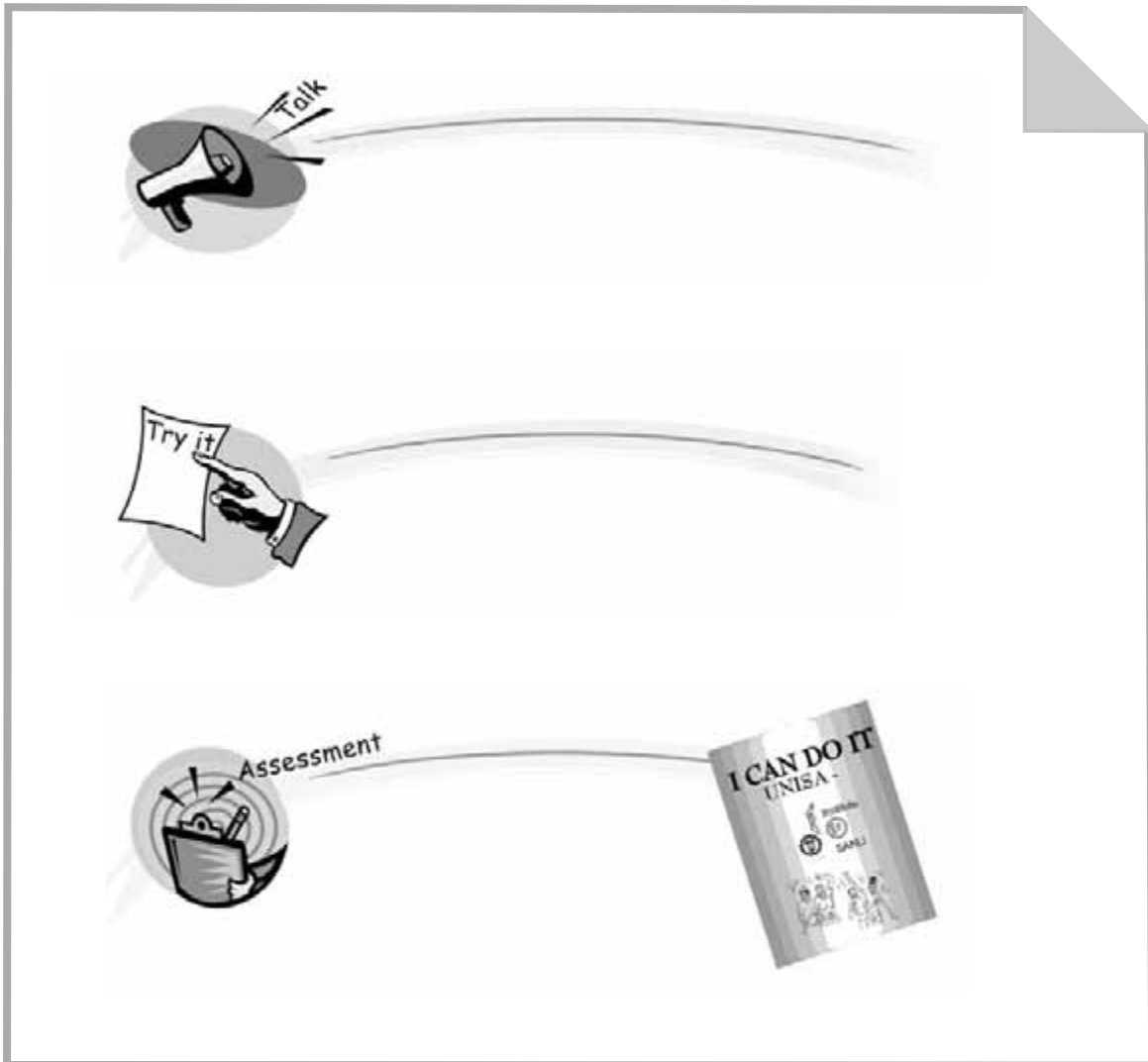


Source: Institute for Adult Basic Education and Training (UNISA)

## Icons

Examples of the use of icons in ODL courses can be found in Example 48.

### EXAMPLE 48. Examples of icons



Source: Institute for Adult Basic Education and Training (UNISA)

### **Dynamic graphics**

Dynamic graphics, another form of illustrative device that could be added to the list, are now quite common on web pages. However, they represent a specialised area and not one that most instructional designers would ever have the time to master. If you are working on a course that needs dynamic graphics, it is best to seek expert help.

## 4.4.4 GUIDELINES FOR SUCCESSFUL ILLUSTRATIONS

The following good practice guidelines (after Lewis, 1990; Rowntree, 1990) will help you create successful illustrative devices:

- Keep graphics and illustrations as simple as possible. The key learning point should stand out clearly.
- Always include a caption.
- Use the caption to lead the learners into the illustration (e.g., 'Graph showing variations in world temperature against CO<sub>2</sub> density' is better than 'World temperature').
- Always have a clear purpose for your illustration (e.g., 'This illustration will help learners to ...').
- Explain the purpose of your illustration.
- Where possible, set activities around your illustrations.
- Explain any conventions you use, unless you are sure all your readers will know them (e.g., 'the shaded area means land over 1000 m').
- Help learners to 'read' the graphic/illustration.
- Keep illustrations close to the text that refers to them.
- Always place an illustration *after* the first reference to it.

## 4.4.5 NUMERICAL TABLES: GOOD PRACTICE GUIDELINES

Tables are freely used in all sorts of text, but they are not always presented in a way that makes them easy to understand. The following guidelines (after Hartley, 1994) will help you produce good quality tables:



- Choose a layout by first asking 'What do I want my learners to get from this table?'
- Round off numbers. This makes it easier to compare them.
- Include an average. This gives a benchmark to relate the other numbers to.
- Put numbers in columns. They are easier to read than in rows.
- With numerical data, put a blank line after every fifth row. This makes it easier to read.

More detailed guidelines on table layout can be found in Tufte (1983).

Example 49 shows a typical table as it might be presented in a course or book. You can see that because this table is quite dense, it is hard to make sense of. It can be made easier to read with the following changes:

- Group the regions into two blocks of five.
- Insert space above and below each block of five.
- Repeat the region title at the right-hand end of each row.
- Insert row averages. This gives us a comparator to help us read along any one row.
- Insert column averages. This gives us a comparator to help us read down any one column.

The results in Example 50 are much easier to read than those in Example 49.

### EXAMPLE 49. A roughly prepared table

	Student numbers				
	1990	1991	1992	1993	1994
Region 1	351	406	395	463	482
Region 2	209	310	357	311	335
Region 3	476	482	641	759	744
Region 4	101	98	123	153	190
Region 5	430	461	379	341	498
Region 6	545	515	602	579	599
Region 7	78	99	132	145	144
Region 8	283	258	294	288	263
Region 9	284	267	283	265	287
Region 10	187	146	168	185	184
Totals	4934	5033	5366	5482	5720

**EXAMPLE 50.** The table (in Example 49) improved

<b>Student numbers</b>							
	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>		<b>Average</b>
Region 1	350	400	400	460	480	Region 1	420
Region 2	200	310	360	310	330	Region 2	300
Region 3	480	480	640	760	740	Region 3	620
Region 4	100	100	120	150	190	Region 4	130
Region 5	430	460	380	340	500	Region 5	420
Region 6	550	520	600	580	600	Region 6	570
Region 7	80	100	130	150	140	Region 7	120
Region 8	280	260	300	290	260	Region 8	280
Region 9	280	270	280	270	290	Region 9	280
Region 10	190	150	170	190	180	Region 10	180
Average	290	300	340	350	370	Average	330
<b>Totals</b>	<b>4900</b>	<b>5000</b>	<b>5400</b>	<b>5500</b>	<b>5700</b>	<b>Totals</b>	

**4.4.6 GRAPHS AND CHARTS: GOOD PRACTICE GUIDELINES**

This section draws heavily on Tufte (1983), who is one of the few writers to have studied what makes graphs and tables easy to read and understand. He offers one overall principle in his writing: 'Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space' (Tufte, 1983).

When graphically displaying numerical data, you can choose to use a variety of types. Some of the most common are shown in Table 20.

**TABLE 20.** Some graphs and chart types and when to use them

Type of device	Use to show
Line graph	<ul style="list-style-type: none"> <li>trends</li> </ul>
Bar chart	<ul style="list-style-type: none"> <li>categorical data (e.g., male, female; text, audio, computer, radio, television)</li> <li>breakdowns within categories</li> </ul>
Histogram	<ul style="list-style-type: none"> <li>continuous data (e.g., marks)</li> <li>breakdowns within groupings</li> </ul>
Pie chart	<ul style="list-style-type: none"> <li>comparative percentages of one type of variable (but best avoided)</li> </ul>
Tables	<ul style="list-style-type: none"> <li>exact quantities</li> </ul>

## Hints for effective graphs and charts

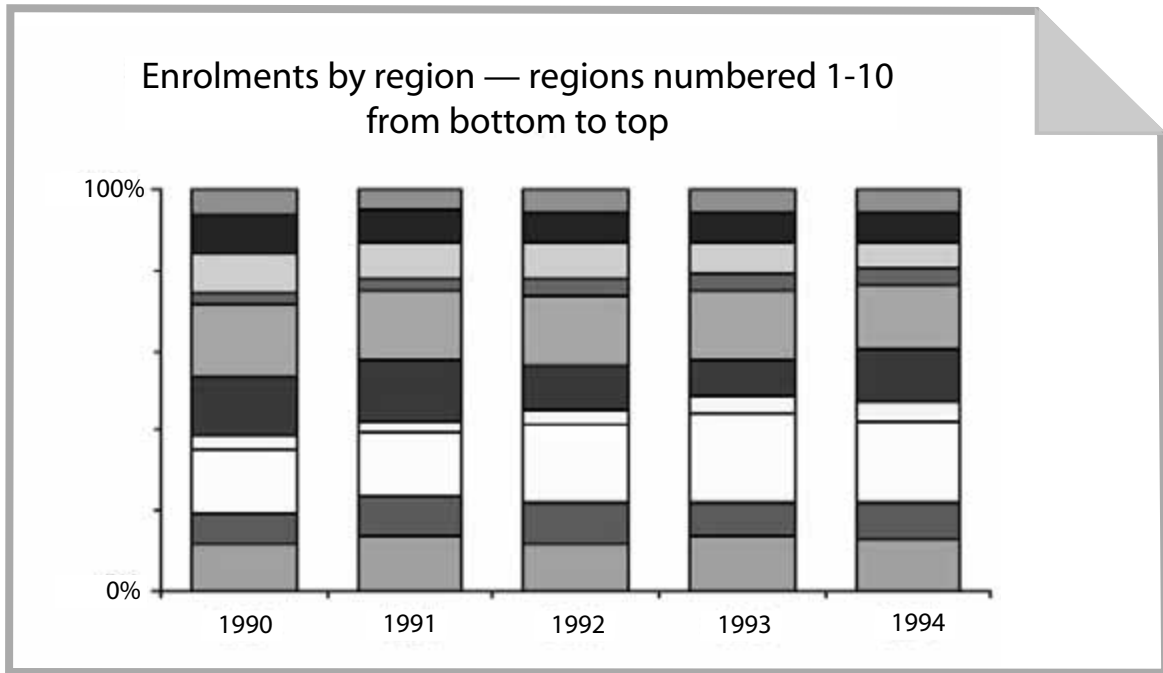
Hartley (1994) and Tufte (1983) offer the following guidelines for preparing effective graphs and charts:

- A good graph or chart will always have at least two variables so that the user can make a comparison. ‘Graphical excellence is nearly always multivariate’ (Tufte, 1983).
- Avoid pie charts as they can never be multi-variate.
- Avoid three-dimensional charts. They are harder to read than two-dimensional ones.
- Remove everything that is not essential to accurately convey the data. Avoid what Tufte calls ‘chartjunk’.
- Aim for a high data-ink to total-ink ratio – that is, the more of your chart that is data rather than other items, the better.

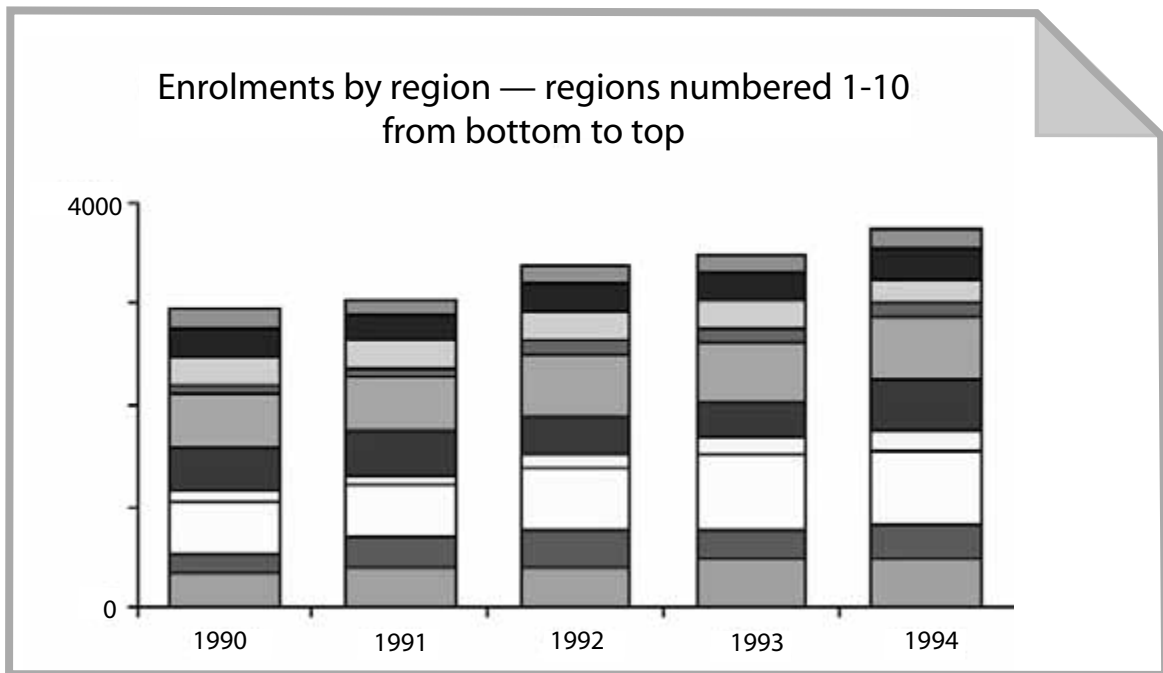
Tufte is the leading writer on presenting data in visual forms. Examples 51 and 52 give some idea of the simplicity and clarity that he aims for. Notice, for instance, the lack of horizontal grid line and the sparseness of detail of the *y*-axis – even the border is removed. This is done to highlight the data and to remove every distraction possible from the figure. In doing this, it is important to remember that charts and figures should not be used to present detailed data (tables do that), but to give a *picture* of the data.

Notice also that the charts are multi-dimensional – they show enrolments, year and region – so allowing the user to *make comparisons*, which is the primary objective of collecting data.

**EXAMPLE 51.** Sample bar chart following Tufte's (1983) advice (a)



**EXAMPLE 52.** Sample bar chart following Tufte's (1983) advice (b)



## 4.4.7 METHODS FOR CREATING EFFECTIVE GRAPHS AND CHARTS

Graphs and charts can be created on computer using:

- drawing packages (for graphics),
- image manipulation packages (for photographs),
- spreadsheet packages (for line graphs, bar charts and histograms),
- clip art (there are masses of copyright-free clip art on the internet), and
- word processing packages (for tables).

## 4.5 ACCESS DEVICES

### 4.5.1 INTRODUCTION

The methods that we use to help learners find their way around a piece of learning material are called **access devices**. On the whole, they serve two purposes: to make the structure of the material clear and to help learners understand how they are to use that material.

Generally, access devices operate at the unit level and that is how they're discussed here.

#### **Issues for instructional designers**

1. How can I make clear to students how all the separate components of the units (e.g., activities, examples, tests) fit together?
2. What devices can I use to ensure that learners recognise each of the separate components and use them appropriately?

### 4.5.2 PLACING ACCESS DEVICES

It is useful to classify access devices by the stages in which learners use them (after Rowntree, 1990):

- before they start the unit,
- during their study of the unit, or
- when they have completed the unit.

## 4.5.3 BEFORE STUDYING THE UNIT

### Titles

One of the simplest ways of making the contents of a unit accessible to learners is to use clear, meaningful, descriptive titles both for units and for topics within units. Examples of such titles include:

- How does carbon dioxide cause global warming?
- The past tense of regular verbs
- Basic facts about triangles

Some authors prefer amusing titles (often based on puns), but the evidence is that the most effective titles either clearly state the topic or clearly state a problem that will be discussed in the section of learning.

### Contents lists

It is common practice to include a contents list for each unit of study. This helps the learners get an overview of what they are about to study and can be seen as a form of advance organiser (see section 4.1, 'Structuring a Unit').

Example 53 shows a typical unit contents list and Example 54 shows a variation in which the contents list concentrates on the key concepts in the unit.

### EXAMPLE 53. A unit contents list

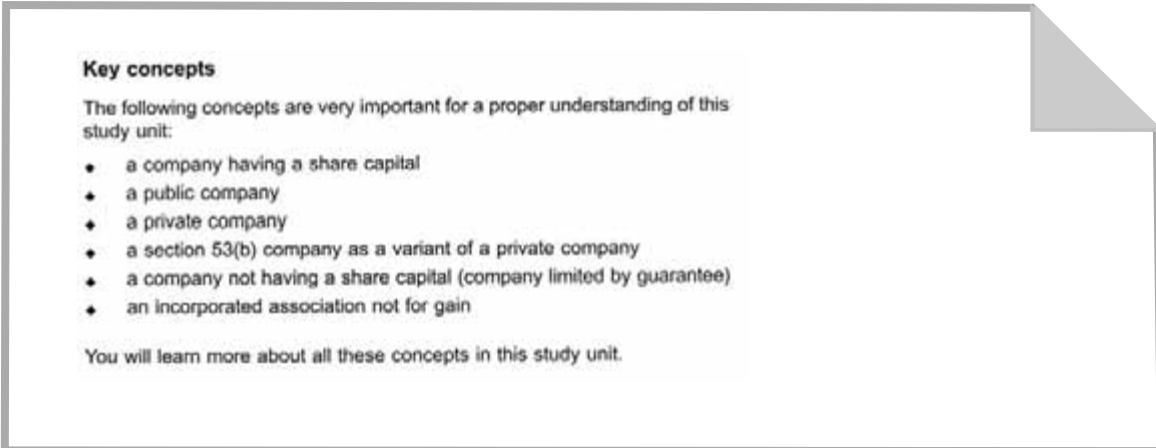
#### **1.3 Unit contents**

This unit has the following contents:

2. Identifying the needs of the learners and their implications for learning
3. The learning cycle: the different stages of the learning cycle and the various forms of support required by the learners in each stage
4. The role and significance of learner support
5. Conclusion
6. Bibliography

Source: *Introduction to Learner Support in ODL*. ODL104J, p. 36 (UNISA)

## EXAMPLE 54. A unit contents list as a list of key concepts



**Key concepts**

The following concepts are very important for a proper understanding of this study unit:

- a company having a share capital
- a public company
- a private company
- a section 53(b) company as a variant of a private company
- a company not having a share capital (company limited by guarantee)
- an incorporated association not for gain

You will learn more about all these concepts in this study unit.

Source: *Entrepreneurial Law*. MRL101F, p. 43 (UNISA)

## Glossary items

Some courses contain glossaries to explain the meanings of key words. These may be at the back of the course materials or published as a separate item. To make these glossary items even more accessible, the relevant entry is sometimes reproduced alongside the first use of that particular term.

## Menus on web sites

In web-based materials, the contents are more likely to be displayed as a menu or as a series of buttons. Whichever method you choose, it is still important to give learners a clear overview of what they are about to study. Indeed, one could argue that it is more important to do this on the web than it is in print, since learners cannot flick through the pages of a web site as they can the pages of a workbook.

There are various forms of menus, some more helpful and easier to use than others.

**Permanent menus** – Permanent menus are ones that stay unchanged wherever the user goes in the web site. These are usually embedded in the top frame or left-hand side frame, with the content selected by the user being shown in the main frame. This type of menu is by far the easiest to use (and to keep updated), but is only practical for displaying a small range of options.

**Dynamic menus** – Dynamic menus change according to where the user is in the site. They are like contents lists for chapters in a book. If you go to chapter 3, you see a contents list for chapter 3. The ODL equivalent is when the user clicks on a button for Unit 3 and then sees a contents menu for that unit. This type of menu is easy to use, easy to update and able to show a good level of detail.

Drop-down menus – Web designers often use drop-down menus because they look sophisticated and showy. In fact, users often find these difficult to use. ‘Users get very confused when options come and go’ (Nielsen, 2002).

Menus that don’t look like menus – Some web designers use hidden menus, for example, a map of a country with five regions marked. If you hover the mouse over the regions, you find that you can click on each region and go to the relevant part of the site. Menus of this type are clever, but it is best to avoid them since some users never discover that the map is a menu. Menus should look like menus.

Site maps – A good way of listing the contents of a site is by using a site map. Some points to bear in mind about site maps are:

- Keep the site map short enough to give an overview of the site.
- Make sure that the site map can be accessed from every page in your site.
- Where possible, arrange the map so that it shows the hierarchies within your site.

One point to note on the web is that if buttons are used to select study topics, this can severely limit the number of words that can be used to describe topics. This can lead to unhelpful wording. For example, consider the contents list item ‘The three parts of an objective’. On a web site this might well be reduced to the unhelpful and uninformative button below:



## Site structure

Web sites present a particular access problem in that their structure is often hidden from the learners and their content is always hidden (since you cannot flick through the pages). This can mean that learners do not know where they are, where they should go next and which parts of the site they have not yet visited. It can also mean that they cannot find their way back to a page or topic they wish to revisit. It is therefore a good idea to give a clear overview of the site structure. This can be done in various ways. Example 55 shows a possible structure for a short course on writing a piece of learning material. The course units are displayed across the top and the content of each unit can be displayed in the left-hand column. The addition of a ‘Site map’ button provides another means of seeing the course contents.



### EXAMPLE 55. A web site that clearly displays a course and unit structure

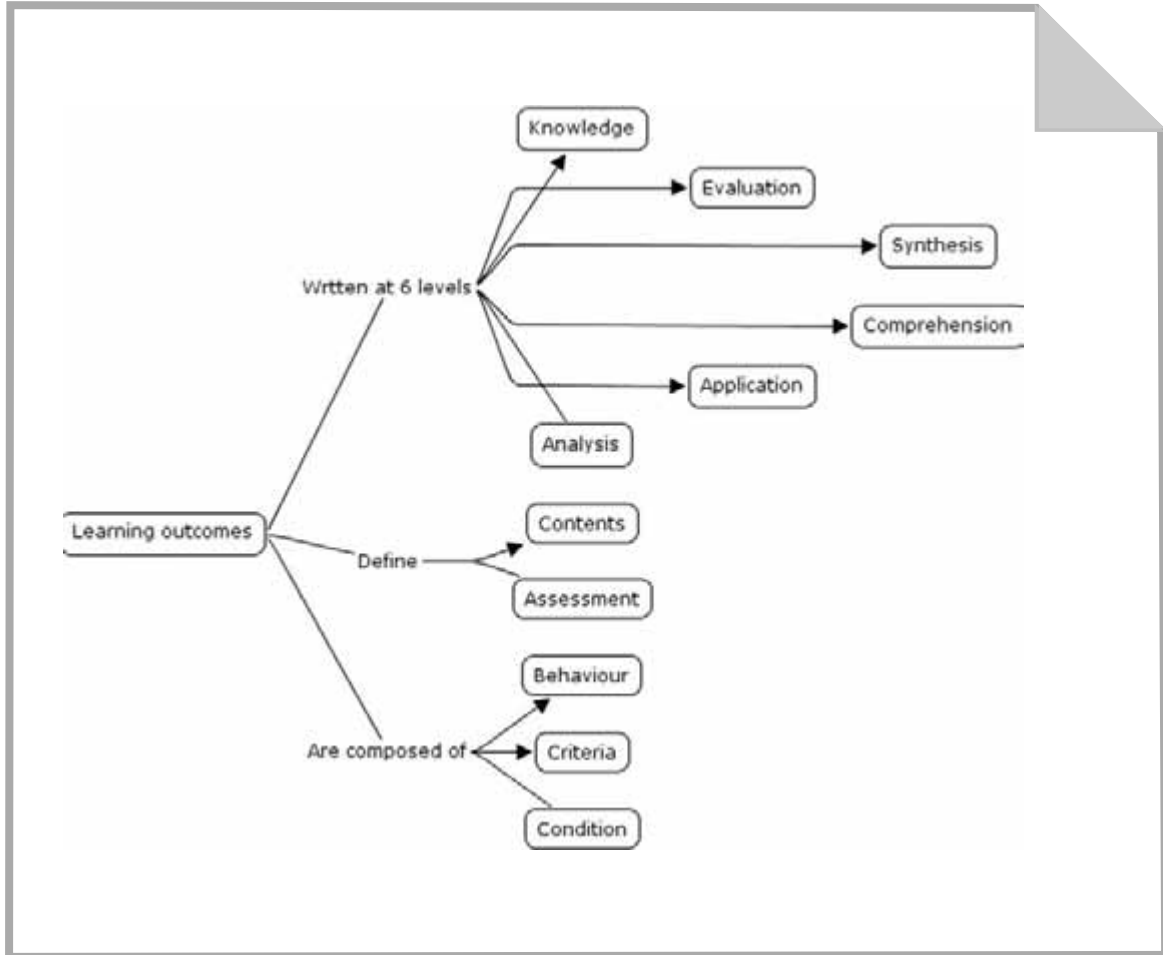
The screenshot shows a web browser window with a navigation menu at the top containing 'Home', 'Site map', 'Unit 1', 'Unit 2', and 'Unit 3'. The main content area is titled 'UNIT 1 Introduction' and includes sections for 'Objectives', 'What is the purpose of objectives?', 'The three parts of an objective', 'Some examples of objectives', 'Verbs to avoid in objectives', and 'Verbs to use in objectives'. A table titled 'Figure 1 Four ways of describing the contents of a course' lists four methods: 'A general description of the course', 'A contents list', 'A set of aims', and 'A set of learning outcomes'. A vertical arrow on the right side of the table points downwards, labeled 'Increasing precision'.

A general description of the course	↓ Increasing precision
A contents list	
A set of aims	
A set of learning outcomes	

### Concept maps

Another method of displaying the contents of a unit is to use a concept map. A possible example of a concept map for a unit on learning outcomes is shown in Example 56. This particular map was created with Cmap (<http://cmap.ihmc.us/>), although other concept mapping tools are available. A good guide to the rules of concept mapping can be found in Novak and Gowan (1984).

**EXAMPLE 56.** A concept map to provide an overview of a unit on learning outcomes



### Objectives

The learning objectives that you include in a unit (see section 3.3, ‘Setting Aims and Objectives for Your Course’) are a very important access device because they tell learners what to expect from studying the unit.

### Pre-requisites and pre-tests

If learners attempt to study a unit of learning for which they do not have the necessary pre-requisites, they are likely to fail to learn. It has been claimed that one of the most important factors in determining whether learners succeed in learning or not is whether they have the pre-requisite knowledge and skills (Gagné, 1968). For example, learners should not attempt to solve quadratic equations if they do not know what algebra is; nor should they attempt to change sentences from one tense to another if they have not already learnt the basic tenses first.

To avoid failure through lack of pre-requisite knowledge, it is useful to provide either a list of that knowledge or a self-test. For example, the pre-requisites for a spreadsheet unit that is to teach the use of formulae might be as in Example 57.

### EXAMPLE 57. Sample pre-requisites list

#### **Pre-requisites for formulae unit**

This unit assumes that you are able to:

- open a new spreadsheet
- enter numbers into cells
- enter words into cells
- correct errors in cells
- save a spreadsheet.

(It is worth noting that stating the pre-requisites in this way also reminds the instructional designer to check that the items listed have been taught in earlier units.)

In web-based courses, pre-requisites are especially important because learners can usually jump around such sites rather than studying them in the planned order.

### Advance organisers

Advance organisers (as discussed in section 4.1, 'Structuring a Unit') are any device that helps learners link what they already know to what they are about to learn. The organiser can be thought of as a piece of mental scaffolding that the learner will use to structure the new material that is to be learnt, for example:

- a concept map provided in the text;
- a concept map created by the learner as part of an activity;
- an activity to recall previous experience (e.g., for a unit on 'problems of inner cities', ask learners to recall what they themselves have seen and experienced in inner cities); or
- an activity (or test) to recall previous knowledge (e.g., for a unit on 'preparing a balance sheet', set an activity asking learners to recall the meaning of terms such as 'current assets' and 'working capital').

## Introductions

Perhaps one of the most used 'before' access devices is an introduction to the unit. There is much word-of-mouth evidence that learners (indeed all readers) do not pay much attention to introductions, so more priority should perhaps be given to the other 'before' devices that we have discussed above. If introductions are used, though, they should include:

- what the unit will cover,
- why it will be useful to you, and
- how the unit follows on from the previous units.

### 4.5.4 'DURING DEVICES'

The 'during devices' tend to be ones that help learners see the structure of the text or web site. They are devices that help the learners answer the following two questions:

- Where am I?
- What am I supposed to be doing?

## Headings

A typical printed unit will have:

- topic headings – these usually match the learning outcomes (i.e., if there are five learning outcomes, then the unit will be divided into five topics); and
- subheadings – these show the main components of the topic.

As with titles, headings and subheadings should be clear, informative and meaningful.

A test of a good heading or subheading is how well it answers the question 'What will I learn when I study this section?' You can see from Table 21 that the revised wordings all answer this question. For example, in the case of the documents heading, the improved heading tells you that you will learn 'how to create a one-page document'.

**TABLE 21.** Poor headings and how to improve them

Poor wording	Improved wording
Molecules	What is a molecule? or How does a molecule differ from an atom?
Documents	How to create a one-page document
Verbs and objectives	Verbs to use and verbs to avoid in objectives

In web-based learning materials, the same principles apply in choosing carefully the wording of headings.

## Section numbering

Some authors like to number their sections and subsections. For example:

1.0 Topic 1

    1.1 Sub-topic

    1.2 Sub-topic

2.0 Topic 2

    2.1 Sub-topic

    etc.

The use of such numbering systems is largely a matter of personal taste, but they are useful in a lengthy, detailed text (such as this handbook) to show its structure.

## Icons


Many ODL texts and web sites use icons to indicate the nature of a piece of text or a task. Some of these are shown in Example 58.

### EXAMPLE 58. Icons being used to guide learners through a complex piece of learning material

4 Details of dates and travel to the exhibition; a description of the areas of interest.


5 A description of experience in dealing with the public and customers.

6 A description of handling difficult situations.

 **Reflective learning log**

Make a note of the difference between open and closed questions and anything else you have learned in this topic.

**Self-check 2**



**Hint**  
You may need to listen to the whole track before answering any of these questions.

1 Listen to Track 14 on the CD. Four people are discussing an issue they feel quite strongly about.

a) What are they talking about?

b) Write down on a separate sheet the actual words spoken in favour. Then state what the speaker means by this comment.

c) Note down anything you hear said against the general idea.

2 Think about how you feel about this issue and then record your spoken reply. (You could play this back to a friend or to your tutor.)

Suggestions on the first part of this Self-check are provided at the end of the section.

**Summary**

In Topic 4 you have looked at:

- the skills involved in listening effectively to questions
- how to identify different types of questions
- keeping track of key points when answering open questions.

By completing Topic 4 you have covered the following part of the 'Listen and respond' section of the Adult Literacy Core Curriculum:

- 'understand that some questions require the responder to address more than one sub-question'.

Again, these tend to be a matter of personal preference. Some organisations make great use of them; others use no icons at all. Of course, what you really need to do is to find out whether your target learners like icons or not.

On the web, an advantage of icons is that they can be clicked on and so used as navigational/menu devices.

## Typography and layout

Both in texts and on the web, typography and layout are very important. Generally, ODL texts are characterised by:

- using a good-sized page (usually A4) to create a spacious layout;
- space being left for learners to make their own notes on the pages;
- spaces being provided for learners to write down their answers to activities (see section 4.2, 'Writing Activities', for the rationale behind this);
- the use of different type fonts (and/or different sizes) to indicate the nature of a piece of text (e.g., using a different font for activities); and
- the use of boxes, rules, etc to distinguish the different aspects of the text.

To prevent the pages becoming cluttered and confusing, you need to carefully control how many devices you use and for which purposes. As a starting point, you might consider three devices, to distinguish the three key aspects of your text:

- teaching text,
- examples, and
- activities.

Layout on the web – Any consideration of typography and layout on the web has to start from two observations:

- The usable area of a web page is very small.
- That area's shape is landscape rather than portrait.

Both of these points are the opposite of what we seek in good print design – in other words, web pages are problematic for presenting learning material. We can overcome these problems by adopting the following guidelines:

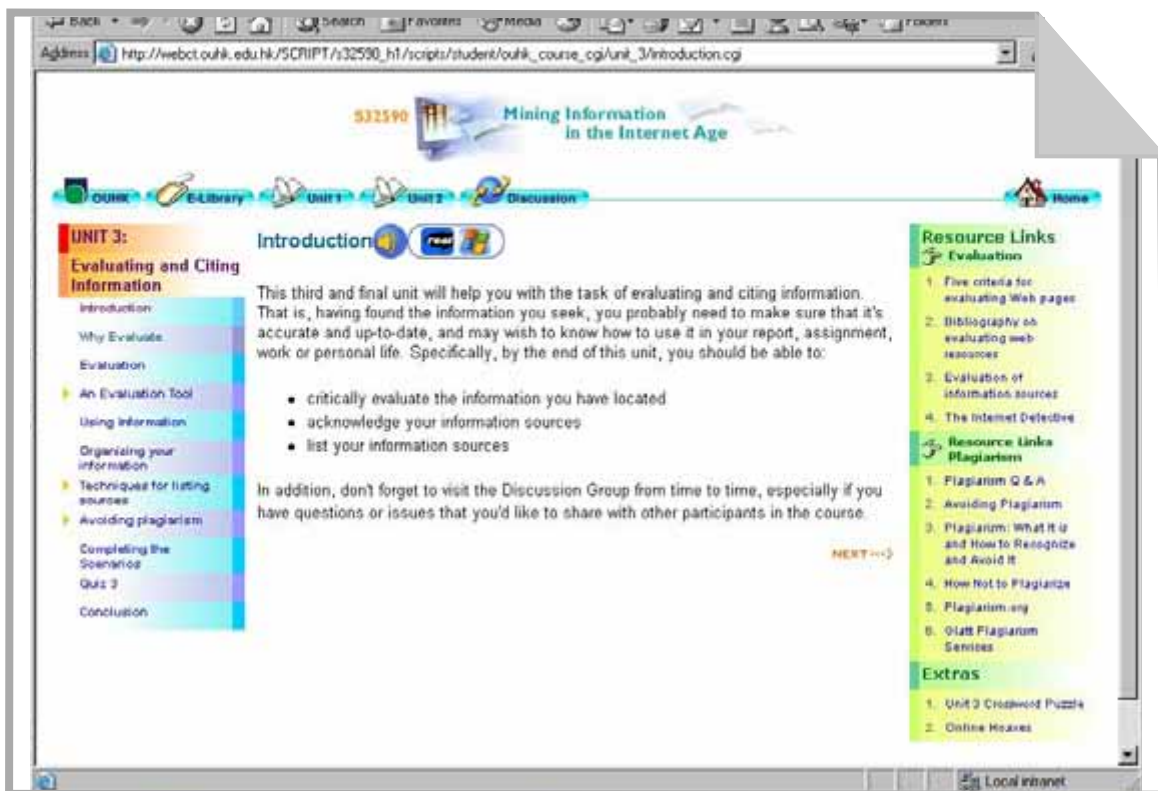
- Restrict the line length. If you don't, the user's browser will let each line of text to fill the screen. Online text is much more readable if line length is kept to around 10–13 words.

- Put plenty of space between paragraphs. This makes the text much easier to read.
- Have a clear format for each of teaching text, examples and activities.
- Ensure that the menus clearly show the learners where they are in the material.
- Use numbering when it will help learners to locate where they are (e.g., **Page 3 of 5** to indicate that the learner is on the third page of a five-page sequence).

You can see some of these principles at work in Example 59, which illustrates:

- a restricted line length so that the text does not fill the width of the screen,
- a reasonable space below the first heading,
- ...> to indicate that the topic continues on another page,
- unit numbers across the top,
- unit content down the left-hand side, and
- other, relevant links on the right-hand side.

### EXAMPLE 59. Creating an easy-to-follow web page



Source: David Murphy, Open University of Hong Kong



## Verbal signposts

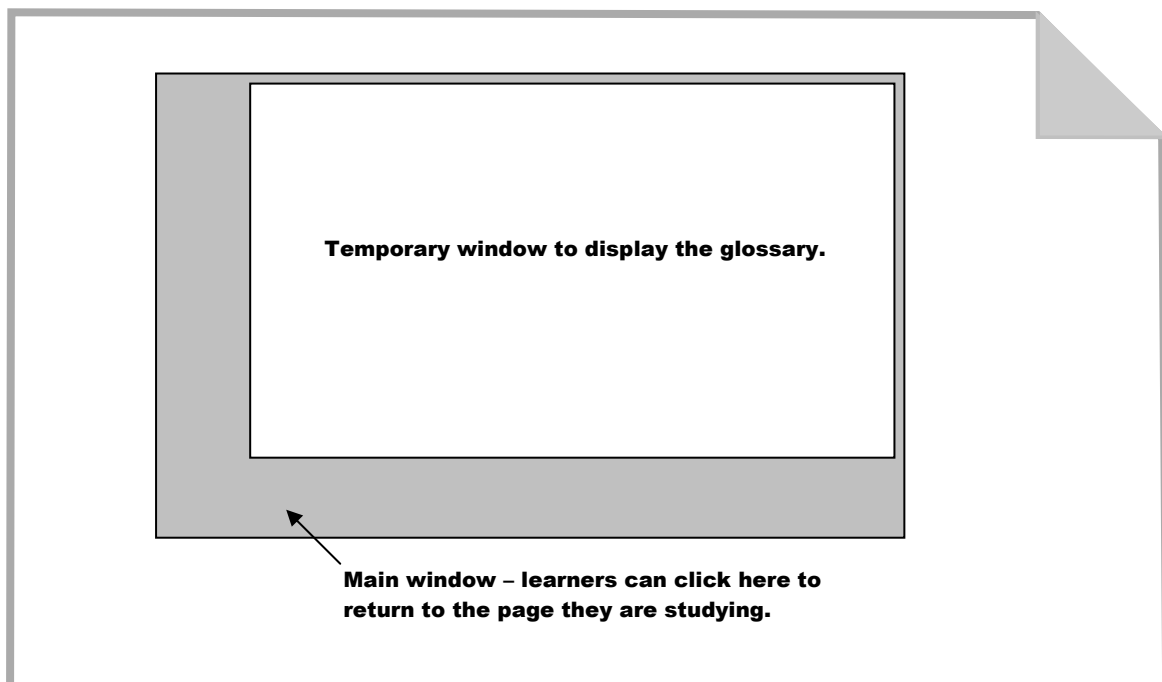
The last device for the 'during' stage is one that is used a great deal. It is the 'verbal signpost' (i.e., a word or words that help learners follow the text). Examples of verbal signposts include:

- 'as you saw in the previous unit',
- 'in the next example you will see this difference more clearly',
- 'that activity should have helped you to identify the main reasons for ...', and
- 'in the next unit we will explore some solutions to this problem'.

## Glossaries

Glossaries are also a useful addition to an ODL course, providing a quick way for learners to check words that they do not understand. In print courses, glossaries usually appear at the end of the units. On the web, it is best to provide a Glossary button on every page. When learners click the button, the glossary should open in a new window – not in the window which the learner is studying. See Example 60.

### EXAMPLE 60. Use of a temporary window to display a glossary



### 4.5.6 'AFTER DEVICES'

The 'after devices' are concerned with helping learners round off their study of the unit. They include:

- summaries
- key points lists
- post-tests
- other links to previously learned material.

### Summaries and key points

Learners can often be confused about what the most important points are in a unit of learning. It is therefore helpful to give them a list of these at the end of the unit, as shown in Example 61.

#### EXAMPLE 61. A summary in paragraph form

**Summaries taken from English Communication**

In this unit you have learnt about verbal reporting and writing a report. Formal letter writing was also one important aspect we have looked at. Making a spoken and written complaint and interrupting other people politely, were also introduced to you. Finally you have worked through some guidelines on speaking in public.

In this Unit you have had the opportunity to learn something about farming and tourism in Namibia. You have learnt many new words and their meanings. You have also been introduced to adjectives. You have completed various activities on the different forms of the adjective. In Section 5 you had the opportunity to speak about your region. Remember that the activity in Section 5 is particularly important. Doing such a speaking activity will improve your speaking skills.

I hope that you have enjoyed Level 1. If you experience problems with any of the units in Level 1, go back to that unit and study it again before attempting the assignment.

In this unit you have listened to a passage to improve your skills. You have also learnt new words that you can use in the context of the family and the home. We have discussed that a sentence consists of a subject, verb and an object. You have learnt that the Present Simple Tense refers to actions that are habits, permanent or general truths.

Source: Namibian College of Open Learning (NAMCOL)

Many writers favour a numbered or bulleted list rather than paragraphs of text. See Example 62.

### EXAMPLE 62. A summary in the form of 'good practice'

**Key points**

Well-designed numeric tables:

- maximise the space occupied by data
- minimise the space occupied by headings, etc.
- break up rows into blocks of five or so
- include averages
- put data into columns rather than rows
- round off data as much as possible.

A more sophisticated approach to summaries is taken in Example 63. In this case, examples are built into the summary, reinforcing the learning points being made.

### EXAMPLE 63. A summary that builds in reminder examples

#### UNIT 4: FRACTIONS

9 Calculate the following:

(a)  $3 \times \frac{2}{5}$       (b)  $7 \times \frac{1}{4}$       (c)  $5 \times \frac{2}{3}$

(d)  $\frac{1}{4} \times 9$       (e)  $\frac{1}{10} \times 11$       (f)  $6 \times \frac{7}{8}$

10 Arrange these fractions in order of size, smallest first:

$\frac{1}{2}$        $\frac{2}{3}$        $\frac{1}{4}$        $\frac{3}{4}$        $\frac{2}{5}$        $\frac{5}{12}$

#### Summary

In this unit you have met and used the following ideas and results:

- Fractions are numbers that involve parts of wholes. They are written like this:  $\frac{3}{5}$
- One meaning is '3 out of 5'. The top number is called the **numerator**, the bottom number is called the **denominator**.
- A fraction is another way of writing a **division** sum, so another meaning of  $\frac{3}{5}$  is  $3 \div 5$ , or 3 shared between 5.

- **Equivalent fractions** represent the same amount, e.g. '3 out of 5' is the same as '6 out of 10'.

Two fractions are equivalent if the top and bottom of one fraction can be multiplied or divided by the same number to give the other fraction.

- A fraction is in its **simplest form** if no whole number can divide the top and the bottom.
- An **improper fraction** has its numerator bigger than its denominator. These can be written as a **mixed number**, e.g.  $\frac{23}{7} = 3$  whole ones and  $\frac{2}{7} = 3\frac{2}{7}$
- To **order a set of fractions**, first order the ones you can by thinking about the relative size, then, for the ones you are not sure about, find equivalent fractions with a common denominator.
- **Addition and subtraction**. First find fractions equivalent to the ones given, each with the same denominator, then add or subtract the numerators.

$$\frac{3}{7} + \frac{4}{5} = \frac{3 \times 5}{7 \times 5} + \frac{4 \times 7}{5 \times 7} = \frac{15}{35} + \frac{28}{35} = \frac{43}{35} = 1\frac{8}{35}$$

- **Multiplying** a fraction by a whole number involves multiplying the numerator by the whole number, e.g.  $\frac{3}{7} \times 2 = \frac{6}{7}$

Summaries can also be used to link what has been learnt in one unit to what is to come in the next (as in Example 64) or be put in diagram form (as in Example 65).

### **EXAMPLE 64.** A summary that builds links to the following unit

#### **Summing up: unit review**

In this unit, you have done a great deal of thinking and reading about strategic planning for distance education managers. In particular, you have used the example of the Malawi College of Distance Education to analyse the planning process.

You have tried your hand at some of the techniques of strategic planning and analysis, in particular advising on a mission statement, analysing environmental forces and internal skills resources.

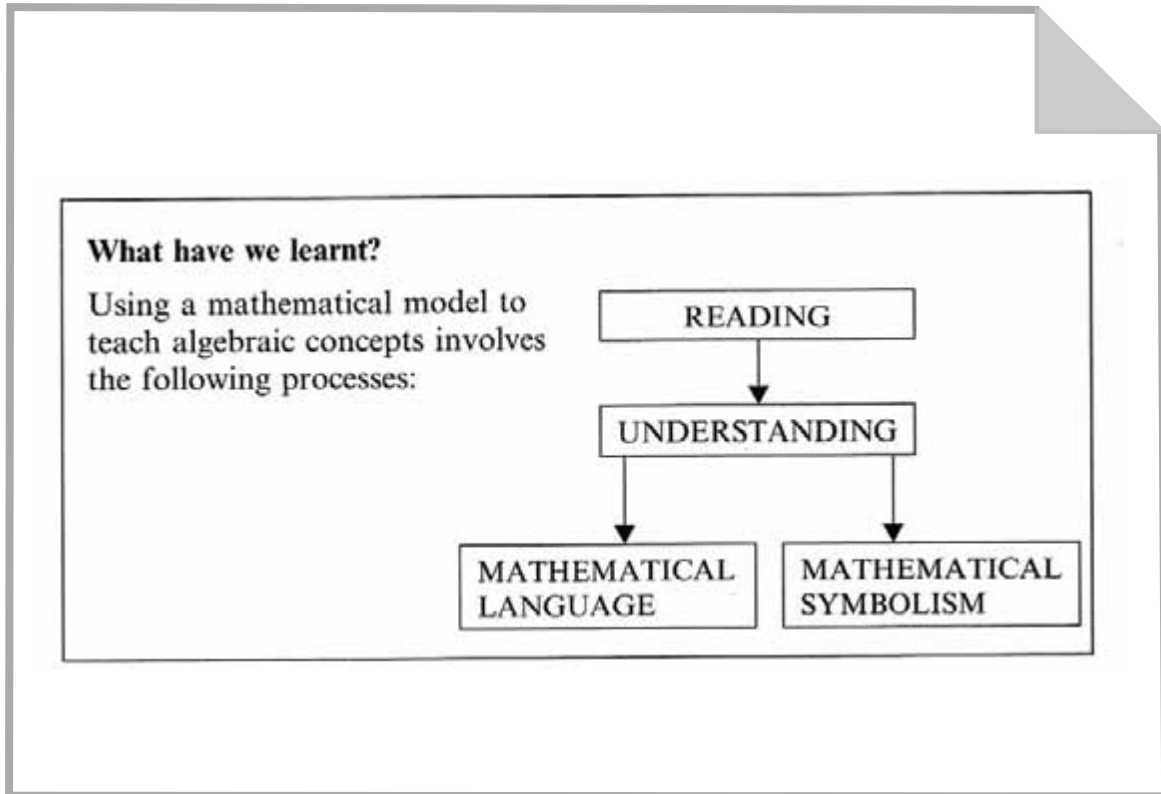
You have undertaken a SWOT/TOWS analysis for MCDE, and you have evaluated MCDE's strategic objectives.

In the next unit we shall be looking in detail at a particular approach to strategic planning — the logical framework approach — and you will be asked to try your hand at doing it yourself.

Here is your end-of-unit activity.

Source: *Introduction to Distance Education*. M2, p.18 (International Extension College, Cambridge)

### EXAMPLE 65. A summary in diagram form



Source: *Trigonometry, Algebra and Calculus*. NPD030-A (UNISA)

### Post-tests

A post-test can be a good method of helping learners find out if they have understood everything in a unit of learning. If they answer any of the questions incorrectly, they can be referred back to the relevant part of the unit in order to have another attempt at learning that part.

### Links with previous material

The final access device is to explain to learners how what they have learnt links with other material in the course. This might be done using a concept map (see Example 56) or a verbal description.

## 4.6 DIVERSITY ISSUES

### 4.6.1 INTRODUCTION

It is a paradox of ODL that materials-based courses are less adaptable than classroom teaching, and therefore must focus on narrower student groups, while at the same time ODL attracts more varied groups than does classroom teaching. As a result, diversity is potentially a bigger issue in ODL than in classrooms.

#### Issues for instructional designers

1. What will be the range of learners who will use these materials?
2. What do I need to do to ensure that the materials meet their varied needs and are acceptable to them all?

### 4.6.2 WHAT WILL BE THE RANGE OF LEARNERS WHO WILL USE YOUR MATERIALS?

This can be a hard question to answer, particularly for a new course, but if you can answer it, you are in a better position to design a course that will meet your learners' needs.

The main variations between learners that have been found to affect how they react to courses are as follows:

- **gender** – Men and women can react very differently to different aspects of courses. For example, both men and women may be demotivated if a course predominantly uses people of the opposite gender in the course materials.
- **age** – ODL courses often attract learners over wide age ranges. If all the people appearing in the materials are predominantly of one age group, other age groups may feel that the course has not been designed for them.
- **ethnicity** – In a society with a range of ethnic groups, it is important that learners from all groups feel the course is for people like them.
- **religion** – Religion is not often an issue in course design, but it occasionally can be. For example, in literature courses, novels and poems might refer to forms of relationship that are forbidden by certain religions. Another example is the problem of how to teach Darwinian evolution, given that certain religious groups do not accept Darwin's (and later researchers') theories.

## 4.6.3 WHAT DO I NEED TO DO TO ENSURE THAT THE MATERIALS MEET THESE VARIED NEEDS AND ARE ACCEPTABLE TO ALL LEARNERS?

### Portrayal of people

Most of the diversity problems arise from the portrayal of people in courses, as in drawings, photographs, scenarios and so on. Clearly the standard approach is to ensure that there is a good mix of gender, age and ethnicity throughout the course material. However, this can sometimes be problematic. Suppose you are creating a course for nurses in a country where 90% of the nurses are female. Should your course ensure that 50% of the people shown or referred to are male and 50% female, or should they be 10% male and 90% be female?

### Treatment of sensitive issues

An even more difficult area is how to treat issues that are known to be sensitive to one or more sections of your learners. For example, some Muslims believe that all Muslim women should wear headscarves. How will this affect the pictures that you put in your courses? Will you show all Muslim women wearing headscarves (to avoid offending those who approve of this practice, but perhaps offend those Muslim women who disagree with the practice), or will you show a mixture (which might offend both groups)?

There are no easy answers to these questions, so you must take particular care to explore these issues when you developmentally test your materials before their full use.

## 4.7 ESTIMATING THE STUDY TIME FOR A UNIT

### 4.7.1 INTRODUCTION

There is much anecdotal evidence to show that instructional designers persistently underestimate how long learners will take to study a given piece of learning material. Despite this, it is important to attempt to estimate study time. This part introduces a method for doing that.

#### **Issues for instructional designers**

1. How long will students take to complete a particular unit?
2. What methods are available for estimating study time?



## 4.7.2 PRINCIPLES OF THE METHOD FOR ESTIMATING STUDY TIME

The method, described here for a unit of study, involves listing everything that learners need to do and then attaching a time estimate to that activity, based on some basic assumptions about performing different activities. The method is explained using the example of the hypothetical course unit in Figure 12.

### Step 1: Identify all the tasks that learners have to undertake

Figure 12 identifies everything that learners will be asked to do, including such minor tasks as 'read the title of the unit', major tasks such as doing the activities, and implied tasks such as taking notes. The more complete your analysis at this stage, the more accurate your time estimate will be.

**FIGURE 12.** The hypothetical unit

Read title
Read introduction
Read contents list
Read outcomes
Topic 1
Read introduction to topic 1
Do Activity 1
Read feedback to Activity 1
Listen to audio tape 1
Study Example 1
Do Activity 2
Read feedback to Activity 2
etc.
Make notes on Topic 1
Topic 2
Read introduction to topic 2
etc.
Read the summary
Do the end test
Check end test answers

## Step 2: Develop some time usage rules

In this step, you decide the speed at which you think your target audience can complete various tasks. Clearly, this speed depends on factors such as age, educational level and experience of self-study, so any figures you use here will depend heavily on your target audience. However, you make some usage rules such as:

- read a page of text – 20 minutes

This process of time estimating is repeated for every item in the unit, gradually completing a table as shown in Figure 13. This shows that the unit of learning will take about 90 minutes.

**FIGURE 13.** The hypothetical unit with estimated study times

<b>Task</b>	<b>Estimated study time (mins)</b>
Read title	1
Read introduction	1
Read contents list	1
Read outcomes	1
Topic 1	
Read introduction to topic 1	2
Do Activity 1	10
Read feedback to Activity 1	3
Listen to audio tape 1	5
Study Example 1	10
Do Activity 2	15
Read feedback to Activity 2	5
etc.	
Make notes on Topic 1	10
Topic 2	
Read introduction to topic 2	2
etc.	
Read the summary	5
Do the end test	10
Check end test answers	5
<b>TOTAL STUDY TIME</b>	<b>86</b>

Less routine tasks will need to be timed individually. Example 66 shows the sample study time estimate for one activity.

### EXAMPLE 66. Sample time estimate for completing an activity

<b>Activity 1: Apostrophes with singular words</b>	<b>Read 0.25 min</b>
This activity will help you improve your use of apostrophes to show possession.	<b>Read 0.25 min</b>
Rewrite each of the following to use an apostrophe. We've done the first one for you. 1. the palace of the Queen 2. the book of my friend 3. the computer of Charles 4. the surface of the Earth	<b>Read 0.5 min</b>
1. <u>the Queen's palace</u> _____ 2. _____ 3. _____ 4. _____	<b>Answer</b> <b>3 × 1 = 3 min</b>
Take no more than 5 minutes to do this.	
<b>Total estimated time</b>	<b>4 min</b>