CREATING LEARNING MATERIALS FOR OPEN AND DISTANCE LEARNING:

A Handbook for Authors and Instructional Designers

COMMONWEALTH *of* LEARNING

COMMONWEALTH OF LEARNING

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The Chairman of the Board of Governors is Mr. Lewis Perinbam, O.C.; the Commonwealth of Learning's President and Chief Executive Officer is Sir John Daniel.

ACKNOWLEDGEMENTS

We are grateful to the following organisations for permission to use extracts from various courses:

- Institute for Adult Basic Education and Training, University of South Africa (UNISA)

- International Extension College, Cambridge

- Namibian College of Open Learning (NAMCOL), Windhoek, Namibia

- National Extension College, Cambridge

- University of South Africa (UNISA), Pretoria

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INTRODUCTION

WHO THIS HANDBOOK IS FOR

This handbook has been written for anyone who plans and writes learning materials for use in open and distance learning (ODL). Anyone who is interested in producing better ODL materials will find something of value in this handbook, but the three main target audiences are:

• teachers

• instructional designers

• writers.

ODL materials are sometimes prepared by individuals, but more often by small teams made up of people with skills such as curriculum design, instructional design, tutorial support and print or web design skills. This handbook focuses on the instructional design part of the process, although some of the other aspects are dealt with in part.

There are four principal ways in which learning materials are produced:

• by an instructional designer who is the content-provider and the writer;

• by an instructional designer who commissions freelance content-providers to write the materials;

• by an instructional designer who converts text provided by a teacher; or

• by a team of people, including content-providers, instructional designers and specialists such as audio and video producers.

For simplicity, this handbook addresses primarily the first approach – that in which a single writer is both content-provider and instructional designer. If, however, you are an in-house instructional designer who is commissioning content and expertise from others, then you will need to pass on the advice in this handbook to them. In these circumstances, you are likely to be the only person who specialises in instructional design and you will need to guide the other specialists in applying best practice in instructional design.

The handbook seeks to help you, the instructional designer, be better able to answer questions such as:

• How do ODL materials differ from other types of learning material?

• Should I adapt existing materials or create new ones for the organisation?

• How should I plan an entire ODL course to create a holistic educational experience at a distance?

- What special techniques are there for promoting active, effective learning in print and on the web?

- In what ways are print and web materials similar and in what ways are they different?

- How can the effectiveness of distance learning be assessed?

- How should I write to ensure that language will not be a problem for our learners?

- How should I manage the drafting and quality assurance processes to produce high quality materials on time and within budget?

WHAT IS ODL?

Open and distance learning (ODL) combines two forms of education – open and distance – that focus on expanding access to learning. It is characterised by two factors: its philosophy and its use of technology.

Most ODL systems have a **philosophy** that aims to:

- remove barriers to education, and

- allow students to study what they want, when they want and where they want.

In short, ODL is about increasing educational **access** and increasing educational **choice**.

ODL systems typically use **technology** to mediate learning, for example:

- printed workbooks

- audio cassettes

- radio

- the web.

There is no one method for providing ODL, so a wide variety of courses are described as 'open learning' or as 'distance learning'. Some typical examples are shown in Figure 1. The variety is instructive. In some cases, students work almost entirely by themselves (e.g., correspondence courses); in others they study in groups (e.g., interactive radio); and in still others they might meet together at intervals (e.g., distance teacher training). There is an equally wide variety of purposes to which ODL is put, ranging from primary education to post-school study of the secondary curriculum and, ultimately, professional updating.

FIGURE 1. Examples of ODL systems

1. Correspondence courses where students study for professional qualification and degrees.

2. Interactive radio instruction in primary schools, where classroom-based pupils learn from studio-based teachers.

3. Open learning systems using workbooks, study centres and online conferencing to enable working adults to gain school-leaving qualifications.

4. Web-based courses used to update technical staff in the workplace.

5. Distance learning courses to upgrade classroom teachers without their having to leave their classrooms.

TERMINOLOGY

The vocabulary used in ODL and in instructional design varies around the world (and even within countries). For the purposes of this handbook, particular terms are defined as follows:

Learner: Anyone who will learn from the materials that you design. Some learners are registered students and others are not.

Student: A learner who is using ODL materials and is registered for support and assessment with an educational institution.

Learning aim: The performance expected from learners once they have completed a course.

Learning objective/outcome: A specific piece of learning that learners are expected to achieve as a result of studying a small part of a course.

ODL course: The total offering to students studying by ODL – thus an ODL course, including learning materials, tutorial support, assessment, administration and so on.

ODL course materials: The learning materials for an ODL course.

Wrap-round materials: A set of materials (in any medium) designed to make some other set of materials (e.g., a textbook) more accessible to ODL learners.

This handbook concentrates on the design and development of print and web materials for ODL learners 16 years of age or older. This is not to say that ODL cannot be used with younger learners, but the instructional techniques tend to be different for them – for example, younger learners often study in groups in a classroom.

HOW TO USE THIS HANDBOOK

The handbook can be used at a number of depths, according to your needs (Figure 2). For the most part, each section can be used independently of the other sections and, to a lesser extent, each topic can be used independently of the other topics. Where it is important to refer to more than one section or topic at the same time, cross-references are provided in the text.

FIGURE 2. Ways to use the handbook

	If you need to …	Then
1	Get a high level overview of what is involved in instructional design of ODL materials.	Read Sections 2–10 in the table of contents.
2	Get an overview of the key issues in any one aspect of instructional design of ODL materials	Read the overview at the start of the relevant section.
3	Get an overview of the key issues in any one topic	Read 'Issues for instructional designers' for that topic.
4	Develop your skills and knowledge in the instructional design of ODL materials	Read the detail for that topic and, for further information, follow up some of the references.

Of course, to fully develop your skills as an instructional designer, you will need to apply what is in this handbook to a course that you are responsible for developing.

FURTHER READING

The bibliography at the end of the handbook includes a wide range of sources. Key among them as sources of a general introduction to ODL are the following:

Distance Education at a Glance. Available at www.uidaho.edu/eo/distglan.html.

Freeman, R. 1997. *Managing Open Systems*. London: Kogan Page.

Freeman, R. 2004. *Planning Open and Distance Learning Systems: A Handbook for Decision Makers*. Vancouver, BC: Commonwealth of Learning.

Freeman, R. and Lewis R. 1998. *Planning and Implementing Assessment*. London: Kogan Page.

Instructional Design Theories. Available at www.indiana.edu/~idtheory/home.html.

Kember, D. 1991. *Writing Study Guides*. Bristol: Technical and Educational Services Ltd.

Kember, D. and Murphy, D. 1994. *53 Interesting Activities for Open Learning Courses*. Bristol: Technical and Educational Services Ltd.

Laurillard, D. 2002. *Rethinking University Teaching*. London: Routledge-Falmer.

Lockwood, F. 1992. *Activities in Self-Instructional Text*. London: Kogan Page.

Lockwood, F. (editor) 1994. *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing.

Mager, R. 1962. *Preparing Instructional Objectives*. Palo Alto, CA: Fearon Publishers.

Mishra, S. 2001. *Designing Online Learning*. Vancouver, BC: Commonwealth of Learning.

Morgan, C. and O'Reilly, M. 1999. *Assessing Open and Distance Learners*. London: Kogan Page.

Murphy, D. 2000. *Instructional Design for Self-Learning for Distance Education*. Vancouver, BC: Commonwealth of Learning.

O'Rourke, J. 2003. *Tutoring in Open and Distance Learning: A Handbook for Tutors.* Vancouver, BC: Commonwealth of Learning.

Race, P. 1989. *The Open Learning Handbook*. London: Kogan Page.

Race, P. 1992. *53 Interesting Ways to Write Open Learning Materials*. Bristol: Technical and Educational Services Ltd.

Romiszowksi, A. 1981. *Designing Instructional Systems*. London: Kogan Page.

Romiszowksi, A. 1986. *Developing Auto-Instructional Materials*. London: Kogan Page.

Romiszowksi, A. 1988. *The Selection and Use of Instructional Media*. London: Kogan Page.

Rowntree, D. 1990. *Teaching Through Self-Instruction: How to Develop Open Learning Materials*. London: Kogan Page.

Rowntree, D. 1992. *Exploring Open and Distance Learning*. London: Kogan Page.

Rowntree, D. 1994a. Existing material: how to find it, evaluate it and customize it. In: Lockwood, F. (editor). *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing Ltd., pp. 79–88.

Rowntree, D. 1994b. *Preparing Materials for Open, Distance and Flexible Learning*. London: Kogan Page.

Rowntree, D. 1997. *Making Materials-Based Learning Work*. London: Kogan Page.

Swales, C. 2000. *Editing Distance Education Materials*. Vancouver, BC: Commonwealth of Learning.

Ward, C. 1981. *Preparing and Using Objective Questions*. Cheltenham: Stanley Thornes.

SECTION 1:
WHAT IS INSTRUCTIONAL DESIGN AND WHAT ARE ODL MATERIALS?

OVERVIEW OF SECTION 1

This section looks at the background to instructional design under four headings:

- Instructional design: what it is and why it is important in ODL

- How adults learn

- What is special about ODL materials?

- Types of ODL instructional design

Instructional design: what it is and why it is important in ODL

This part looks at how instructional design is used to create learning materials that will replicate what the teacher does in the classroom. Definitions of instructional design are provided and the main steps in the process of creating materials are described.

The three main theoretical approaches to instructional design used in the history of ODL are then presented. The point is also made, however, that despite theories and the systematic approaches, 'the field of instructional design is more like a craft while it claims to be a technology' (Elen and Clarebout, 2001).

How adults learn

This part discusses how adults learn and, in particular, how their approach to learning differs from that of school-age learners. Six key characteristics of adult learners that we need to take into account in planning ODL courses are identified, as are five key principles of learning that are of great importance in designing learning materials.

How do ODL materials differ from other educational materials?

This part introduces the core ideas detailed in this handbook. It is not effective to send textbooks to ODL students. Rather, materials must be specially designed to suit the

ODL situation. The differences between ODL materials and conventional classroom materials are discussed.

Types of ODL instructional design

This part introduces three basic types of instructional design – tell-and-test, tutorial and reflective action – and describes how each relates to some of the key theories of learning. The characteristics of each type are also described and when each might be most appropriate to use.

1.1 INSTRUCTIONAL DESIGN: WHAT IT IS AND WHY IT IS IMPORTANT IN ODL

1.1.1 INTRODUCTION

Understanding the nature of instructional design starts with looking at the three main theoretical approaches to how adults learn. These approaches lead, in turn, to three views of what the function of learning materials in ODL should be and what sort of devices should be inserted into ODL materials in order to promote effective learning. The instructional designer uses all of this information to fulfill his or her role.

Issues for instructional designers

1. What will be my role as instructional designer?

2. What theory will guide me in planning and writing materials?

3. Does any one theory sufficiently explain how people learn?

1.1.2 WHAT IS INSTRUCTIONAL DESIGN?

The following definition offers a good starting point for understanding what instructional design means:

Instructional Design is the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities; and tryout

and evaluation of all instruction and learner activities. (Pennsylvania State University, nd)

This definition can usefully be supported by Romiszowski's definition of the word 'instruction':

Instruction … [is] … a goal-directed teaching process which is more or less pre-planned. (Romiszowksi, 1981)

Instructional design is thus a process (see Figure 3) that works in a systematic way to translate learners' needs and goals into successful learning.

FIGURE 3. The instructional design process
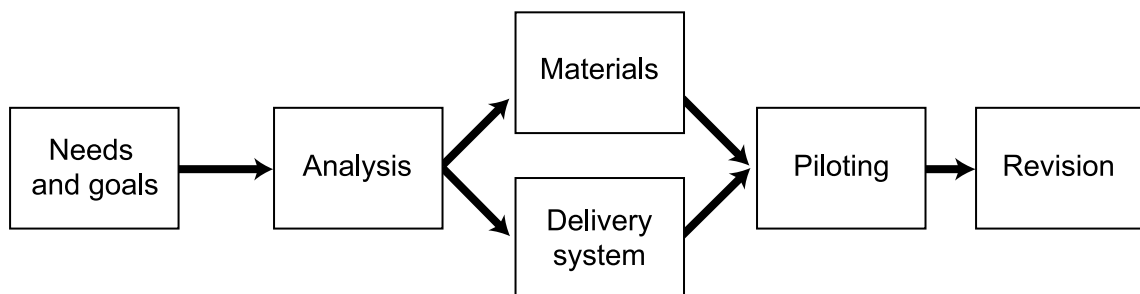
In classroom-based teaching, the basic resource is the teacher. He or she may use other resources such as textbooks or audio-visual aids, but the teacher remains the central component of the system. He or she performs many functions. He or she:

• defines what is to be learnt,

• provides information,

• gives examples,

• explains,

• questions,

• sets learning tasks, both for individuals and groups,

• marks work,

• answers learners' questions,

• checks what learners have learnt,

• provides feedback to individual learners on their progress,

• provides other resources (e.g., textbooks),

- gives advice on how to use those resources,

- gives study advice, and

- helps with individual problems.

In distance learning, there is no teacher. The teacher is replaced by a combination of learning materials and tutors. Because tutors are expensive and because distance learners mostly study at home, the tutors are only involved with learners for short periods. This means that the learning materials have to carry out all of the 14 tasks above, except for marking work. In other words, the learning materials themselves will define what is to be learnt, provide information, give examples and so on.

Creating materials that can do this is a complex technical task. That is where the need for a good understanding of **instructional design** comes in – the subject of this handbook.

As Figure 3 shows, instructional design in an ideal world would be a simple matter of identifying learners' needs and goals and then creating some learning materials that enabled them to meet those goals. Such a statement presupposes that some theory exists to guide instructional designers in that process. What is the theory?

1.1.3 THEORIES OF INSTRUCTIONAL DESIGN

The first definition above refers to 'using learning and instructional theory'. The question is, 'which theory?' Instructional designers have tended to come up with different answers at different times. ODL has passed through three main phases, each based on a particular theoretical approach.

- First, there was the one of Gagné (1968) who stressed that the aim of instructional design was to create the particular conditions needed for a particular type of learning. Under this behavioural approach, he described, for example, the conditions that a student needed for learning things such as rules, concepts and problem-solving.

- In the next phase, which was dominated by cognitive approaches, the emphasis was on design based on characteristics of individual learners.

- More recently has been the constructivist approach, which emphasises the learner's own activities as the mechanism for learning (Elen and Clarebout, 2001).

Although many writers today espouse the constructivist approach as the only one to use, any cursory perusal of ODL materials shows that instructional designers regularly make use of all three approaches. Some constructivist writers also acknowledge that other theories have their place:

We believe that the initial knowledge acquisition phase is better served by instructional techniques that are based upon classical instructional design techniques. Classical

> instructional design is predicated upon predetermined learning outcomes, constrained and sequential instructional interactions, and criterion-referenced evaluation. (Jonassen et al., 1993)

This judgement would seem to be supported by the practice of instructional designers. Table 1 summarises some of the common applications of the various theoretical approaches.

TABLE 1. Some uses of learning theories

Type of theory	Learning tasks to which that theory is often applied
Behavioural	Rote memorising Training people to do routine tasks (e.g., issue driving licences) Learning arbitrary information (e.g., irregular verbs) Learning rule systems (e.g., the rules for assessing a person for social security benefits) Learning procedures where variation is not acceptable (e.g., the correct procedure to assemble a piece of equipment)
Cognitive	Classifying Concept learning Problem-solving Procedures Reasoning and argument Rules
Constructive	Case studies Complex situations Real-world problem-solving

The devices that designers build into their learning materials help identify which approach they are using. Table 2 sets out some of the most common devices that are found with each type of theoretical approach.

TABLE 2. Typical learning devices associated with each type of theory

Type of theory	Learning devices used
Behavioural	• learning objectives stated • task broken down into small steps • most tasks have clear right or wrong answers • learners assessed against the stated learning objectives • the learning package prescribes what is to be learnt
Cognitive	• learning objectives stated • task broken down into small steps • learners assessed against the stated learning objectives • a wide variety of tasks, but within the scope of the stated objectives • material is 'chunked' into small, meaningful pieces • mnemonics are used to aid memory • advance organisers are used to help learners see the structure of the topic • simplification of real-world situations • the learning package tends to prescribe what is to be learnt
Constructive	• learner choice of task or situation • authentic, real-world tasks • case studies • complexity of the real world presented in the tasks • collaborative learning tasks • opportunities to learn from observing others (e.g., trainee teaching as observer in a classroom) • the learning package tends to be open-ended in terms of what is to be learnt • self-evaluation rather than formal assessment

1.1.4 MORE A CRAFT THAN A PRESCRIPTIVE PROCESS

If you feel confused by the range of approaches and the lack of prescription as to which approach to use when, then you are merely experiencing what most instructional designers experience. Of course it would be wonderful to have a theory that told us how to design materials for topic X, given student characteristics Y. No such theory exists. The reality of instructional design can be summed up as Elen and Clarebout (2001) put it: 'The field of instructional design is more like a craft while it claims to be a technology.'

In practice, most instructional designers probably draw on all three approaches at different times.

1.1.5 WHAT DOES AN INSTRUCTIONAL DESIGNER DO?

There is no prescriptive list of the tasks that an instructional designer carries out in turning theory into the day-to-day work, but the following are typical:

- determine what the learners need to know (a stage often called 'learning needs analysis' or 'training needs analysis');

- develop learning outcomes;

- decide how learning will be assessed at the end of the course (or during the course if the assessment is in stages);

- allocate outcomes to the various sections of the course (usually called units);

- for each unit:

  - decide the types of activity needed to achieve each outcome

  - decide the examples needed to help learners learn each outcome

  - identify any graphics needed

  - plan any self-assessment needed for that unit;

- write the units;

- test and evaluate the materials; and

- revise to take account of the evaluation results.

1.2 HOW ADULTS LEARN

1.2.1 INTRODUCTION

Our knowledge of how adults learn is incomplete. It is not even clear whether 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 deduce from those some guiding principles for the design of post-school learning materials. Whatever the weaknesses of this approach, it at least ensures that 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?

1.2.2 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 characteristics of adult learners are those six identified by Knowles (1990).

1. Adults 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 such as '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 they will benefit from it. This implies that ODL curricular should concentrate on what is beneficial to adult learners – that is, 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 by adult learners 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.

3. Adults come to post-school education with a wealth of experience

Adults will have (to varying degrees) experience of attending school, working, handling money, bringing up children, following politics and so on. They are therefore likely to view post-school education as building on those experiences.

Such experience is usually spoken of in positive terms, and often that is the way it is. However, some prior experience can also be a block to new learning. For example, where someone has developed a prejudice towards certain people, he or she may be reluctant to have that attitude and associated ideas challenged.

4. Adults are likely to choose to learn when they are ready to learn

In school, children are often taught things for which they are not always ready. For example, teaching business studies to students younger than 16 is a questionable activity. Adults, on the other hand, are unlikely to enrol in courses before they feel ready to follow them. For example, adults are not likely to take a business course unless they have decided to start a career in business. This means that adult ODL learners tend to be highly motivated: they study what they want to study and have clear personal goals that they wish to achieve through study. (However, it is also the case that some adult students will enrol in courses that do not match their needs. For this reason, it is important for adults to have access to educational guidance when choosing their courses.)

5. Adults, in their learning, are problem-centred

Adults tend to enter post-school education to solve a problem. For example, if a woman wants to get a job in a local office that uses computers and she knows nothing about computers, she might decide to take a course in basic ITC (information technology and communication) skills. In other words, adult learners tend to be goal-oriented. This means that we need to design ODL courses in a way that assists adult learners to achieve their goals – that is, courses need to have a strong, practical aspect.

6. Adults tend to be motivated by personal factors

According to Knowles (1990), adults engage in post-school education primarily to meet personal needs such as greater job satisfaction or a better quality of life. It seems doubtful whether this is true of developing countries, where getting a job, gaining a better job or a promotion, and earning a higher income are likely to be important motivators.

1.2.3 IMPLICATIONS FOR INSTRUCTIONAL DESIGN IN ODL

What are the implications of these characteristics for instructional design? We can probably conclude that instructional designers need to emphasise the following approaches when designing post-school courses:

- Include opportunities for learners to recall their prior knowledge and experience, and encourage them to reflect on this and compare it with what they are learning.

- Design adult curricular around the needs of learners. 'Needs' refers here to why they are learning (e.g., to qualify for some other course, to start their own business or to gain a particular type of job). It helps to look at every item in a proposed curricular and ask 'How will this item be useful to our learners?'

- Look for ways of allowing learners to make choices and direct their own learning (e.g., by setting some of their own goals or by giving them a choice of tasks). (In practice, this can be quite difficult to do since building choice into learning materials can be both costly and complex.)

- Encourage learners to set their own personal goals and to check their progress against them.

- Look for ways in which learners can choose how they complete tasks. For example, in designing a marketing programme, learners might have the choice of preparing a brochure, a poster or radio advertisement.

- Try to give learners the maximum opportunity to put new knowledge and skills into practice.

1.2.4 LIMITATIONS OF ADULT LEARNING THEORY

Whilst the above principles are widely quoted and followed in designing post-school courses, it has to be admitted that our knowledge of how people learn is very patchy. Much of the research on adult learning has been conducted on very small groups, often of middle-class learners in the developed world. The limitations of our knowledge are discussed further by Brookfield (1995).

1.2.5 OTHER PRINCIPLES OF LEARNING

In looking at what makes post-school learning distinctive, there is a danger of forgetting some other crucial points about how people learn.

- Learning is an active process, so good learning materials focus on learner activities rather than on exposition and explanation.

- Learning tasks should always be meaningful to the learner.

- Learning tasks should always match the assumed prior knowledge of the learners.

- Learning requires feedback: learners need to know whether they have learnt something correctly and therefore need regular feedback on their progress.

- Learning is enhanced by examples: learners can better understand and remember important points by being presented with good examples.

You will find that these ideas run through the whole of this handbook.

1.3 HOW DO ODL MATERIALS DIFFER FROM OTHER EDUCATIONAL MATERIALS?

1.3.1 INTRODUCTION

How do ODL materials differ from other learning materials – in particular, traditional textbooks? To understand the answer to this question, it helps to start by looking at a typical ODL text layout and then explore how such layouts are derived from the theories of adult learning that were presented in section 1.1, 'Instructional Design: What It Is and Why It Is Important in ODL'.

You will notice that whilst the content of ODL materials is often quite similar to that of textbooks, ODL materials place much more emphasis on the **processes of learning**.

> **Issues for instructional designers**
>
> 1. What is the difference between writing a textbook and writing ODL materials?
>
> 2. What are the key features of ODL materials?

1.3.2 THE STRUCTURE OF ODL MATERIALS

If you glance at a random sample of ODL materials, you are likely to be struck by how different they look from traditional textbooks. Probably the four things that will be most noticeable are:

- the wide range of learning devices,

- the relatively low proportion of text compared to learning devices,

- the space that is often provided for learners to write their answers in, and

- the 'generous' layout overall.

You can see these features in Example 1.

EXAMPLE 1. Example of an ODL text

GCSE Biology
UNIT 1, TOPIC 2

Animal group	Main features that adapt organism to its environment
Mammals	Mammals have hair for insulation. Many mammals have **sweat glands** for temperature regulation. The females carry the developing young in the womb during pregnancy and have mammary glands which produce milk, for feeding (suckling) the young after birth. The parents care for the young until they become self-supporting.

Self-check

1   Read through the following passage and then complete it by adding the most suitable word or words in the spaces:

A moth is an .... because it does not have a backbone, and an arthropod because it has .... limbs and an .... skeleton. A moth is an insect because it has .... of legs, two pairs of .... and .... body regions. It differs from an arachnid, such as a .... because arachnids have .... of legs.

2   Why is a dolphin classified as a mammal but a haddock classified as a fish?

Review

In this topic you have found out about the way animals are classified. You have learnt the characteristics of each main group. You will probably have observed at least one real animal for yourself, and will have been able to identify some of these characteristics.

Answers to Activities

Activity 1

We hope you have been able to discover the following information:

1   Sparrow: vertebrate, bird (feathers, wings, beak, hard-shelled egg).

2   Woodlouse: invertebrate, arthropod (exoskeleton, segmented body, jointed limbs), crustacean (two pairs antennae).

3   Elephant: vertebrate, mammal (hair, pregnancies, mammary glands to suckle young).

4   Beetle: invertebrate, arthropod (exoskeleton, segmented body, jointed limbs), insect (three body segments, three pairs of legs).

If you are unsure, check the diagrams.

Activity 2

Although they share the same habitat, there are so many different aspects of the environment that various organisms can utilise the different conditions.

Self-check Answers

1   invertebrate; jointed; exo-; three pairs; wings; three; spider/scorpion/tick/mite; four pairs.

2   A dolphin has pregnancies and suckles the young via mammary glands; a fish does not do this and has a scaly skin, gills and fins.

12   © National Extension College Trust Ltd

Source: *Getting Started at GCSE Biology* (National Extension College, Cambridge)

Embedded devices

The term 'embedded devices' seems to have been fashioned by Martens (1998) to describe all the devices that instructional designers include in their materials. Martens noted 23 different types of embedded device in the materials that he looked at. The most common include:

•   learning objectives

•   tests of prior knowledge

•   advance organisers

•   activities

•   feedback to activities

•   examples

•   self-tests

•   summaries and lists of key points

•   study tips

•   animations (in electronic materials)

•   hypertext links (in electronic materials).

Most of these devices are not present in a typical textbook, so why do instructional designers include them in ODL materials?

The answer lies in the theories discussed in section 1.1. As noted in Table 2, cognitive approach stresses the use of learning devices such as:

•   learning objectives,

•   tasks broken down into small steps,

•   learners assessed against the stated learning objectives,

•   a wide variety of tasks but within the scope of the stated objectives,

•   material 'chunked' into small, meaningful pieces,

•   mnemonics used to aid memory,

•   advance organisers used to help learners see the structure of the topic, and

•   simplification of the real world.

It is not too difficult to see how the commonly used embedded devices have been derived from cognitivist theories. Learning outcomes, activities with feedback, summaries and key points are all devices to structure the learning of relatively complex material.

At the same time, the *typical* ODL course shows fewer signs of the factors that are stressed by constructivist approaches such as:

• authentic, real-world tasks,

• learner choice of task or situation,

• case studies,

• complexity of the real world presented in the tasks,

• collaborative learning tasks,

• opportunities to learn from observing others,

• the learning package being open-ended in terms of what is to be learnt, and

• self-evaluation rather than formal assessment.

There is a very practical explanation for this. Constructivist approaches emphasise *learner choice* of task and situation and the validity of any learner response. It is hard to incorporate such an approach into learning materials. (It is worth noting, however, that hypermedia lend themselves better to a constructivist approach [Elen and Clarebout, 2001].)

Finally, embedded devices usually take up a high proportion of the page (or screen) space, relative to expository text. Again, this is a reflection of cognitivist and constructivist theories, both of which stress the need for learners to carry out tasks. ODL materials do not seek to tell, but to *engage*.

Space for learners' answers

It is common practice to provide answer spaces in ODL text materials, reflecting the widespread teacher belief that this encourages learners to complete the activities. As Lockwood (1992) says, the evidence that this is the case 'is persuasive'. He reports research by Henderson (1993) which found that questions without answer spaces were answered by 40% of learners, but the same questions with answer spaces were answered by 90% of learners. Martens (1998) has also noted that learners who complete activities tend to do better on the course as a whole.

The 'generous' layout

Writers on ODL instructional design repeatedly mention the desirability of a 'generous' layout and the liberal use of 'white space'.

(Interestingly, research supports the opposite case for web pages that are used for searching: see 'Reduce the amount of unused space on pages used for scanning and searching' at *http://usability.gov/guidelines/layout.html#five*.)

Table 3 summarises a comparison between typical ODL materials and a typical textbook.

TABLE 3. Comparison of ODL materials and textbooks

ODL materials typically …	Textbooks typically …
Are divided into study units, sometimes representing a week's work	Are divided into chapters, based on topics rather than study time
Include a study guide on how to use the materials and how to study by oneself	Do not include study guides or study guidance
Include study tips (e.g., on note-taking)	Do not include study tips
Include examples	Include examples
Include diagrams and pictures	Include diagrams and pictures
Include numerous activities	Have few or no activities
Provide feedback on answers	Do not provide feedback
Are tightly structured	Are more loosely structured
Address the learner as 'you'	Use passive language (e.g., 'it can be seen that' or 'the reader will note that')
Have a generous layout, often including space for learners to write in	Have pages filled with text, figures, tables, lists and other graphic elements – there is no space for learners to write in
Have as an audience the individual learner	Serve a dual audience: the learner and the teacher
Attempt to meet all the needs of the learner	Assume that the learner has a teacher who will be able to amplify the printed text

1.4 TYPES OF ODL INSTRUCTIONAL DESIGN

1.4.1 INTRODUCTION

There are many ways to classify instructional design. One simple but very useful way is that by Rowntree (1994):

•   tell-and-test

•   tutorial

•   reflective action guide.

These roughly correspond to behaviourist, cognitivist and constructivist approaches. The tutorial approach is the one most commonly used in ODL, although the reflective action guide approach can be found in quite a few university courses. It is important to note, though, that an instructional designer might use all three approaches in one course, depending on the learning objectives to be achieved at any one point in the course.

> **Issues for instructional designers**
>
> 1.   Which instructional design type do I wish to use for my course?
>
> 2.   Do I wish to use a mix of types?
>
> 3.   What are the advantages and disadvantages of using the type (or types) that I have chosen?

1.4.2 TELL-AND-TEST

In this approach, each topic consists of a piece of explanatory text (with diagrams and examples as needed) followed by a test to check whether the learners have learnt the material. A course might consist of tens or hundreds of such tell-test sequences. The emphasis of the method is on *memorising* rather than understanding.

The advantage of this type of material is that it is comparatively easy to produce and can easily be created from existing teaching notes or lecture notes. The disadvantage is that it contains almost none of the cognitive devices thought to be necessary by researchers for long-term retention and none at all of the constructivist devices. Overall, this approach is not very effective.

This style of teaching is rarely seen in ODL materials nowadays and never in such materials produced by leading ODL institutions. Regrettably, it is a style that has returned to ODL in many of the web-based courses now on offer. Large numbers of these 'instant' online courses are simply

lecture notes turned into web pages with, sometimes, a set of self-test questions at the end. This so-called form of instructional design is not a recommended model.

1.4.3 TUTORIAL

The tutorial approach is characterised by the writer presenting some form of input (e.g., text, diagram, case study) and then setting an activity on it (see Example 2). The activity seeks to help the learner *understand* the material being taught. A complete unit consists of a succession of input-activity sequences. In this way the material mimics the teacher who gives some input and then asks a question or sets a task in the classroom.

This is the dominant style in text-based ODL materials and the one on which this handbook concentrates.

The tutorial model works very well when the material to be taught is a well-defined body of knowledge and methods. Thus, it works well for topics as diverse as:

• foreign languages

• maths

• sciences

• accountancy

• medicine.

It works less well for subjects such as management studies (because there is no one right way to manage) and creative writing (because every writer must find his or her own way to write).

It is worth noting that the tutorial style was developed for use in print ODL materials. It can be extended to the web, but care needs to be taken in the navigation of web tutorial sites. The tutorial method assumes a carefully controlled order of presentation of input, activity and feedback. If learners are allowed to freely navigate a web site, this order will be lost and so will undermine the tutorial's structure. To avoid this problem, course web sites should be constructed with careful control over hypertext links.

EXAMPLE 2. Example of a tutorial style of ODL teaching

UNIT 5: UNDERSTANDING DECIMALS

Recurring decimals

Look back at your earlier work on division. You may have had problems with dividing the tray of flapjacks among certain numbers of people. When you divided it among nine people, at some point you probably thought, 'Oh, it goes on for ever!' Each time you divided it you had one left over.

Decimals that go on for ever are called RECURRING DECIMALS. They are written with a dot showing the recurring figure:

$$0.\dot{1} = 0.1111111 \ldots$$

or two dots showing the recurring part:

$$0.5\dot{4}3\dot{2} = 0.54324324 \ldots$$

Decimals that end are called TERMINATING DECIMALS.

15 Write out the first ten figures after the decimal point in these recurring decimals. For example:

$$0.3\dot{2}5\dot{4} = 0.3254545454 \ldots$$

(a) $0.\dot{3}$ (b) $0.2857\dot{1}\dot{4}$ (c) $3.\dot{6}\dot{4}$ (d) $7.\dot{1}\dot{2}$

(e) $0.5\dot{4}\dot{3}$ (f) $0.6\dot{3}\dot{7}$ (g) $0.1\dot{6}$ (h) $2.34\dot{2}$

16 Write out these decimals using recurring decimal dots. For example:

$$1.34444 \ldots = 1.3\dot{4}$$

(a) $2.464646 \ldots$ (b) $0.666666 \ldots$ (c) $3.24444 \ldots$
(d) $0.327327327 \ldots$ (e) $0.515515515 \ldots$ (f) $6.33333 \ldots$
(g) $7.2411111 \ldots$ (h) $11.11111111 \ldots$

17 Look at your table in Question 2. Some fractions give recurring decimals and others give terminating decimals. (Notice how your calculator 'ends' the recurring decimals.)

(a) Organise the fractions in this table:

Fractions giving terminating decimals	Fractions giving recurring decimals	Fractions giving decimals that go on forever without recurring
$\frac{1}{5}$	$\frac{1}{3}$	

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

1.4.4 REFLECTIVE ACTION GUIDE

Reflective action guides take an essentially constructivist approach to materials design. Such materials usually aim to support learners in learning from their own experiences (e.g., at work). Typically such materials will:

- specify broadly defined aims but no precise learning outcomes;

- set projects;

- set tasks that require the learners to engage with others (who, for example, may be other learners or people at work);

- encourage the learners to record and reflect on their own experience (e.g., by keeping a learning journal);

- use case studies; and

- set activities that are open-ended, often being based on the learners' own experiences.

This format (see Example 3) works well in both print and on the web.

EXAMPLE 3. Example of a reflective action style of ODL teaching

INTRODUCING COUNSELLING SKILLS   Unit 3: A model for helping

Activity 5

Think about a difficulty or obstacle that you have worked through in your life. Did it follow a similar process – did you think it through or talk it through with someone you trusted, begin to see some possibilities and start to move forward?

The problem area:

The process:

Comment

Many people find this basic three-stage process effective in beginning to sort out their problems.

Activity 6

Now describe how you have helped someone else through a problem area.

Their problem area was:

The process of helping:

INTRODUCING COUNSELLING SKILLS   5

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

Problem-based learning: a variation on the reflective action guide method

Problem-based learning is similar to the reflective action guide type of instructional design, and even considered by some people to be a fourth type of instructional design. It is an approach that is widely used in medicine and engineering in particular.

Burgess (nd) describes problem-based learning as that which 'starts from a problem, a question or a scenario, within which a number of themes or dimensions of learning are present'. In other words, complexity is a characteristic of the items used in problem-based learning. Problem-based learning is used to encourage higher level learning skills (such as critical thinking), problem-solving skills and deep learning (Poon et al., 1997; Burgess, nd). It is also seen as an approach that encourages self-directed learning in which students become responsible for their own learning and the teacher becomes a facilitator of learning (Poon et al., 1997; Burgess, nd).

The basic principles of problem-based learning are:

- to set a practical problem; and

- to leave students to access whatever sources they wish to come up with a solution.

Whilst problem-based courses may include tutor-prepared ODL materials, students are also likely to need to make use of other materials such as libraries, the web, databases and so on.

As an approach, problem-based learning has been found to compare well with traditional methods in terms of promoting on-the-job performance and higher level learning, but less well in terms of increasing basic knowledge (Burgess, nd).

1.4.5 MIXING INSTRUCTIONAL DESIGN TYPES

It is perfectly acceptable to *mix* the types of ODL design within a course to suit different needs. The most common mix would be a combination of tutorial to cover outcomes associated with well-defined material, and reflective action guide to cover less well-defined material. For example, a course on interviewing might contain some very well-defined outcomes (e.g., ones to do with how to use open and closed questions) and some material on the total experience of being an effective interviewer. The former part might be done using a tutorial approach and the latter might be done using a reflective action guide.

SECTION 2: ADAPT OR CREATE?

OVERVIEW OF SECTION 2

There are two basic ways of creating an ODL course: adapting some existing materials or writing a completely new course. This section explores those two options.

The write/adapt/wrap-round decision

This part reviews some of the factors that can influence whether you adapt or create materials. Most organisations prefer to create new materials, but that is costly and time-consuming, so the decision between the two approaches involves evaluating a range of factors and making a balanced judgement.

How to evaluate existing materials (with a view to adapting them)

If you do decide to adapt existing materials, then you have to choose which materials to use. Some materials are easy to adapt, others much more difficult. This part summarises the many factors that might contribute to your decision to use or not use certain materials as the basis for your ODL course.

Working with authors and teachers

This part looks at some of the difficulties that can arise from the splitting of responsibilities among authors, teachers and instructional designers.

2.1 THE WRITE/ADAPT/WRAP-ROUND DECISION

2.1.1 INTRODUCTION

There are three basic ways to produce an ODL course:

- write it from scratch,

- adapt an existing ODL course, or

- produce a wrap-round guide to an existing non-ODL resource such as a textbook.

A single course may be created through the use of only one of these methods or all three employed for different parts of the course.

Two contrary points of view about adapting learning materials indicate both the benefits and the challenges of the task:

> The real benefit of transformed materials is their flexibility. They can be added to, modified, adapted and re-targeted depending on the audience. (Davis and Smith, 1996)

> One of the most difficult constraints inhibiting the transfer of material is the perceived uniqueness of the curriculum. (Dhanarajan and Timmers, 1992)

Issues for instructional designers

1. Should I produce a new course, or can I use one produced elsewhere?

2. If I need to adapt an existing course, what changes will I need to make?

3. Is a wrap-round course an option for us?

2.1.2 REASONS WHY YOU MIGHT ADAPT OR DEVELOP WRAP-ROUND MATERIALS

There are two main reasons for deciding not to produce an ODL course from scratch and, instead, to adapt an existing course or create a wrap-round course. These reasons are time and cost.

Time

Producing a new ODL course from scratch takes a lot of time. In well-established ODL institutions, the time from identifying a need to having materials ready for use is typically two years, but can be as much as three. In an institution that is new to ODL, it is unrealistic to expect that good courses can initially be produced within 18 months to two years since, in the early stages, new skills will need to be learnt and new systems established. For many developing countries, this delay in having the first courses ready may be totally unacceptable.

Cost

Writing ODL courses from scratch is costly. The many steps such as planning, writing, reviewing, revising, editing and piloting are all labour-intensive and difficult to rush. The resulting high costs may be justifiable if the course is to be used by a large number of learners (since the unit cost will then be low), but for smaller groups, high-cost courses produce high-cost units – a situation that defeats one of the advantages of ODL: its cost-saving potential.

These two reasons – time and cost – point to the need to look carefully at the adapting and wrap-round options.

2.1.3 REASONS WHY YOU MIGHT WRITE NEW MATERIALS

The most compelling reason for writing new materials is when there are no existing materials (ODL or textbook) that cover the subject you need, at the level you need and in the language you need. If you are seeking materials in English, you will likely have no trouble finding something you can adapt. However, this is not the case in seeking materials in other languages.

The second reason to write your own materials is degree of control. Whenever you work from existing materials, you will face a range of constraints imposed by the approach, copyright and what you can do with the materials.

The advantages and disadvantages of producing materials in the three main ways are summarised in Table 4. A range of more detailed questions to ask yourself about adapting materials can be found in Rowntree (1990).

TABLE 4. Advantages and disadvantages of the various approaches to producing materials

	Write own materials	**Adapt other ODL materials**	**Wrap-round other ODL materials or textbook**
Advantages	• complete control of content • complete control of future use and adaptation • can sell rights to the materials to other organisations	• faster • not so expensive as writing your own materials • can give you access to teaching expertise not available locally	• very fast • can be quite cheap
Disadvantages	• takes longer • costs more	• may be restricted in the changes you can make • may be restricted in how you can use the materials you produce	• may produce a clumsy learning package • you will need to revise your wrap-round every time the original material is changed • the original material may go out of print

2.1.4 MAKING THE WRITE/ADAPT/WRAP-ROUND DECISION

The decision to write new materials should only be arrived at (since it is costly and time-consuming) when the other options have been considered. The algorithm set out in Figure 4 is one way of reaching this decision.

FIGURE 4. Deciding on how to produce a course
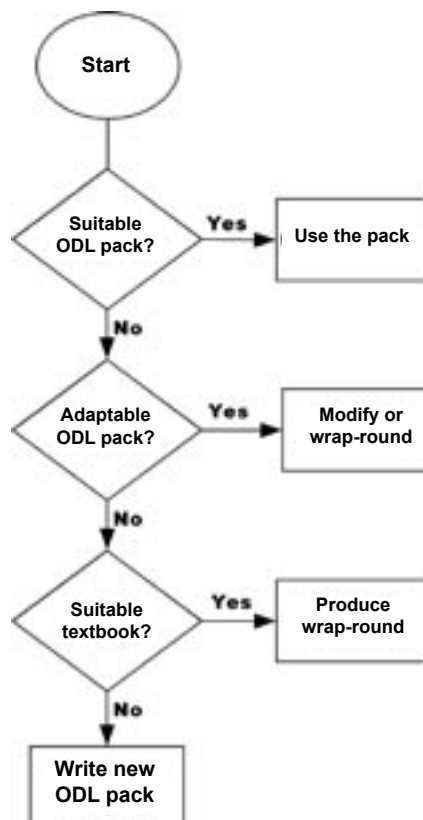
2.1.5 WHAT YOU MIGHT ADD

If you find a course package or textbook that roughly meets your needs, then you can consider adding to it in order to fully meet your needs. The sort of devices you might add include:

•   study advice

•   activities

•   examples

•   self-tests

•   summaries

- assessment material

- links to local resources

- case studies

- additional media elements such as an audio tape or a web site.

2.1.6 LEVELS/TYPES OF ADAPTATION

Rowntree (1990) distinguishes various levels of adaptation, ranging from simply putting your institution's name and logo on the cover ('badging') to creating new materials. His five levels of adaptation are:

- badging

- adding study guidance

- adding local examples

- adding new content

- adding new media.

2.1.7 STEPS IN ADAPTING MATERIALS

Very little has been written about systematic procedures for adapting materials (whereas there is a sizeable literature on writing new materials), but a useful model by Davis and Smith (1996) includes the following five steps:

- decide on the changes needed,

- get permission to make the changes,

- make the changes,

- pilot, and

- revise.

2.1.8 ISSUES IN ADAPTING

There are a number of potential problems that can arise in adapting materials, the chief ones being as follows.

Copyright

You need to obtain permission to modify the materials from another institution. Once you produce a new version, it will be a hybrid copyright product. Your licence agreement with the original producer will probably only allow you to use your version for certain stated purposes. If you later find new needs and wish to adapt the materials further, you may not have the right to do so.

Changes in the original version

If the originating institution updates its version of the materials, will your agreement with that institution give you access to those updates?

Going out of print

This point only applies to wrap-round courses. If you create a course around existing ODL materials or a textbook, you will have a problem if that material goes out of print. You may also have a problem if that material is updated, so that your wrap-round materials no longer fit the new version.

These issues illustrate the need for a close collaboration between the contracting parties when adapting materials (Dhanarajan and Timmers, 1992).

Case study of adaptation

In a case study involving the adaptation of journal articles into ODL materials, Davis and Smith (1996) evaluated learners' views of the raw journal articles. They then produced the ODL versions of these articles and carried out a further evaluation. The two surveys asked five identical questions (as well as other non-identical ones), enabling the authors to demonstrate that the adapted versions were:

- more pleasing to the eye,

- better structured and organised clearly,

- of a more appropriate length,

- more user-friendly, and

- better addressed to learners' needs and requirements.

This study demonstrates the sort of gains you can expect to make from a well-planned materials adaptation.

2.2 HOW TO EVALUATE EXISTING MATERIALS WITH A VIEW TO ADAPTING THEM

2.2.1 INTRODUCTION

If you decide to adapt an existing course or to write a wrap-round course, your first step will be to assess the existing materials. You will do this to:

• choose between different available materials, and

• decide what changes or additions need to be made to those materials.

This part looks at how to carry out that evaluation.

> **Issues for instructional designers**
>
> 1. Where can I find materials to use or adapt?
>
> 2. What criteria should I apply to selecting materials to use or adapt?

2.2.2 BEFORE YOU LOOK FOR MATERIALS

Before you start your search for materials, you must be clear about the need you are trying to meet. It helps to have first decided:

• your target learner group – e.g., age, sex, prior education, preferred modes of study;

• the curriculum that you wish to teach – e.g., its aims and outcomes;

• the level of the course – e.g., secondary school leavers, undergraduate;

• the delivery language; and

• the delivery media.

Since you are going to be searching for material, the clearer your specification, the more likely you will find what you want. If you have a loose requirement, you may find offers of hundreds of courses, few of which you can use.

2.2.3 STARTING PLACES

Once you know what you are looking for, you can move on to trying to find out what materials are available that might suit your needs. Your most likely starting points will be: (a) for adaptation, existing ODL courses; and (b) for wrap-round, published textbooks.

Some useful sites for locating ODL resources include:

- Commonwealth of Learning: *www.col.org/resources/weblinks/resources_edtech.htm*

- Distance Learning Course Finder: *www.dlcoursefinder.com/*

- Resources in Distance Education (RIDE, Athabasca University, Canada): *http://ccism.pc.athabascau.ca/html/ccism/deresrce/de.htm*

- The International Centre for Distance Learning: *www-icdl.open.ac.uk/*

- UK distance learning courses: *www.distance-learning.co.uk/*

- World Wide Learn: *www.worldwidelearn.com/index.html* (mostly North American institutions)

2.2.4 EVALUATION CHECKLIST

You will clearly want to evaluate any materials that you might use against various criteria. Here, however, the focus is on those aspects of the materials that will most affect your costs of adapting or wrapping-round. The mismatches that will most put your costs up are: inappropriate content; materials at an inappropriate starting level; content that is out of date or inaccurate; materials not covering all the curriculum; or content that lacks activities or progress tests. The consequences of these factors from the point of view of adapting are set out in Table 5.

TABLE 5. Factors that affect adaptation costs

Aspect	Issues for adapting
Is the content appropriate?	The content should match the needs of your learners as closely as possible. The poorer the match, the more adapting you will have to do. If too much adaptation is needed, it might be cheaper to write your own course.
What prior knowledge is assumed?	If the prior knowledge assumed is more than your learners will have, then you may need to produce a pre-course supplement to bring your learners up to the starting point of the course.
Is the content up-to-date?	This is always an important issue in ODL since materials, once made, may need to continue in use for several years (updating is generally fairly costly). How long will it be before your version of the course needs updating?
Is the content accurate and authoritative?	A few inaccuracies are not a problem – you can draw attention to them in your study guide or deal with them in your adaptation. Too many inaccuracies will increase your adaptation costs.
Is the coverage comprehensive?	How much new material will you need to add? If it is too much, it might be better to write your own course.
Is the language level appropriate?	For example, is the vocabulary appropriate and are the sentences not too long or complex? If you will need to translate the text, will this present any special problems?
Are there plenty of activities and are they of high quality?	Activities are the most important part of ODL materials. If the activities are few or poor, you will have to create new ones.
Are the progress tests adequate?	Does the material include self-tests so that learners can check their own progress? If not, you will need to add these, although that is quite easy to do.
Is it acceptable in terms of cost?	How much will it cost you to produce a course using these materials? How much will it cost you to write your own course?

A three-page checklist for evaluating materials for adaptation is presented in Lewis and Paine (1986).

2.2.5 LEARNING OBJECTS

Learning objects are reusable pieces of learning that can be combined to create courses. A learning object might be something small and simple such as a photograph or a sound file to show how to pronounce a word in Spanish; or it might be something larger and more complex, such as an animated sequence to show the circulation of blood in a human or a computer-marked test to assess a person's knowledge of the theory of driving.

While some researchers disagree over what is, and what is not, a learning object (Sosteric and Hesemeier, 2002), there is general agreement that a learning object is something that can be reused outside the context for which it was originally created. The implications of reusability have been discussed by Sicilia and Garcia (2003). There are few published studies of the application of reusable learning objects to distance learning. One such study suggests that the process is not dissimilar to what any teacher does – that is, create items for use in one class and then reuse them later in another class (Murphy, nd).

Examples of learning objects can be seen at: *http://ejad.best.vwh.net/java/* and *www.londonmet.ac.uk/ltri/learningobjects/examples.htm.* The latter site is interesting because it contains some evaluation data on students' use of the learning objects.

2.3 WORKING WITH AUTHORS AND TEACHERS

2.3.1 INTRODUCTION

In general, this handbook does not discuss the process of managing materials production, but one aspect of this should be noted by an instructional designer: working with authors and teachers. The issues here are about 'who does what' and 'who is responsible for what'. These issues most commonly arise when the responsibilities for different aspects of a course lie with different people.

> **Issues for instructional designers**
>
> 1. What problems might arise when I am working with authors and teachers?
>
> 2. What steps can I take to prevent those problems from arising?

2.3.2 WHAT PROBLEMS MIGHT ARISE WHEN YOU ARE WORKING WITH AUTHORS AND TEACHERS?

The central issue that can cause problems when working with academics is disputes over who is responsible for which aspects of a course. There are two potential sources of friction and misunderstanding here.

First, teachers are used to being responsible for all (or almost all) aspects of what they teach, and have little experience of working in circumstances where there is shared responsibility for preparing or delivering teaching.

Second, you, as instructional designer, will be introducing new stages into the preparation of materials and their delivery. These stages – such as identifying outcomes at the unit level, creating activities and developing self-assessment – may be new to teachers, who may not appreciate the value or necessity of them.

As a result of these two problem areas, you may find that the authors and teachers with whom you work wish to question just what your role is. What value are you adding? Even more, they may feel that all decisions about the course are for them to decide, reducing you to someone who just arranges the printing and distribution of what they have created.

2.3.3 WHAT STEPS CAN YOU TAKE TO PREVENT THOSE PROBLEMS FROM ARISING?

There are several things you can do to help minimise conflicts and misunderstandings with authors and teachers:

1. Be clear in your own mind about the tasks you think need doing and who might do them, for example:

    • decide content – teacher;

    • develop unit outcomes – you and the teacher;

    • develop ideas for activities – you and the teacher;

    • write the content – teacher; and

    • edit for additional instructional design elements (e.g., activities and feedback).

2. Explain to the teacher the sorts of skills you can offer, showing him or her some examples of what you have produced.

    Ask the teacher for ideas on how you can best help him or her produce the course.

3. Be clear in your own mind what your minimum success criteria (in terms of instructional design) are – that is, what things you are not prepared to negotiate over. For example, you might decide that a good range of activities is absolutely essential. (It helps here, of course, if you work within a distance learning system that has minimum standards, so that you are not the one who is seen to do the imposing.)

4. Make clear to the teacher that you are not offering any subject expertise and do not intend to override what he or she writes. Rather, you see your role as helping the teacher convert his or her successful classroom teaching into successful distance teaching.

5. Be ready to be flexible – the relationship that you have with one teacher may not work with another.

SECTION 3: PLANNING AN ODL COURSE

OVERVIEW OF SECTION 3

Section 3 is all about planning. Because ODL courses are mostly based around learning materials that have to be prepared before the students start to study, almost every detail of the course needs to be planned before the course starts. This section looks at some of the many aspects of planning that you will need to think about.

Learner profiles

The first part looks at learner profiles – that is, at describing who your learners will be. They may be very like the students in your face-to-face classes, but it is more likely they will differ in many ways. For example, they may be older, they may have more heterogeneous backgrounds and they may live much farther away from resources such as libraries or schools than your current learners.

Context issues

This part looks at the circumstances under which your learners will study. Will they have somewhere to study? What resources will they have at home? What resources will they be able to access in their locality? All these factors affect how you design your course and what you will need to provide to students.

Setting aims and objectives for your course

Your first ideas about your course will probably be in the form of some general aims. In this part of the handbook you will look at course aims and at how course objectives can be derived from those aims. Aims and objectives are very important in helping to define the content of a course and the depth to which that content will be studied. The earlier you can decide on the aims and objectives of a course, the easier it will be to create the learning materials for that course.

Content analysis and planning: what to include?

Evaluations of ODL courses frequently show that learners have too much to study. If courses are overloaded with content, learners adopt superficial learning techniques, attempting to memorise key points rather than to understand the material. It is therefore

important to keep control of the quantity of material put into a course. This topic looks at some methods for doing that.

Methods of ordering content

Once the aims, objectives and content have been decided, they all have to be put into an appropriate teaching order. For some topics, the order is almost determined by the content itself – this applies to sequential subjects such as maths and some parts of the sciences. For other subjects, there is a wide range of possible content orderings. This topic looks at 10 different methods of ordering, although not all are applicable to every course.

Pacing the course

Decisions about pace are only loosely connected to planning and writing learning materials, but it is convenient to make those decisions at the same time as planning the course as a whole.

The course specification

Course planning leads to two key documents, which are then used in creating the course. The first of these is the course specification. This is a document that authors, instructional designers, editors, tutorial staff and administrative staff can use to put in place every aspect of the new course. The smaller your organisation, the simpler this specification can be, but in very large institutions the specification may actually be a series of documents, specifying the course and its systems in great detail.

The course guide and other devices

The other key planning output is the course guide, which is an overview of the course for use by students and tutors. It usually contains information about the course itself, the tutorial and support system for the course, the administrative systems, and the course assessment.

3.1 LEARNER PROFILES

3.1.1 INTRODUCTION

In planning a new ODL course, your starting point will always be your learners. Who will they be? How old will they be? What prior knowledge will they have? Why do they want to study?

As you answer questions such as these, you will build up a picture of a typical learner for your course. This is called a 'learner profile'.

> **Issues for instructional designers**
>
> 1. What sort of data do I need about our potential students?
>
> 2. How can I collect that data?

3.1.2 WHY PROFILES ARE NEEDED

Learner profiles are important because they provide the instructional designer with data that will enable him or her to make informed judgements about key aspects of the learning materials. For example, when designing a course, you need to know the literacy level of learners, their ITC skills and their prior knowledge of the subject you are teaching. Table 6 summarises some of the key uses that an instructional designer makes of learner profile data.

3.1.3 THE CONTENTS OF A PROFILE

You could collect a lot of learner profile data – more perhaps than you could use. It is therefore important to think about what data you most need for the particular course you are preparing. For example, for a course on a sequential subject (e.g., maths or a foreign language), data on prior learning might be the most important to have. For a course on a professional subject (e.g., law, accountancy), the most important thing to know might be learners' current work and the type of work that they hope to move into. You therefore need to adapt your profile data collection to your needs as instructional designer.

Some of the commonest data collected is shown in Table 7.

TABLE 6. How an instructional designer uses learner profile data

Type of data	You need to know this to decide …
Literacy level	The level of language to use when writing materials
Age group	What types of examples to use The extent to which you can draw on learners' experience (e.g., older learners will have more experience of work and bringing up children)
ITC skills	The skills you can assume learners have and which will have to be taught
Reasons for studying	The approach and types of examples to use to best motivate learners (e.g., learners studying law to become lawyers might be motivated by a different approach than that of learners studying law to help them as managers of small businesses)
Home situation	Does the learner have a place to study? Does the learner have access to electricity?
Prior knowledge	The knowledge you can assume that learners already have and the knowledge that you must teach
Learning situation	The sorts of tasks you can set (e.g., can you set a task that requires going to a library?)

3.1.4 LEARNER PROFILE FORMATS

There are two main formats for learner profiles:

Tables and charts

Tables and charts are used for profiles based on survey data or data extracted from an administrative system. This data represents large numbers of learners and will show things such as:

• percentages of learners in different age bands, and

• percentages of learners with given levels of prior qualification.

TABLE 7. Examples of learners' profile data

Category	Examples
Personal characteristics	• age • gender • family circumstances • work circumstances
Reasons for studying	• to gain entry to another course • to gain a qualification • for pleasure
Prior knowledge	• the qualifications the learners already have • other learning they have completed • learning problems they might they have (e.g., misconceptions and bad study habits)
Prior study skills	• experience the learners already have of studying other than in a classroom • their ability to organise their own time • their note-taking skills • their self-assessment skills • their ITC skills
Study circumstances	• their access to a library • their access to a computer and the internet • their access to other learners • their ability to visit study centres

Source: Woodley and Ashby (1994), Race (1992) and Rowntree (1994)

Vignettes

This method is used when the profiling data refer to individual learners. A short description is prepared of each learner, representing a 'typical' learner. This is a good method to use if, say, you are asking a teacher to tell you about a 'typical learner'. The resulting profile reads like a short biography, but may well be a composite of several students.

3.1.5 METHODS OF COLLECTING PROFILE DATA

The most accurate source of data is that from the learners who are going to take the course you are designing. Unfortunately, you may have no access to those learners. For example, if you are setting up a new ODL organisation, you will need to start planning courses many months before any students have enrolled. Even if you are working in an existing ODL institution, you cannot necessarily assume that the institution's existing students will represent the students for the new course. For these reasons, collecting accurate profile data is problematic and you need to be careful in extrapolating on data from existing learner groups to future ones.

That being said, the following are potential sources of learner profile data:

- If you are a teacher, think about the characteristics of the students that you have had in your classroom. How will ODL students be similar to these? How will they differ?

- Contact other teachers who have taught similar students and ask them for learner profile data on their students.

- Gather together a group of students on an existing but similar course and ask them for data about themselves.

- Mail a questionnaire to past students, current students or people who have enquired about the courses offered by your institution.

- If your instructional design process will include a period of developmental testing, mail a questionnaire to the students who test your course. (It would be good to have learner data long before this, but no data will be more reliable than that which comes from a pilot, since the pilot learners are the nearest you have to 'real' learners.)

- Find out what sort of student profile data is kept in your institution's administrative records. If this is on computer, you might be able to search for data on courses at the same level or in the same subject as the one you are working on.

3.1.6 ISSUES IN PROFILING

Data on personal characteristics such as age are fairly easy to obtain. However, data on things such as prior study skills, learning styles and personality can only be obtained using sophisticated (and therefore expensive) survey techniques (Woodley and Ashby, 1994). It is important to be realistic about just how much of this data you can reasonably collect. The more money spent on data collection, the less money will be left for making the course.

3.2 CONTEXT ISSUES

3.2.1 INTRODUCTION

Where your learners will study and what resources they have access to are important factors in planning a course. Perhaps you can be sure that they will have pencils and paper, but will they have access to a radio or to the telephone? Will they be able to travel to a local centre or visit a library?

You need to know the answers to questions such as these before you plan your course in detail.
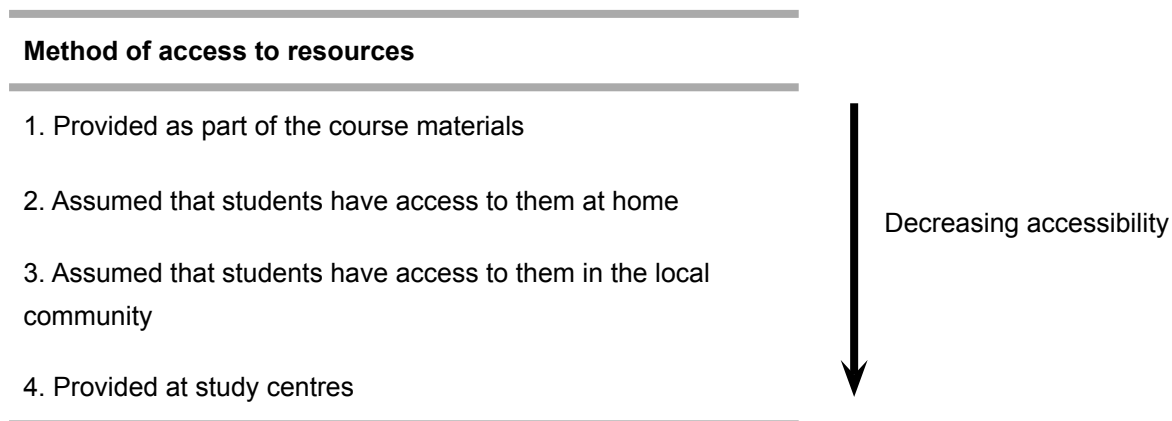
Issues for instructional designers

1. Where will the learners study?

2. What resources will they have access to?

3. What resources will I need to provide?

3.2.2 CONTEXT ISSUES IN INSTRUCTIONAL DESIGN

As soon as you begin to plan an ODL course, you find yourself having to make learning context decisions. These vary from the fairly trivial (e.g., asking learners to look up a word in a dictionary) to the larger scale ones (e.g., deciding to broadcast part of the course on radio). The first decision assumes that learners have access to dictionaries and the second that they have access to a radio (and one away from too many distractions).

In ODL, most learners are studying part-time and many have jobs. It therefore suits them to do as much study as possible either at home or at work. If they have to travel in order to do part of their course, the time taken and the travelling problems can be a deterrent to enrolling. Thus, accessibility of course resources for ODL students can be thought of in a hierarchy. At the top of the hierarchy (i.e., most accessible) are the resources the organisation sends to students as part of their course (see Figure 5). Next come those resources that students are assumed to have in their homes. These vary from simple things such as paper to write on, to things that not every student will have, such as a radio. They may also have access to textbooks or other material produced by other organisations than yours.

The next group of resources are those things that students are assumed to have access to in the community. These might include access to a library or to an internet café. Finally come those resources that students have to travel to a local centre to access. If doing that is time-consuming and costly, then those resources are not in fact very accessible.

FIGURE 5. Levels of access to resources

Method of access to resources

1. Provided as part of the course materials

2. Assumed that students have access to them at home

3. Assumed that students have access to them in the local community

4. Provided at study centres

Decreasing accessibility

It follows from our analysis in Figure 5 that the instructional designer will try to make as much use as possible of items that are most accessible to students and as little use as possible of items that are least accessible to students. (It is important to note that our analysis is not suggesting that you should not include study centres. Rather, it is saying 'do not ask students to go to study centres for trivial purposes'.)

3.2.3 HOW TO PLAN AROUND THE CONTEXT RESTRAINTS

At a fairly early stage in designing your course, you need to make a list of all the things you will assume the students have access to. Once you have a list, it can be helpful to categorise each item under one of the headings of Figure 5, as Example 4 shows.

EXAMPLE 4. Possible resource requirements for a particular ODL course

Method of access to resources	Resources
1. Provided as part of the course materials	Workbook Textbook
2. Assumed that students have access to them at home	Pens, paper Calculator
3. Assumed that students have access to them in the local community	Internet café for emails to tutor
4. Provided at study centres	Tutorials Computers for developing ITC skills

3.2.4 EQUIPMENT CHECKLIST

The following is a list of the sort of things that ODL courses sometimes assume that students have access to. You can use your student profile results to produce a list of the things that your students will realistically have access to.

- textbooks

- libraries

- computers

- internet

- a place to study quietly

- a place to keep materials

- study centres

- other students

- electricity

- pens, paper, rulers, drawing equipment

- calculators

- audio tape player

- video player

- radio

- TV

- tutors

- local centres.

3.2.5 ROLE OF TUTORIAL SUPPORT

One of the most important parts of the context for an instructional designer is the role of tutorial support. Tutorial support is usually provided by part-time tutors and usually done by mail, telephone and email. Support may also be offered by local centres to which students have to travel. Although the instructional designer is not usually responsible for deciding on the form of tutorial support to be provided, the designer needs to take account of the form of the support in the design of the materials.

Tutorial support usually includes one or more of the following functions (Freeman, 2004):

- correspondence (letter/email) with tutors

- marking and commenting on written work

- telephone discussion with tutors

- telephone/online discussions led by tutors

- tutorials

- weekend study sessions

- field trips

- newsletters and newspapers

- radio tutorials

- self-help groups

- social events

- web sites (especially bulletin boards).

The issue for the instructional designer is 'Which bits of the course should be allocated to tutorial support?' A simple way to answer this question is to note that tutorial support is usually the most expensive part of delivering a course. It should therefore be used for things that cannot readily be done within the ODL materials. For example, a course may include 10 written assignments. It is better to use those for tasks that students cannot check for themselves (e.g., essay writing, problem solving) than for tasks for which it is easy to develop self-tests (e.g., simple right-wrong knowledge tests). The more expensive the support medium, the more the instructional designer must check the medium is being used to its best advantage.

3.2.6 TUTOR TRAINING

In most ODL systems, tutors are recruited from face-to-face teaching and so lack those skills specific to ODL, such as marking and commenting on written work, establishing a relationship at a distance and supporting home-based learners. Although instructional designers do not generally have to take responsibility for this type of training, it is useful for them to be aware of the issues involved. More details on tutoring in ODL can be found in O'Rourke (2003).

3.3 SETTING AIMS AND OBJECTIVES FOR YOUR COURSE

3.3.1 INTRODUCTION

Before you write your materials, you need to know what it is you wish to write. The four most common ways to do this are shown in Figure 6.

FIGURE 6. Four ways of describing the contents of a course

A general description of the course

A contents list

A set of aims

A set of learning outcomes

Increasing precision

This part sets out to explain why aims and outcomes are more precise than other methods, and why we need that level of precision.

> **Issues for instructional designers**
>
> 1. What is the best way to describe the course that I wish to write?
>
> 2. What should be the course aims?
>
> 3. What should be the course outcomes?

3.3.2 COURSE AIMS

What they are

According to Fry et al. (1999), '[Aims] are intended to provide the student, teacher and other interested parties with an understanding of the most overarching general statements regarding the intended consequences of a learning experience.'

Rowntree (1994a) defines aims as being 'a general statement of either (a) what the learner might learn or (b) what the teacher will do.'

From these definitions it is clear that course aims are high level and generalised. Their importance, therefore, is in giving a sense of direction to a course, rather as a mission statement does to a business (Rowntree, 1994a). Aims are the sort of thing that you might use in promoting a course as in 'This course will help you gain an up-do-date knowledge of the current uses of learning objects and to critically evaluate their potential for ODL.'

Why aims are needed

Course aims serve two main functions.

First, they are a means by which a course team or a group of teachers creates a vision of a particular course they want to create. The aims state the purpose of the course and, to a certain extent, state the justification for its creation.

Second, the aims provide a way of communicating the overall purpose of the course to others. 'Others' might include part-time authors who work on the course, tutors who support the students and, most definitely, students themselves.

How to write aims

Aims should be brief: typically a list of aims will contain three to five items of no more than 50–75 words each. Typical aim statements will be of the following format:

•   This course aims to give you an understanding of …

•   This course aims to equip you to work as …

•   This course aims to help you critically evaluate …

Although aims are important, they play little part in the day-to-day work of instructional designers for one simple reason: aims are always broadly expressed. What the instructional designer needs is something more precise – namely, learning objectives or learning outcomes – which we now look at.

3.3.3 LEVELS OF LEARNING

An extremely useful course planning tool is the taxonomy of educational objectives (Bloom [editor], 1956). Although this taxonomy was developed by a sizeable team of researchers, it is referred to here as 'Bloom's taxonomy'.

The taxonomy, or hierarchy, is shown in Figure 7. At the bottom level is the simplest type of learning: knowledge. Bloom uses the word 'knowledge' to mean 'rote learning', such as learning the names of plants or the months of the year. Little understanding is needed to do these tasks since they are basically 'learnt by heart'.

The next step up is 'comprehension' – that is, understanding basic ideas and concepts. In this context, 'to understand' means 'to be able to explain in your own words'. Typical items that are learnt at the comprehension level are concepts such as weight, democracy and cost.

Other levels of learning as you move up the hierarchy include:

- application (using ideas and methods),

- analysis (taking an idea or thing apart and explaining how it functions),

- synthesis (putting different ideas or things together to create new wholes), and

- evaluation (critiquing ideas or things).

FIGURE 7. Bloom's taxonomy
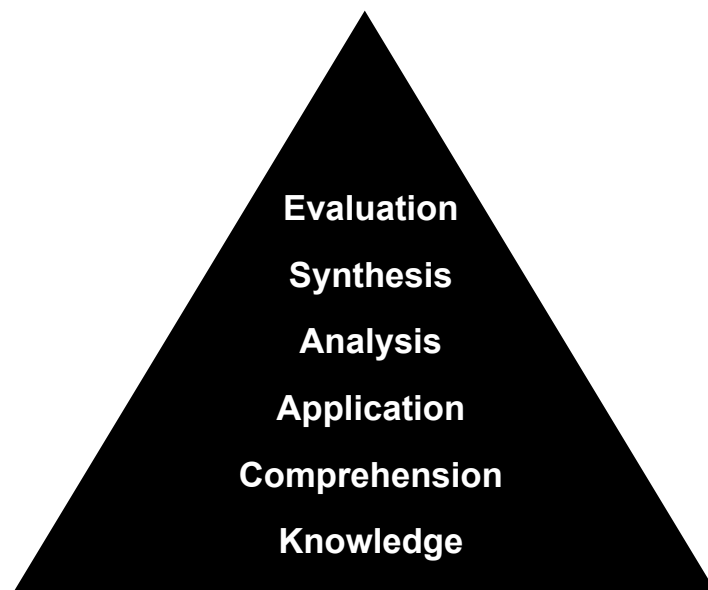
Some examples of how Bloom's taxonomy classifies different pieces of learning can be seen in Table 8.

TABLE 8. Examples of the use of Bloom's taxonomy of the levels of learning

Level	Explanation	Examples
1 Knowledge	The ability to recall facts in a rote manner.	Repeat a definition. Name the parts of a machine.
2 Comprehension	The ability to explain the meaning of a fact or idea.	Put a definition into one's own words. Explain why it is dangerous to touch 240 volt contacts.
3 Application	The ability to use information in new situations.	Calculate distance given speed and time. Conjugate a verb given the rules for the conjugation.
4 Analysis	The ability to identify the parts of, and relationships in, a situation.	Identify which statement follows from a set of premises.
5 Synthesis	The ability to put things together to create a whole.	Write a report.
6 Evaluation	The ability to judge value.	Identify the best of a number of strategies.

3.3.4 OTHER TAXONOMIES

Various other taxonomies have been developed, although none seem to be extensively used in ODL. The two most frequently mentioned are the affective domain taxonomy and the psychomotor domain.

Affective domain taxonomy

The affective domain taxonomy (Krathwohl et al., 1956) deals with feelings and is divided into:

*   receiving (e.g., listens, attends showing sensitivity),

*   responding (e.g., participates, follows instructions),

- valuing (e.g., appreciates, shows commitment),

- organising (e.g., recognises own role, plans), and

- characterising (e.g., influences, modifies, proposes, questions).

Psychomotor domain

The psychomotor domain (Harrow, 1972) is concerned with physical activity and is divided into:

- reflex movements – actions that are completed without any learning (e.g., knee jerk when knee is tapped),

- basic fundamental movements (e.g., walking, running),

- perceptual – movements that involve adjusting to the environment (e.g., jumping over a rope),

- physical activities – actions involving vigour, agility, etc. (e.g., digging),

- skilled movements (e.g., dancing, sport), and

- non-discursive communication (e.g., facial expressions, body language).

3.3.5 LEARNING OBJECTIVES AND LEARNING OUTCOMES

What they are

In contrast with aims, authors are in much less agreement about the meanings of the words 'objectives' and 'outcomes'. The problem can be summarised as follows:

> [The definition and use of the term learning objective] have become less and less precise in recent years. … The term is often used interchangeably (but loosely) with the term 'learning outcomes. (Fry et al., 1999)

At the same time, some British universities maintain that there is a very sharp difference between a learning outcome (which they treat as an aim) and a learning objective. For the purposes of this handbook, aims are defined as being high level and general (see above) and learning outcomes as being synonymous with learning objectives.

According to Mager (1962):

> An objective is an *intent* communicated by a statement describing a proposed change in a learner – a statement of what the learner is to be like when he has successfully completed a learning experience.

Another way of thinking about objectives is to see them as being at three levels (Romiszowksi, 1981):

- **terminal** – This is the level to be reached on completion of the piece of learning, which might be seen as being at the end of a unit or at the end of a course.

- **intermediate** – An intermediate objective refers to a particular piece of learning that needs to be achieved in order to reach a terminal objective. This is the level at which you would check learners' progress.

- **enabling** – An enabling objective is one that is not stated in the terminal objective, but is needed in order to achieve it. For example, a course on agricultural economics might require learners to look at recent journal articles, for which online search skills would be needed. Those skills would be an enabling objective (i.e., they enable students to get the journal articles that they need).

Samples of learning objectives are shown in Example 5.

EXAMPLE 5. Sample learning objectives

- By the end of this unit you should be able to name the capital cities of South America.

- By the end of this unit you should be able to solve quadratic equations by factorisation.

- By the end of this unit you should be able to critically evaluate a research paper.

This list is written in increasing order of intellectual complexity, showing outcomes at levels 1, 3 and 6 of Bloom's taxonomy.

Learning objectives can be set at a unit level (Example 6), course level (Example 7) or module level (Example 8). The smaller the piece of learning that you are describing, the narrower the objective becomes. For example, 'define the term double-entry book-keeping' is more narrow than 'establish your team role style'.

EXAMPLE 6. Sample objectives at the unit level

1.2 Outcomes

In order for us to develop a learner support strategy that liberates and encourages learners to not only become participants in the learning dialogue but also contribute to a better society for all, you should be able to

- Identify the needs of the distance learner and explore the various categories of learner support in the light of the identified needs
- Examine the concept of the learning cycle, identify the different stages in the learning cycle and describe the various forms of support required by the learners and provided by the relevant stakeholders

Source: *Introduction to Learner Support in ODL.* ODL104-J, p. 36 (UNISA)

EXAMPLE 7. Sample objectives at the course level

4 TEACHING MOTHER TONGUE LITERACY

4.1 What will you need to teach your learners in their first language?

By the end of the first language literacy programme, learners should be able to:

- Read with meaning and write their own thoughts.
- Write personal letters and address envelopes.
- Fill in simple texts that learners come across in their own lives. (Examples are forms in their first language. You will need to collect examples of these for use in your classes.)
- Tell the difference between different types of text and understand the meaning of text.
- Use basic punctuation (capital letters, full stops, question marks, exclamation marks, direct speech marks).
- Follow simple instructions, e.g. the instructions on grocery packets, posters and notices, stories, information text, reading pictures. (Collect examples of these and bring them with you to class.)
- Write their own life stories.
- Describe their life situation in writing.
- Discuss HIV/AIDS - how it is transmitted, how to prevent it, how to deal with people who are HIV positive.
- Know their rights as South African citizens.

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

EXAMPLE 8. Sample objectives at the module level

Objectives

At the end of this module you should be able to:

- identify where you fit into the teams you are part of and how those teams fit into the organisation
- explain how a team can be more effective than the sum of the work of the individuals within the team
- explain the importance of effective working relationships
- establish your team role style
- analyse your and other team members' strengths for team working
- deal with difficult working relationships
- identify the goals of your organisation and of your team
- identify team and individual SMART objectives
- review targets and objectives regularly
- review team members' performance
- set performance indicators
- provide feedback and give criticism constructively
- help to motivate the team.

Source: *Administration for Business* (National Extension College, Cambridge)

Why learning objectives are needed

Why do instructional designers attach so much importance to learning objectives? A simple example illustrates the main reason for preparing objectives: Imagine that you are asked to prepare a very short course and you have the choice of preparing it to specification A or B, as below. Which would you prefer to work to?

Specification A

Basic word processing

Specification B

By the end of the unit, learners should be to:

•   explain the function of a word processor

•   start a word processing program

•   create a new document

•   type and correct text in paragraphs

•   save a document.

You would probably prefer to work to specification B because it is precise and clear. Specification A is so vague that you would have no idea what to include and what to exclude.

There are many other benefits to using objectives. First, there are benefits for the instructional designer. For example, learning objectives help the designer choose media, create activities and plan self-tests and assessments. Second, tutors also benefit since the objectives show them what they should expect their students to be able to do and what the main points of the course are. Finally, students can use objectives to help them choose a course, check their progress and so on. These points (and others) are summarised in Table 9.

TABLE 9. Some of the benefits of learning objectives

Benefit	Beneficiary		
	Instructional designer	Tutor	Learner
Help to create appropriate progress tests	✓		
Help learners to check their own progress			✓
Help the designer to decide which media to use	✓		
Help the designer plan activities	✓		
Help the designer create appropriate assessments	✓		
Help learners decide whether the course suits them			✓
Make clear what the learner has to do	✓	✓	✓
Help learners allocate their time			✓
Make clear what is expected of learners		✓	✓
Highlight the key learning points		✓	✓
Break down complex material into simpler chunks	✓	✓	✓

Source: Mager (1962), Race (1992) and Rowntree (1994b)

How to write objectives

In Mager's (1962) original conception of an objective, it had three parts:

• the terminal behaviour – what the learners should be able to do,

• the conditions under which learners should be able to do it, and

• the criteria for judging 'acceptable performance'.

These three components can be seen in Example 9.

EXAMPLE 9. Sample of a three-part objective

Learners should be able to cut a steel bar using a computer-controlled lathe to an accuracy of one part per thousand.

The three components are:

• **behaviour:** cut a steel bar,

• **condition:** using a computer-controlled lathe, and

• **criteria:** to an accuracy of one part per thousand.

In practice, designers do not usually feel the need to be so precise: the degree of precision that is necessary in any given circumstance is always a matter for the instructional designer's judgement. On the whole, though, it is better to be more precise than less. For example, consider the objective: Learners should be able to cut a steel bar. This clearly has little use as a specification for designing learning materials – it is just too vague.

Verbs in objectives

Perhaps the most important thing to think about when writing objectives is the verbs that you intend to use. Compare these two examples:

1.   Learners should be able to understand the causes of inflation in given scenarios.

2.   Learners should be able to explain the factors that caused inflation in given scenarios.

The first says 'understand', but because it does not describe any observable behaviour on the part of learners, how will you know if they have understood or not?

The second says 'explain', which implies a verbal or written argument. Here is a behaviour that we can observer (and assess), so (2) is a better objective than (1) – better because it is more precise and more observable.

Table 10 shows a list of verbs that are best avoided in objectives and verbs that are useful to use in objectives.

TABLE 10. Verbs to use and avoid in objectives

Verbs to avoid	Accept, appreciate, be aware of, consider, enjoy, examine, explore, have a good grasp of, know, realise, recognise, understand
Verbs to use	Break down, calculate, categorise, change, combine, compare, compile, compose, compute, contrast, convert, create, criticise, define, demonstrate, describe, design, devise, differentiate, discover, discriminate, discuss, distinguish, estimate, explain, give example, identify, illustrate, draw inference, interpret, judge, justify, label, list, match, measure, modify, name, operate, organise, outline, paraphrase, point out, précis, predict, prepare, produce, re-write, recall, select, separate, show, solve, state, sub-divide, summarise, transform, translate, use

3.4 CONTENT ANALYSIS AND PLANNING: WHAT TO INCLUDE?

3.4.1 INTRODUCTION

Romiszowksi (1986) defines three basic approaches to planning content:

- topic-orientated,

- concept-orientated, and

- task- or objective-orientated.

These methods are discussed below, along with their strengths and weaknesses.

Issues for instructional designers

1. What topics shall I include in a given course?

2. What methods are there for collecting data on possible course content?

3.4.2 TOPIC-ORIENTATED APPROACH TO CONTENT

In the topic-orientated approach to content, you start from the topic. (This approach is essentially the traditional syllabus approach.) You break down the topic into its components (if a hierarchical subject) or its associated sub-topics (if not hierarchical). In Example 10, part of the topic design for a course on word processing is shown. The main topic appears at the top of the diagram and, at each successive level, the topic is broken down into more and more detail.

## EXAMPLE 10. Sample of a topic approach to content
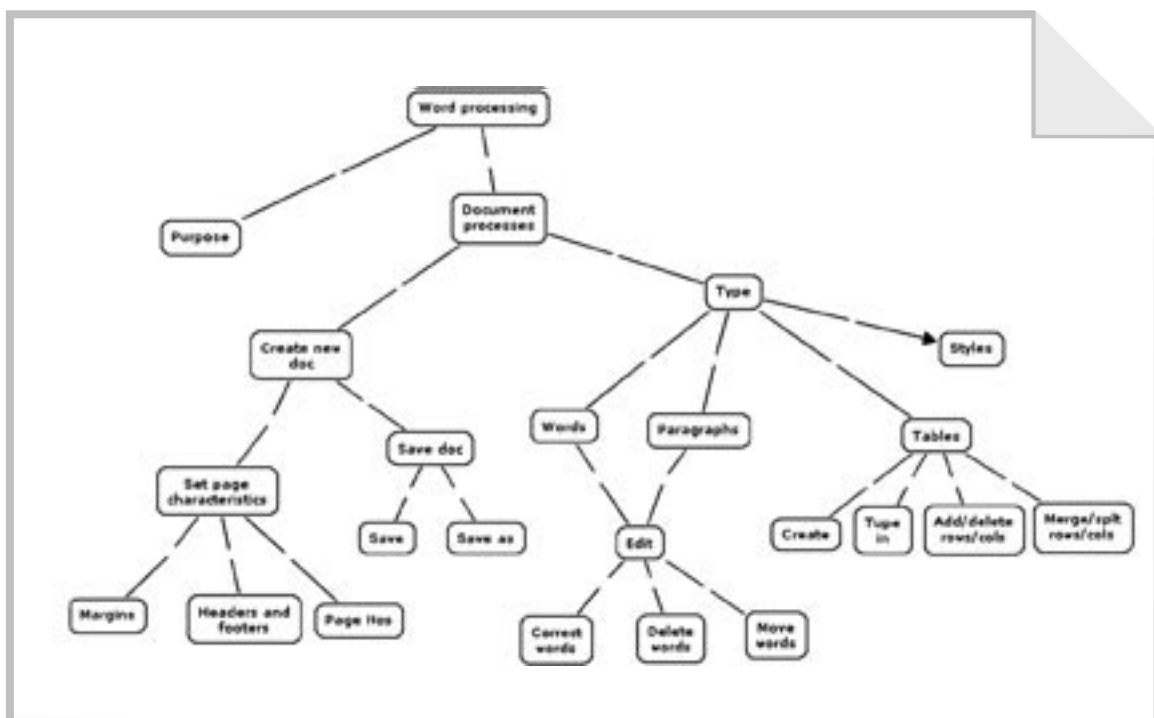
Most teachers find this method fairly easy to apply since it is so widely used in education.

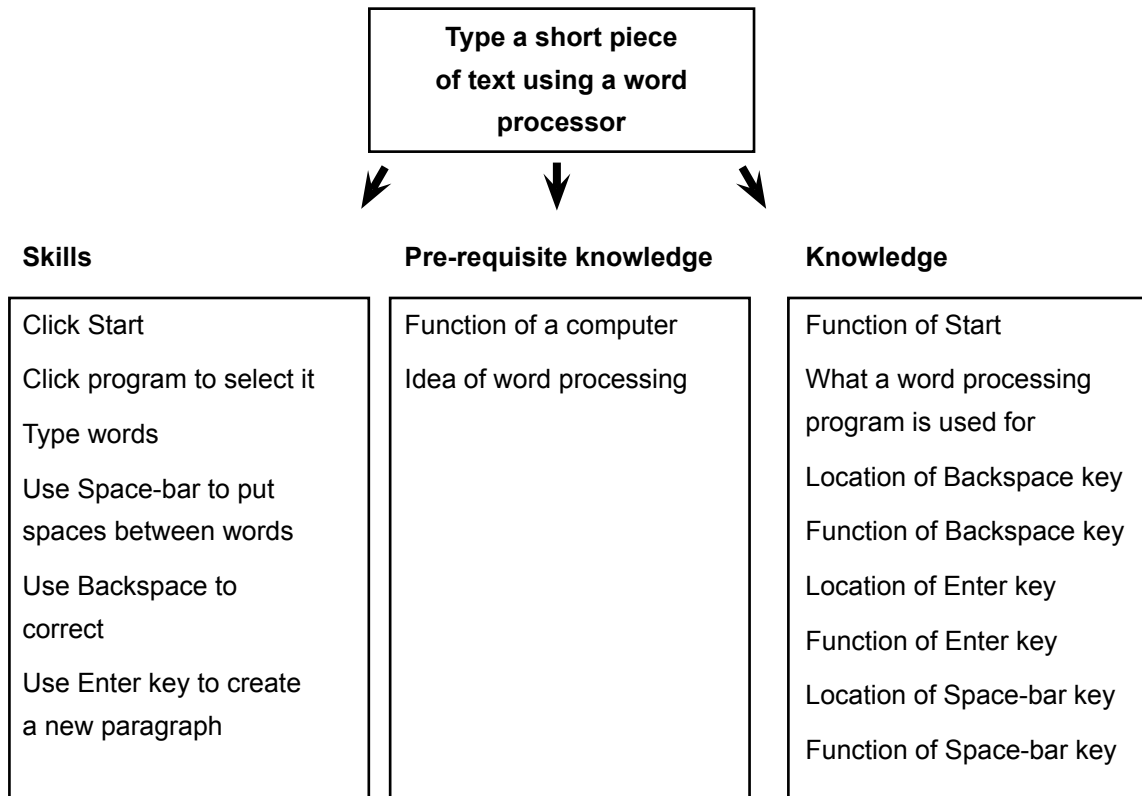## 3.4.3 CONCEPT-ORIENTATED APPROACH TO CONTENT

This approach is similar to the topic-orientated one, but focuses on concepts rather than topics. It is an approach that can work well in concept-rich subjects (such as the sciences), but is difficult to apply to subjects where the content is more open (e.g., literature). A sample of a concept map on learning outcomes can be seen in Example 11. The map is composed of concepts (each in a separate box), linked by verbs or verb phrases that show how the concepts relate to each other. Such maps are an excellent way of establishing an intellectually coherent structure to what is to be learnt. They also help to clarify the relationship between the different concepts, providing an idea of teaching order.

EXAMPLE 11. Sample of a concept approach to content
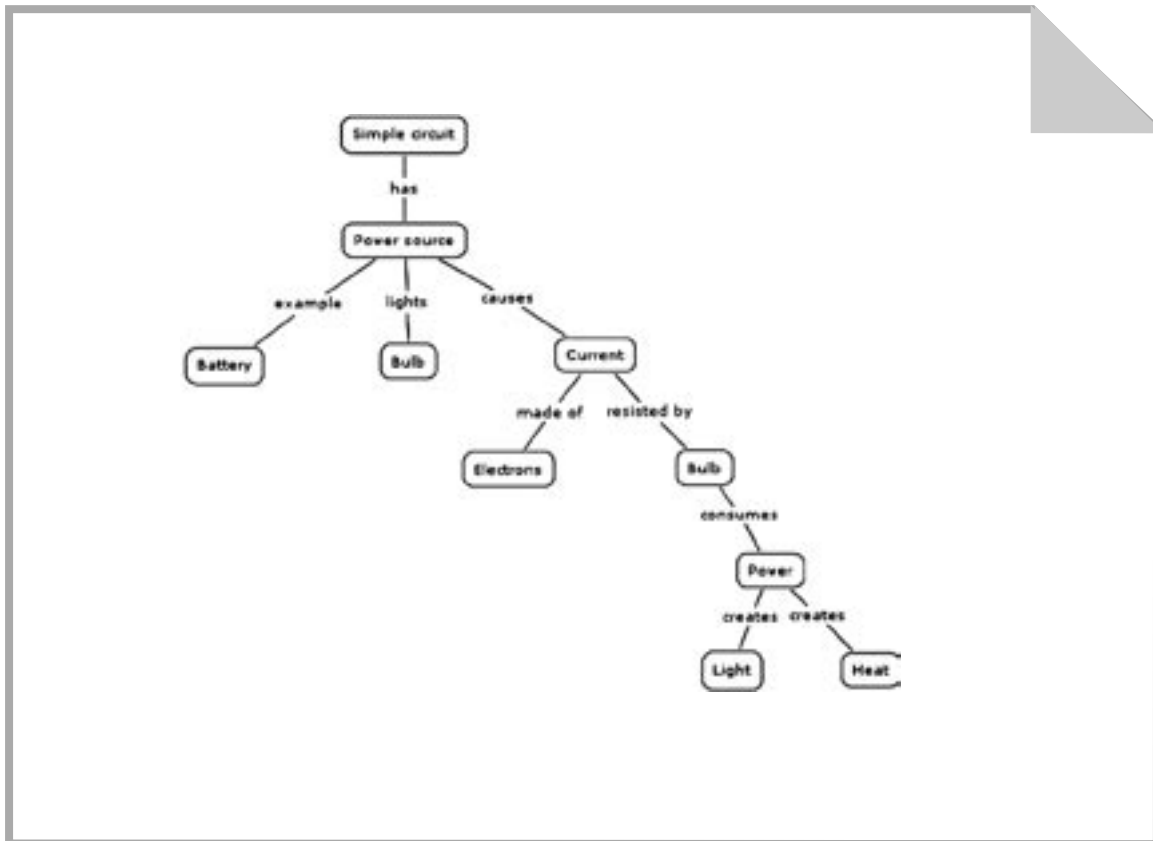
3.4.4 TASK- OR OBJECTIVE-ORIENTATED APPROACH TO CONTENT

In this approach, you start from the overall achievement that you wish your students to have and then break it down into learning objectives. Example 12 starts with the overall course outcome of 'type a short piece of text using a word processor'. It then breaks down into its skills and knowledge components (outermost columns in the figure) and the pre-requisite knowledge that the instructional designer will assume when writing the course. If the example were more complex, the overall outcome might be first broken down into some fairly large outcomes and then those be broken down in turn into smaller outcomes. However, the overall principle here is the same whether the course is small or large: all the content objectives are derived from what the learner must be able to do to achieve the overall course outcome.

EXAMPLE 12. Sample of an objective-orientated approach to content

Type a short piece of text using a word processor

Skills	**Pre-requisite knowledge**	**Knowledge**
Click Start	Function of a computer	Function of Start
Click program to select it	Idea of word processing	What a word processing program is used for
Type words		Location of Backspace key
Use Space-bar to put spaces between words		Function of Backspace key
Use Backspace to correct		Location of Enter key
Use Enter key to create a new paragraph		Function of Enter key
		Location of Space-bar key
		Function of Space-bar key

This method avoids the problem of where to stop, since you only include items that are essential for the student to achieve the overall objective. Of course, you still have to decide whether items that you have identified are to be taught in the course (the outer two columns) or be assumed as pre-requisites, but that is a smaller problem than the one presented by the topic approach.

3.4.5 OTHER DIAGRAMMING METHODS

Both Rowntree (1990) and Romiszowksi (1986) describe other diagramming methods, all of which fall into the three basic types above. Which you use is a matter of personal choice.

3.4.6 SOURCES OF DATA

Whilst the instructional designer may be responsible for planning the content, he or she will draw on the expertise of others. When following the topic approach, the main source of data will be teachers who might be asked questions such as 'What do you think we ought to include in this course?'

The task method tends to take a more systematic approach to content. It usually starts with the instructional designer observing successful performers. For example, to create a task-based course on how to replace a car wheel, the designer would watch a number of good wheel-changers, note what they do and ask them questions about what they do. In this way, the designer can build up a picture of the knowledge and skills needed to change a car wheel. This method works best for simpler tasks. At the higher levels of professional work the method is confounded by the fact that professionals often make decisions and judgements that they cannot explain. This makes it difficult to derive a course's content simply by observation and interview (Schön, 1991).

3.5 METHODS OF ORDERING CONTENT

3.5.1 INTRODUCTION

Once you have decided on the content of a course, you have to put it into a suitable order for teaching. Often, there are many possible orders, any of which will work reasonably well. Some orders, though, will cause great difficulties for learners. It is therefore important to choose an order based on the nature of what you are teaching and which takes account of how your learners prefer to learn.

This part looks at the various possible methods of deciding on a teaching order, and gives some advice on choosing between those methods.

Issues for instructional designers

1. In which order should I sequence the topics?

2. What criteria should I use for sequencing?

3. Does the subject matter determine the sequence?

4. How does the sequence vary between sequential subjects and non-sequential ones?

5. How is order affected by an integrated approach to teaching a topic?

6. Do students always study in the order in which I present material?

7. How can I best order content given that learners learn best when they can link what they are learning to what they already know?

Source: Lawless (1994)

3.5.2 METHODS OF SEQUENCING WITHIN A COURSE

There are a number of ways in which you can sequence the units of a course (after Rowntree, 1990, and Romiszowksi, 1986):

*   **by topic** – This method can be used when the topics can be studied in any order.

*   **chronologically** – An approach that might well apply to a history course but could even be used for a maths course when looking at how a topic has developed over time. An example of this can be found in Toeplitz (1963).

*   **by place** – For example, you might work outwards from the home to the world or work from the micro scale (inside a cell) to the macro (the whole organism).

*   **by cause and effect** – Here you might start with a phenomenon and explore its causes and origins.

*   **by structural logic** – In this case you follow the logic of the subject. Maths is often taught like this.

*   **problem-centred** – In this case you identify a problem and explore its solution (e.g., how do animals survive severe weather?).

*   **spiral** – In the spiral approach, the same material is revisited several times at increasing depths.

*   **backward chaining** – Here you start with the end result and gradually work backwards through the course to explore how that end result is achieved. For example, in building a spreadsheet, you could start with a finished spreadsheet and set some exercises on using and critiquing it. Through doing this, learners start with an overall understanding of a spreadsheet and then gradually develop a deeper understanding of how it is constructed.

*   **a loose network** – In this case the material consists of a loose collection of topics that can be studied in any order. This is a typical approach in discovery learning and topic-learning. It is also an approach that is suited to hypermedia, whilst being difficult to implement in print.

*   **a PERT network** – PERT networks are usually found in project management but they can be used to sequence the topics in a course. The idea of dependency is central to PERT networks. In project management, 'dependency' means that one task cannot be started until another has been completed. In course planning, 'dependency' means that one topic cannot be studied before another has been mastered. Using PERT networks is only practicable if you have access to some suitable project management software.

3.5.3 FACTORS THAT DETERMINE SEQUENCE AT THE UNIT OR TOPIC LEVEL

The first point to note is that there is no one correct way to sequence a particular chunk of learning. (There are, though, plenty of wrong ways to do it.) In deciding your sequence, you first need to identify what constraints there are on possible sequences. These constraints usually derive from the nature of the subject matter (Romiszowksi, 1981). For example:

*   If objective A can only be achieved after objective B has been learnt, then the teaching for A must come after the teaching for B.

*   Where the objectives are closely related (e.g., steps in a process), then the teaching should follow that order.

*   Where the parts of a process need to be learnt separately but eventually linked, then the learning sequence needs to take account of this. For example, to serve in tennis, the learner must learn to throw the ball up, then learn to hit it with the racket, and then learn to do both things as one sequence.

Other factors that affect sequencing are the ones described in the section below.

3.5.4 BASIC PRINCIPLES OF SEQUENCING AT THE UNIT OR TOPIC LEVEL

When introducing a new topic, it helps to follow one or more of four basic patterns:

*   move from simple to complex,

*   move from the known to the unknown,

*   move from the particular to the general, or

*   move from the concrete to the abstract.

The first pattern (simple to complex) is probably intuitively obvious. The other three methods are less obvious, but all derive from the fact that people learn something better when it is rooted in their own experience.

Table 11 shows four approaches to sequencing when introducing a new topic.

TABLE 11. Four ways of ordering when introducing a new topic

Principle	Example
Simple ➔ complex	When teaching the present tense of verbs in a foreign language, teach the regular verbs before the irregular ones.
Known ➔ unknown	When teaching about which types of plants prefer which types of soil, first ask learners to consider the plants that grow where the learners live and the type of soil there.
Particular ➔ general	When teaching about the behaviour of acids, first consider some particular acids and then draw out the general principles of acids.
Concrete ➔ abstract	When teaching about democracy as an abstract, theoretical concept, first consider some particular instance of democratic systems.

Source: Romiszowksi (1981)

3.6 PACING THE COURSE

3.6.1 INTRODUCTION

Paced courses are ones in which various devices are used to require students to follow a timetable for the course.

Unpaced courses are ones where students are free to work at their own pace and can start and finish the courses whenever they like.

This part, using information from Freeman (2004), looks at the relative merits of the two types of course and the mechanisms that an instructional designer can use to pace a course.

> **Issues for instructional designers**
>
> 1. Should learners be paced or left to study at their own pace?
>
> 2. What pacing devices can be used?

3.6.2 SHOULD LEARNERS BE PACED?

There are two ways to answer this question, each reflecting a different philosophical stance towards distance education.

Primacy of student autonomy

Those people who see distance learning as a means to promote student autonomy would probably say that learners should not be paced.

Primacy of course completions

Others believe that distance learners should be directed and supported towards successfully completing their courses. Such people would probably say that learners should be paced.

3.6.3 THE EFFECTS OF PACING

The evidence indicates that pacing helps students complete courses. Completion rates in one study of university level distance learning found that pacing led to doubled course completion rates (Coldeway, 1986).

In another study, Gibson and Graff (1992) described pacing as 'crucial' in preventing early dropout and went on to say:

> Providing assistance with pacing, timelines, detail, interface with other students taking the same course or with peer tutors, and incorporation of optional face-to-face or mediated distance meetings with the instructor represent just a few ways early direction and support could be provided [in order to prevent dropout]. One might hypothesise that these types of direction and support could be gradually diminished without a parallel diminishing of student success in later coursework.

It is also worth noting, that higher course completion rates are a key contributor to lower unit costs per completed course.

You may also need to take account of your learners' attitudes towards pacing. There is little research on this, but it has been found that university students taking selected modules by distance learning consider pacing to be acceptable (Holmberg, 1995).

3.6.4 PACING DEVICES

Pacing devices can be usefully classified under four headings as follows.

Release of materials

One way to pace students is to send course material to them in small amounts – say, once a week or once a month. However, this is expensive.

The advent of the internet has opened a new possibility here. When learning materials are on web pages or sent over the internet as attachments, the ODL provider can make the materials accessible on certain dates.

Events at fixed times

One of the most common ways of pacing is to have events that take place at fixed times, such as:

- tutorials held at local centres, and

- online tutorials (in this case, the tutorial might take place over a week).

Deadlines for completion of parts of courses

Another common method of pacing is to require that certain tasks be done by set deadlines. These include:

- assignments to be completed by given dates,

- online assessments to be completed by given dates, and

- exams to be completed on set days.

Pro-active interventions

Finally, the provider can pro-actively intervene to encourage students with their studies. For example, a tutor might telephone students once every two weeks to check on their progress and talk over the next bit of work to be done.

3.7 THE COURSE SPECIFICATION

3.7.1 INTRODUCTION

The course specification is the most important document produced during the development of a course since its function is to define what is to be produced. It is of particular importance where there is a team of people working on a single course, because the specification helps ensure that the various specialists work in an integrated and holistic manner.

Other terms are also used for course specification, such as blueprint, plan or outline.

Issues for instructional designers

1. Why do I need a course specification?

2. What should be included in a course specification?

3. What level of detail should be included?

3.7.2 PURPOSE

The purpose of a course specification varies according to its audience. In a large university, with multiple levels of decision-making, a course specification may be needed in order to gain agreement to offering the course, to support its contents, to validate it and to release funds for its development. In these circumstances, much of the format and content will be determined by existing university requirements.

At the other extreme, in a very small ODL institution, the instructional designer and any additional course authors may be the only people who use the specification. In this case, the specification is just a working document to help guide them in their development of the course.

So, a first step in developing a course specification is to consider who might use it and for what purpose. For example, apart from you as instructional designer, the specification might be used by authors, support staff and finance staff. Some of the possible users of a specification and the purposes to which they might put that specification are set out in Table 12.

TABLE 12. Main users of course specifications and the purpose for their use

User	Purpose
Instructional designer	• as the basis for commissioning work from others (e.g., authors, designers, web site creators) • as the basis for managing the development of the course (e.g., financial control, project management)
Authors[1]	• as the specification of what they will have to write, both in terms of content and instructional design format
Support staff	• as the basis for planning the support activities for the course
Marketing staff	• as a basis for preparing prospectus entries and other publicity
Registry staff	• as a basis for putting the course on the computer system • as a basis for accepting students into the course
Finance staff	• for budgeting and cost control

[1]The instructional designer may or may not be one of these authors.

3.7.3 WHAT TO INCLUDE

There is no definitive list of what should go into a course specification, but Table 13 is a useful starting point. Few specifications would contain all these items, so you need to pick from the list whatever best meets your institution's needs.

Under 'instructional design style' in Table 13, inclusion of a sample course unit is suggested. This raises another issue about course specifications: they do not have to be a single document. There does need to be *one overall document*, for everyone to use, but additional, more specialist documents can be developed to support the main one. These include a:

• web site specification,

• audio cassette specification, and

• assessment specification.

The larger your institution, the more likely it is that you will need these additional specifications, since the work is more likely to be subdivided among specialist sections.

TABLE 13. Possible contents for a course specification

Aspect	Items to detail
General	• course title
	• course aims
	• learners' needs (e.g., why they are taking the course, what qualifications they need to gain, what they intend to do after the course)
	• learner vignettes to give authors a clear idea of the sort of students they are writing for and their personal circumstances
	• expected learning hours and the number of weeks over which the course will be studied
	• learner circumstances
	• pre-requisite skill and knowledge that will be assumed
Content	• learning outcomes at unit level
	• unit titles
Instructional design style	• typical activities for each learning outcome
	• media to be used
	• sample unit – this is probably the most effective way to convey to authors just how they should write
Tutorial support	• type of tutorial support to be provided (e.g., distance tutor, online tutor, workshops)
	• assignments to be submitted to tutors
Assessment	• assessment details (e.g., number of occasions when assessment will take place and the type of assessments)
Developmental testing details	• which parts of the course will be tested
	• how the testing will be done
Finance	• budget

3.7.4 STANDARD FORMAT

It is a good idea for an institution to have a standard format and contents list for a specification. This will help staff prepare a course specification that will meet the requirements of the various users.

3.8 THE COURSE GUIDE AND OTHER DEVICES

3.8.1 INTRODUCTION

Course guides (which are distinct from study guides) are devices to help learners orientate themselves to a new course and learn how to use it. Course guides also act as reference sources for use when learners have a problem with their course.

This topic also looks at course overviews, course maps and prior knowledge.

> **Issues for instructional designers**
>
> 1. What should be the contents of the course guide?
>
> 2. What should be the format of the course guide?
>
> 3. Should I include any pre-testing?

3.8.2 PURPOSE
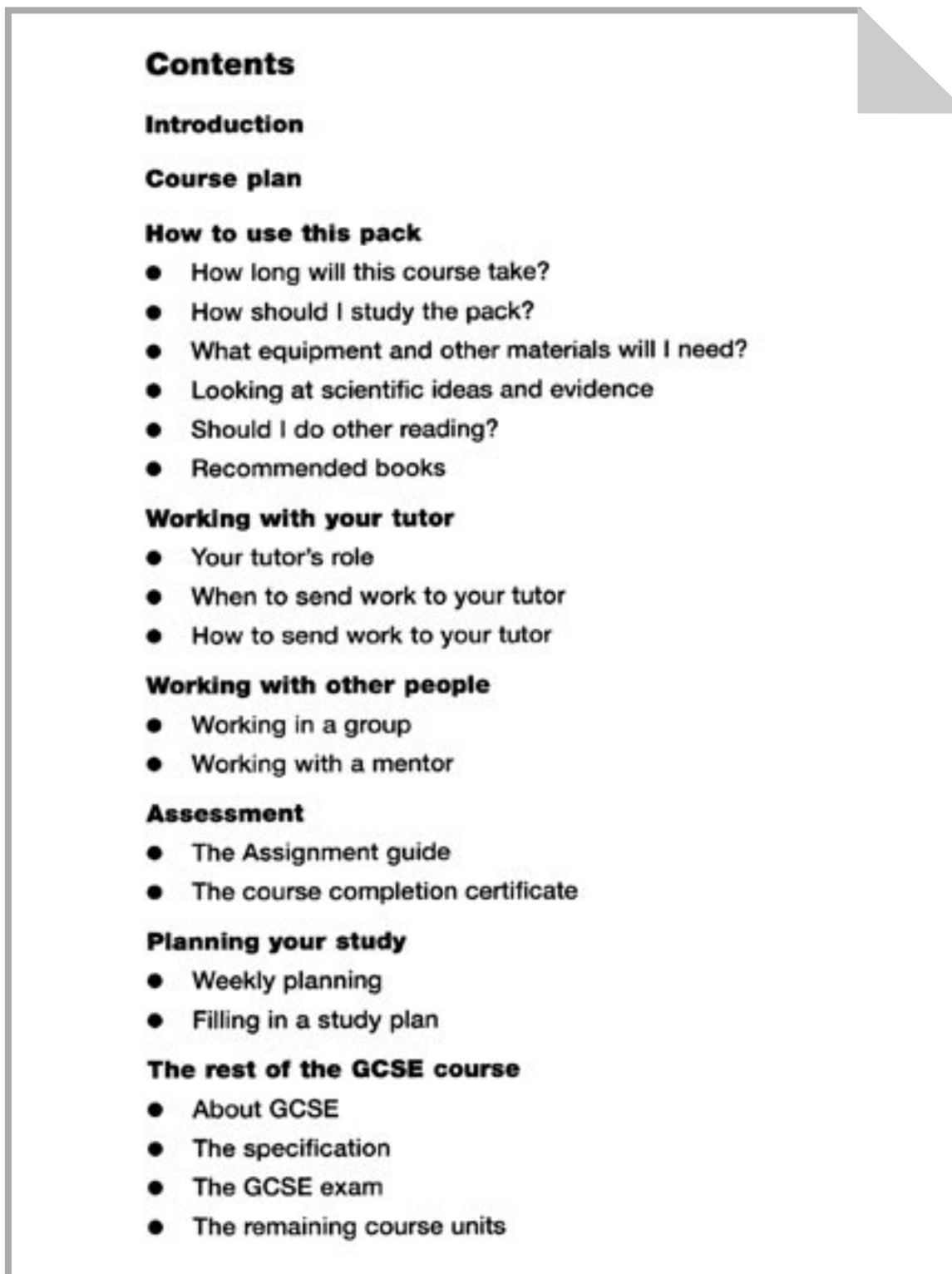
Course guides are developed for learners to:

- explain the aims of the course,

- outline the components and structure of the course,

- describe how to use the course,

- provide administrative information, and

- provide information on assessment.

3.8.3 CONTENTS

There is no definitive list of contents for a course guide, but a typical guide contains items such as:

- an overview of the course,

- the aims of the course,

- a statement of any pre-requisite knowledge and skills that the course assumes,

- a list of contents,

- an explanation of the structure of the course (e.g., how it is divided into units),

- a list of the various components (e.g., workbooks, cassettes, web pages) and some explanation of what they are for,

- a course schedule with dates of key events such as exams,

- details of the support system and who to contact about different types of problems,

- an explanation of the assignments to be submitted and the system for submitting them,

- an explanation of how and when the course will be assessed,

- an explanation of how to use the course (e.g., how to use activities, self-assessment and objectives)

- study skills advice (e.g., how to plan your time, how to make notes, how to learn from the web).

Two examples of the contents of typical course guides can be seen in Example 13 and Example 14.

EXAMPLE 13. Sample contents of a typical course guide (a)

Contents

Introduction

Course plan

How to use this pack
- How long will this course take?
- How should I study the pack?
- What equipment and other materials will I need?
- Looking at scientific ideas and evidence
- Should I do other reading?
- Recommended books

Working with your tutor
- Your tutor's role
- When to send work to your tutor
- How to send work to your tutor

Working with other people
- Working in a group
- Working with a mentor

Assessment
- The Assignment guide
- The course completion certificate

Planning your study
- Weekly planning
- Filling in a study plan

The rest of the GCSE course
- About GCSE
- The specification
- The GCSE exam
- The remaining course units

Source: *Getting Started at GCSE Biology* (National Extension College, Cambridge)

EXAMPLE 14. Sample contents of a course guide (b)

Contents

Source: *Introduction to Distance Education: Learner's Handbook* (International Extension College, Cambridge)

3.8.4 METHODS OF CREATING COURSE GUIDES

One way of developing a course guide is to start with the course specification and edit it to create a student version.

There are three main formats for course guides: printed guide, interactive guide and web course guide.

A printed guide

The most common format is a printed guide, often around 10–20 pages in length. This has the advantage of being fairly inexpensive to produce. However, there is much circumstantial evidence to show that learners either do not read guides in this form or, if they do, do not change their behaviour as a result of reading them. This problem is addressed by the next format below.

An interactive printed guide

In this format, the content of a normal printed guide is rearranged to make it an interactive learning experience. So, for example, instead of just telling learners what the course schedule will be and how to plan their time, the interactive guide sets tasks in which the learners draw up their own timetables (see Example 15). This approach is simply implementing what we know to be good practice in learning materials: that if learner behaviour is to be changed, the learners have to engage in the material, not just read it.

EXAMPLE 15. Sample page from an interactive course guide

Getting started at GCSE Biology
STUDY GUIDE

Assessment

The Assignment guide

You will find this at the end of the pack. It contains the three assignments that you need to complete, with advice on when and how to complete them. You can send these assignments to your tutor for feedback on your progress.

The course completion certificate

If you complete all the Assignments in the Getting Started course successfully, you will receive an NEC certificate. You will then be able to go on to complete the rest of the GCSE course, if you wish. (Information about the rest of the GCSE course is given at the end of this Study Guide.)

Planning your study

By planning out your course you will have regular targets to aim for and a sense of achievement as you reach them. The study planner that is provided with this pack will help you do this. Note down in the boxes below your answer to each of the questions.

● Where will you study? (At home? In the library? On the bus or train?)

● How often will you study? (Once a week? Twice a week? Everyday?)

● When will you study? (Early morning? Evening? Lunchtime? Days off?)

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

A web course guide

This form of course guide is becoming increasingly popular. It is obviously a convenient way to deliver a course guide for a web-based course, but is also used for non-web-based courses. The attractions of this method are the ease of updating and the low cost of distribution. However, there is a risk that learners will never actually find the parts of the guide that they need, particularly if those parts are not listed on menus. Many web site users have enormous difficulties finding what they want on web sites (let alone finding things that they are not aware exist on the site). Nielsen (2002a) has drawn attention to this problem both generally ('users don't understand where they are in a website's information architecture') and with specific reference (2002b) to drop-down and scrolling menus (drop-down menus are often more trouble than they are worth and can be confusing …; scrolling menus reduce usability when they prevent users from seeing all their options in a single glance).

It is therefore likely that web-based course guides may present particular navigation problems that need to be addressed with care.

3.8.5 PRE-TESTS

Pre-tests are closely related to course guides and may even be incorporated within guides.

Pre-tests address a particular problem in ODL, where students often enrol at a distance or online: they may end up selecting courses for which they do not have the pre-requisite knowledge and skills. One way to overcome this problem is to provide a pre-test (Race, 1992), which can help learners decide:

- whether they have the knowledge and skills to start the course; and

- which parts of the course they need to do – some learners may already know parts of the course and can therefore skip them.

3.8.6 INTRODUCTIONS, OVERVIEWS AND ADVANCE ORGANISERS

Introductions and overviews are important in ODL courses, and can occur at various levels: course, unit and topic. See Examples 16–17.

The basic purpose of these elements derives from the concept of an advance organiser (Ausubel, 1960). This is a device that provides a mechanism to help learners make sense of what they are about to learn. It can take the form of:

- reminding learners of what they have already learnt (e.g., by providing a short summary of the key points of the previous topic);

- reminding learners of what they already know (e.g., in a course on marketing, reminding learners of their wealth of knowledge of advertisements and other marketing techniques);

- providing a map or chart to show how the new topic links to previous topics;

- providing an overview of what they are about to learn (e.g., showing a completed table in Word and saying 'In this session you are going to learn to make tables like this').

EXAMPLE 16. Sample course-level introduction

Source: *Applying Information Technology* (National Extension College, Cambridge)

EXAMPLE 17. Sample diagrammatic course introduction

FIGURE I
Materials development and production process

2 Development stage
- Writing and reviewing
- Instructional design
- Editing

3 Production stage
- Layout
- Printing
- Binding
- Packaging

I Planning/design stage
- Learner profile
- Curriculum
- Cost
- Learner support
- Existing materials
- Media mix
- Course outline

4 Delivery stage
- Storage
- Despatch

5 Evaluation stage
- Learners' evaluation
- Assignment results
- Throughput rates

Source: *Introduction to Materials Development in ODL*. ODL103-H, p. 16 (UNISA)

Topic diagrams

Topic diagrams can also be used as advance organisers, as in Example 18.

EXAMPLE 18. A topic diagram being used as an advance organiser
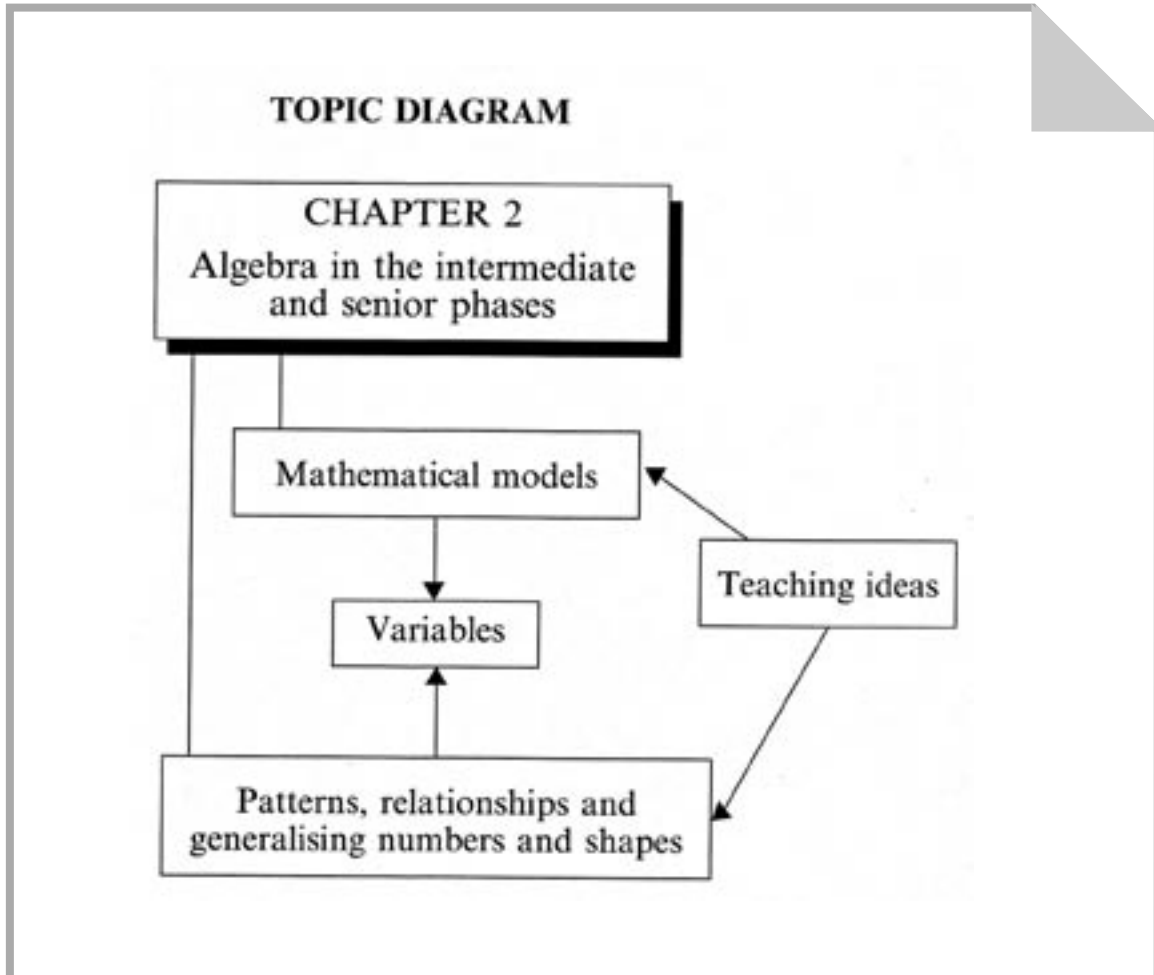
Source: *Trigonometry, Algebra and Calculus*. NPD030-A, p. 5 (UNISA)

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 over-loading 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	• unit number and title • an introduction • contents list • statement of pre-requisite knowledge (or a pre-test) • learning objectives for the unit • list of any equipment needed for studying the unit • other resources needed for the unit (e.g., a textbook) • time required for the unit	
2. Teaching and activities	• examples • explanatory text • activities with feedback • diagrams and illustrations • topic summaries	This stage is usually divided into topics, each topic matching one learning outcome
3. Closing material	• unit summary • self-test based on the unit learning objectives • link forward to the next unit	

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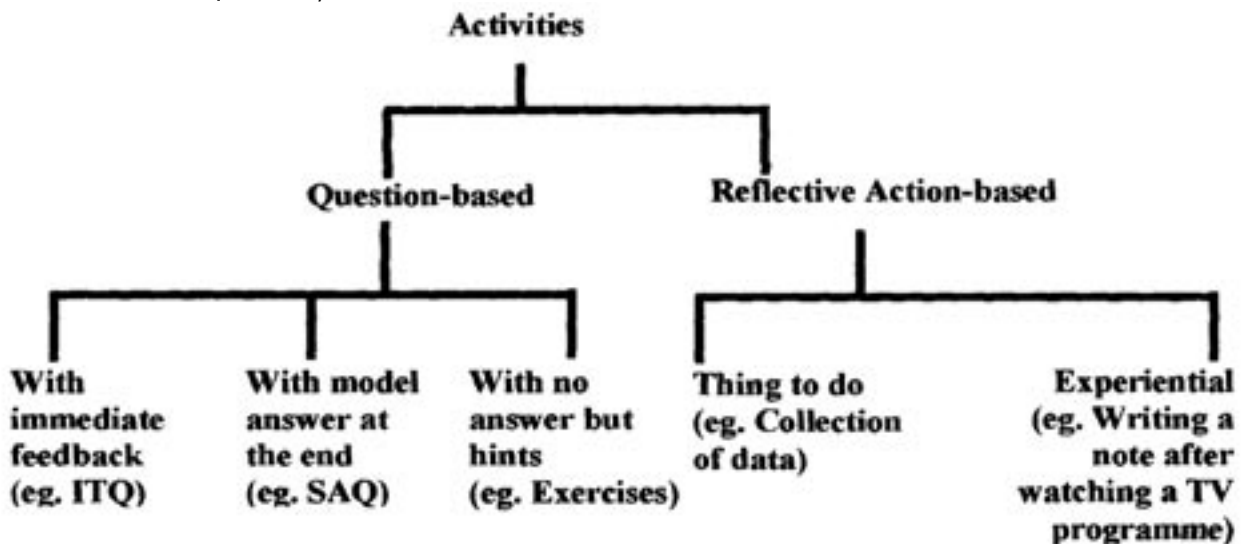
And a much more complex view is provided by Kember and Murphy (1994), who distinguish between 34 types of activity in learning materials and a further 19 types for group meetings.

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 I

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   ☐

I learn best by finding new ways of doing things   ☐

I learn best when I feel I am in a 'safe' environment   ☐

I learn best when I am relaxed and calm   ☐

I learn best when I can see the 'big picture'   ☐

I learn best by working it out as I go along   ☐

I learn best when I have a plan with goals and targets   ☐

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 seque-strated. 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	❏	❏
A bank loan to buy the car	❏	❏
Office furniture	❏	❏
Raw materials	❏	❏
Debt owed for raw materials bought	❏	❏
A building	❏	❏
The mortgage used to buy the building	❏	❏

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.
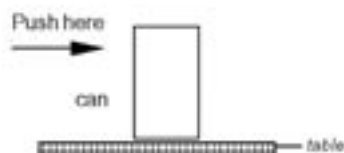
Let us look at some positions of the can.

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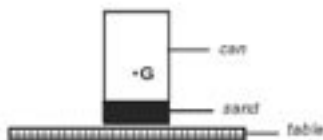
Now try the next self mark activity to see if you understand the Centre of Mass.

Source: Namibian College of Open Learning (NAMCOL)

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?
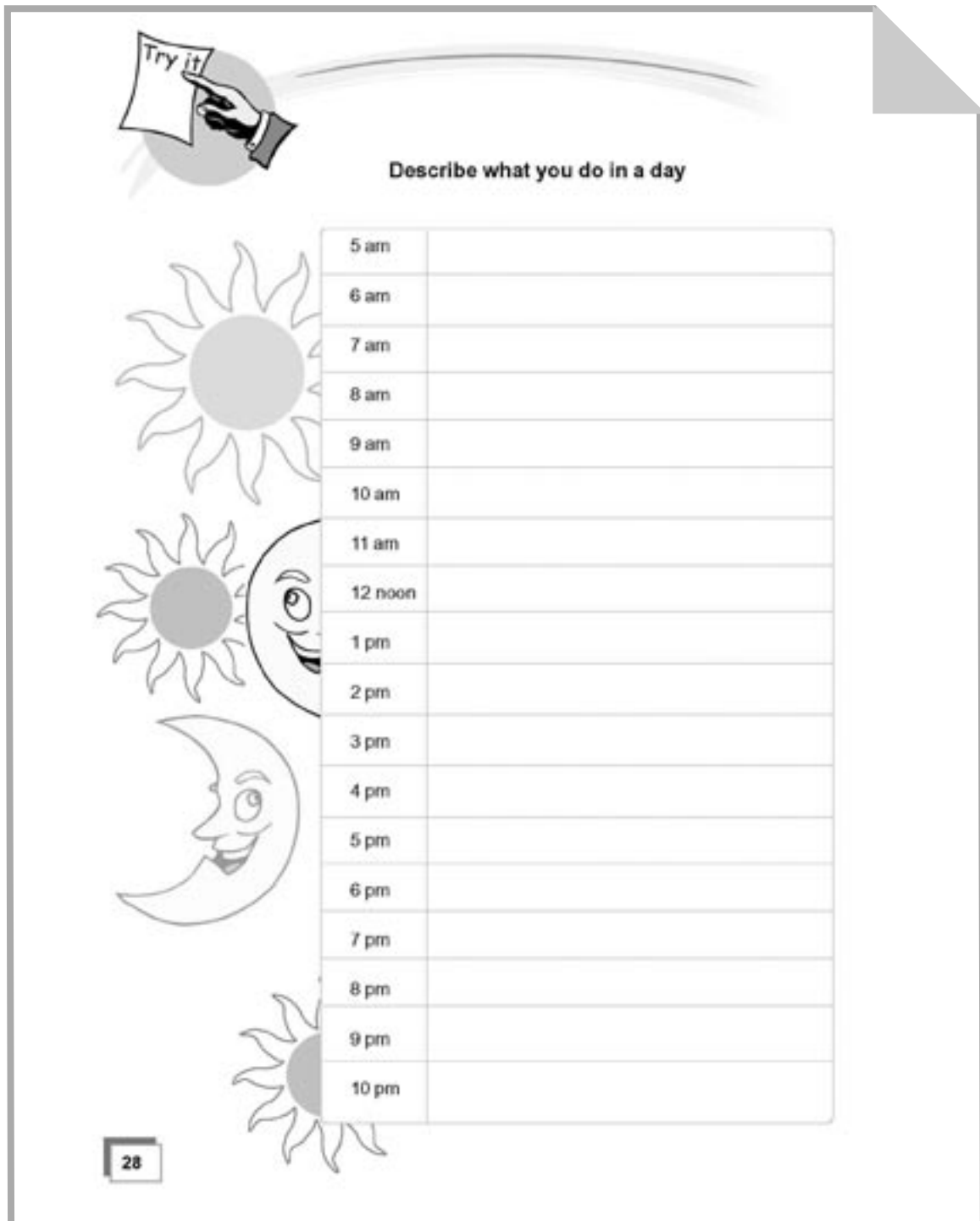
Any casual survey of a range of ODL materials will reveal a wide range of approaches to the precise format of an activity. In some materials, an activity is no more than a question; in others it is an elaborately developed task. Lockwood (1992) has argued that the research that he reviewed points towards 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

Activity 1: Apostrophes with singular words	Purpose of this element:
This activity will help you improve your use of apostrophes to show possession.	Motivational introduction
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	Task/ instructions
1. the Queen's palace _____ 2. _____ 3. _____ 4. _____	Answer grid and example if needed
Take no more than 5 minutes over this.	Time guide
Feedback to Activity 1 Your answers should have been as follows: 2. **my friend's book**. If you wrote 'my friends' book' then your answer refers to a book owned by more than one friend. 3. **Charles' computer** or **Charles's computer**. 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. 4. **the Earth's surface** If you wrote 'the Earths' surface' then you are referring to more than one Earth.	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

Try it		
	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
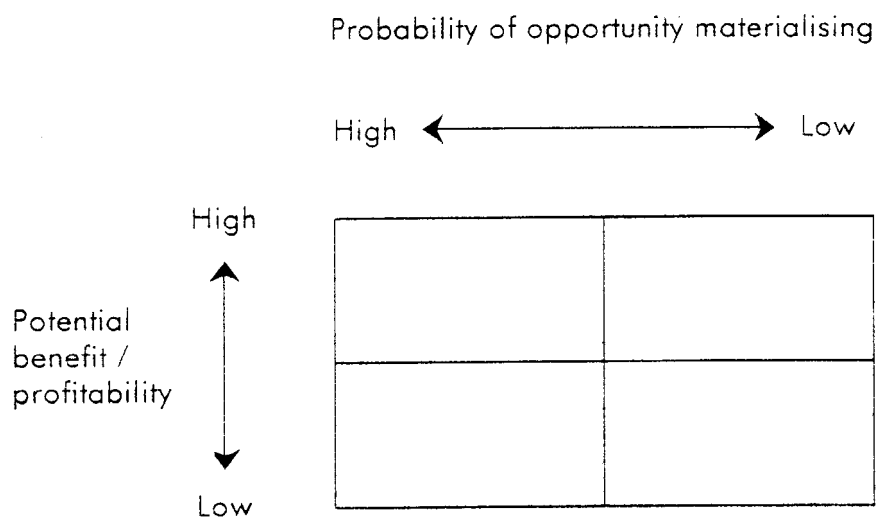
Probability of opportunity materialising

High ←——————————→ Low

High

Potential benefit / profitability

Low

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

EXAMPLE 29. Sample use of an answer grid in an activity

Activity 4: Where does your institution fit?

Considering each of these dimensions separately, *take a few minutes – no more than ten in total –* to plot on the following diagrams where your institution's provision of learner support would best be placed. For example, on the first dimension, if your institution registers learners and provides all tutorial and other services through regional offices, leaving the learner with little or no contact with headquarters, you would place an 'X' on the far left end of the first line, like this:

• —X— • —— • —— • —— • —— • —— • —— • —— • —— •

Local support   ←—————————→   Central support
• —— • —— • —— • —— • —— • —— • —— • —— • —— •

Group support   ←—————————→   Individual
                                                               support
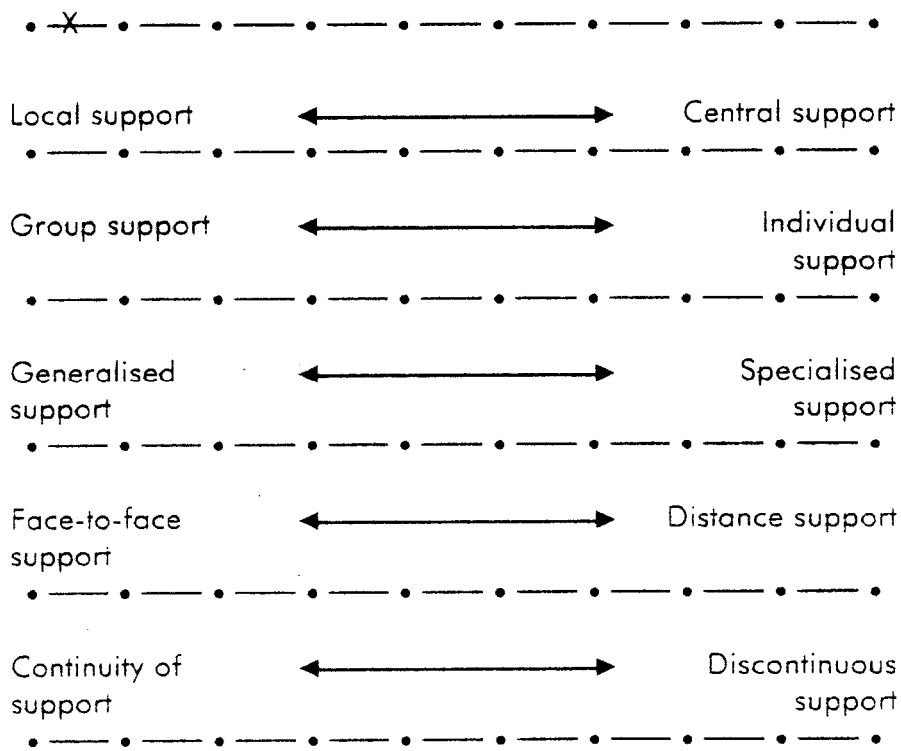• —— • —— • —— • —— • —— • —— • —— • —— • —— •

Generalised   ←—————————→   Specialised
support   support
• —— • —— • —— • —— • —— • —— • —— • —— • —— •

Face-to-face   ←—————————→   Distance support
support
• —— • —— • —— • —— • —— • —— • —— • —— • —— •

Continuity of   ←—————————→   Discontinuous
support   support
• —— • —— • —— • —— • —— • —— • —— • —— • —— •

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.	• be careful not to put too much material into the course • be careful that the later units of a course are not longer than the early ones
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%.	• provide an answer grid when it is practicable to do so
The more demanding the activity, the lower the response.	• be careful not to make activities more demanding than they need to be for learners to achieve the relevant learning objective.

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 Romiszowksi (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	
	Rules	To aid understanding
	Principles	
	Procedures (algorithms)	
Application	Use of concepts	
	Use of rules	To develop proficiency in application
	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 (Romiszowksi, 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) $(w\text{-}y)^2$ (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) $3^4 \times 3^3 =$ ....

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

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

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

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

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

Theodoric Office Furniture ①
19 High Street, South Reading, Berkshire RG1 2NH
Tel: 0118 954 4156 Fax: 0118 954 4178
VAT REG NO 352–2327-75

INVOICE

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　⑦　　　　　　　　⑧　　　⑨

Qty	For	Cat.	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

⑩ ⑪ ⑫

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

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

EXAMPLE 32. An example being used to teach a method

Example

Solve for x and y:

$$x - y = 5 \dots\dots\dots\dots (1)$$
$$x^2 + y^2 = 97 \dots\dots\dots (2)$$

Solution

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

$(y + 5)^2 + y^2 = 97$ *(Substitute (3) into (2).)*

$y^2 + 10y + 25 + y^2 = 97$ *(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[1]
If you cut yourself, you should wash and disinfect the wound.	A: cutting yourself B: washing and disinfecting
If there is traffic coming, you should not cross the road.	A: the arrival of traffic B: crossing the road
If a plant flowers on last season's growth, prune it straight after flowering.	A: flowering on last season's growth B: prune after flowering

[1]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 (Romiszowksi, 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

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.

Source: *Manager's Toolkit: Managing Operations* (National Extension College, Cambridge)

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 (Romiszowksi, 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
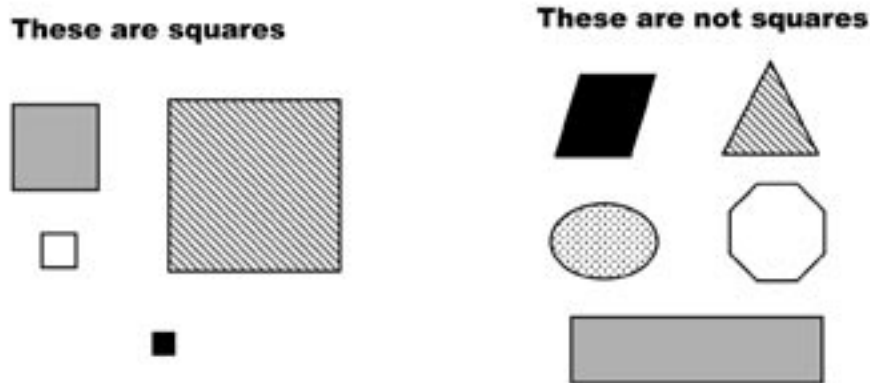
Examples must be …

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 Show what things look like	2 Show how some-thing works	3 Show quantitative relationships	4 Show change over time	5 Show relationships / pattern	6 Show structure	7 Show sequence / process	8 Simplify	9 Motivate	10 Convey emotion / feeling	11 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

Project objective:	One day training course for new staff
Project deadline:	One month from today
Project organiser:	Self with help from Lillian Grover

Task	Who to complete	Deadline
Fix exact date for course Find out budget available find out number of attendees	ST ST to negotiate and agree with LG	end of week 1
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
• knowledge • cognitive skills • literacy • numeracy	intellectual cognitive academic	TUTORING
• time management • job/family issues • planning study • handling paperwork	organisation	COUNSELLING
• motivation • self esteem development • stress management • assertiveness	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	1	50
	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.

Table

Tall cupboard

Sink

Chairs

Choose more items of your own.

Include them in your kitchen layout.

Washing machine

Cooker

Worktop

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'

Ladders can be dangerous if their slope angles are too great, as in the first diagram below, or too small, as in the second diagram.

Wall

Ladder

Slope angle

Ladder

Wall

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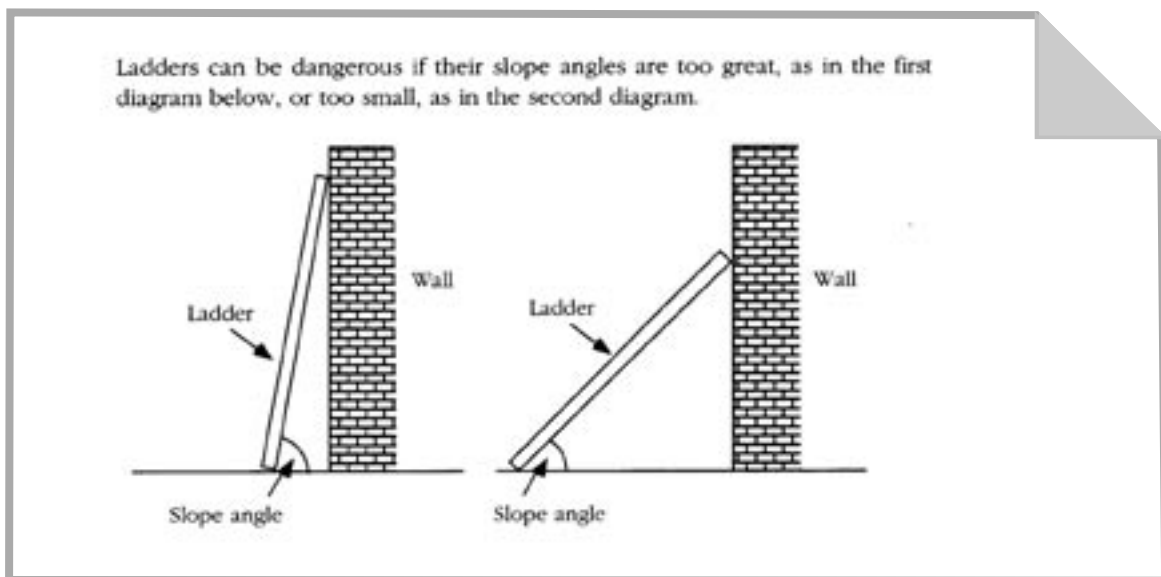
Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

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

Source: Institute for Adult Basic Education and Training (UNISA)
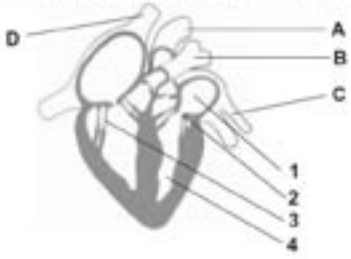
In Example 40, the heart is not really like that shown. Rather, it has been reduced to a few essentials in order to concentrate students' attention on the four parts of the heart to be learnt.

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'

Induction crises

Induction crises occur anything from one month to two years after starting, depending on variables such as the job itself and the organisation's culture and structure. Typically, the first induction crisis occurs after the first pay cheque, the second after six months and then possibly 12–18 months into the job.

The graph below shows you the points at which employees are most likely to leave an organisation.

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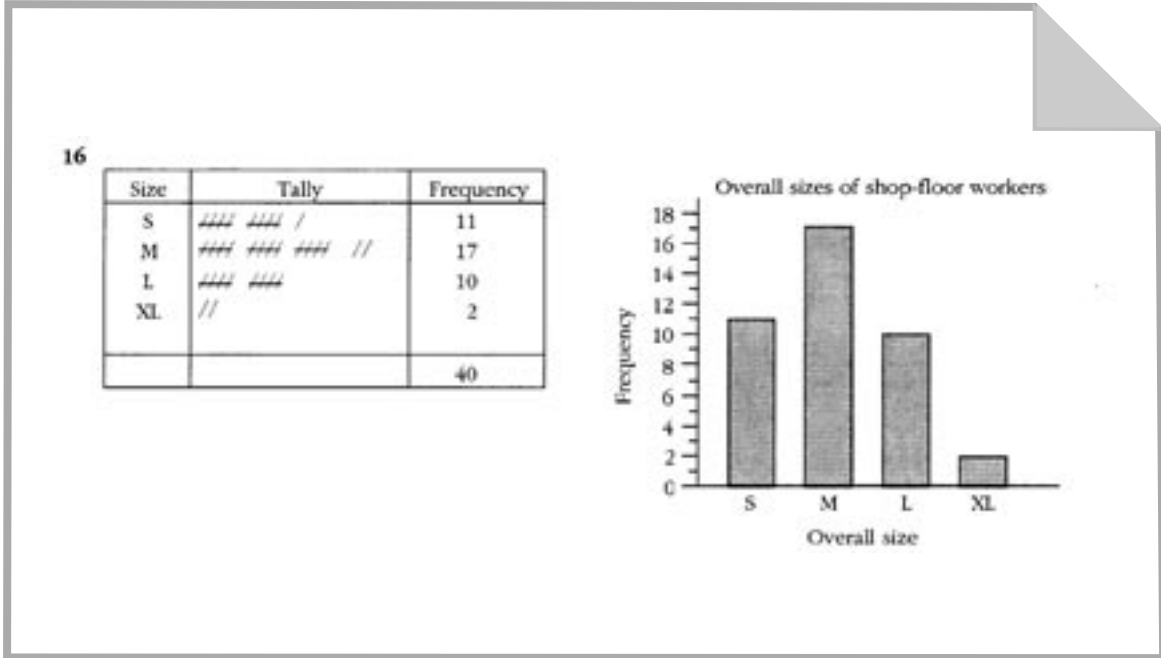
Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

Histograms

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

EXAMPLE 43. Sample histogram in an ODL course
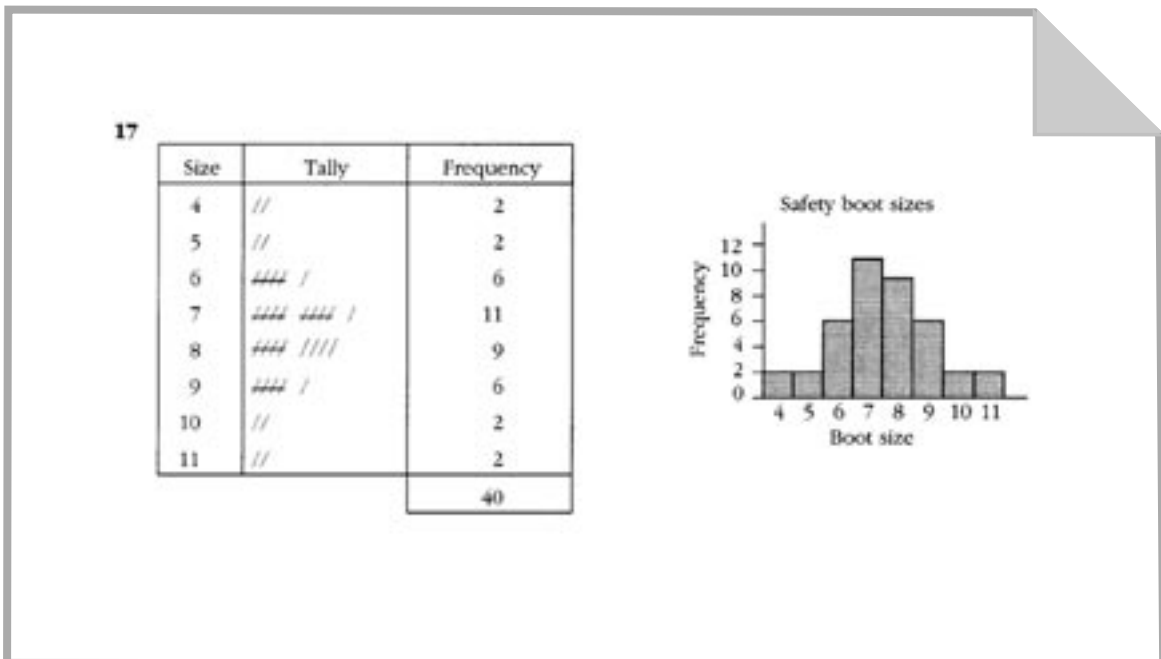
Source: *GCSE Maths Intermediate* (National Extension College, Cambridge)

Note about histogram use

It is worth noting here that many ODL courses contain categorical data displayed as a histogram. This is an error that good editing should eradicate. Histograms should be exclusively used for data that is measured on a continuous scale (e.g., height, weight, temperature). When the data is measured on a discrete scale (e.g., number of rooms, number of cars owned), a bar chart should be used. Bar charts should also be used for categorical data (e.g., political parties, type of car owned).

Organisational charts

Organisational charts are an effective way of showing hierarchies, both in organisations and in other situations. A typical organisational chart is shown in Example 44, but the same approach can be used to portray web site structures (see Figure 11).

EXAMPLE 44. Use of an organisational chart in an ODL course
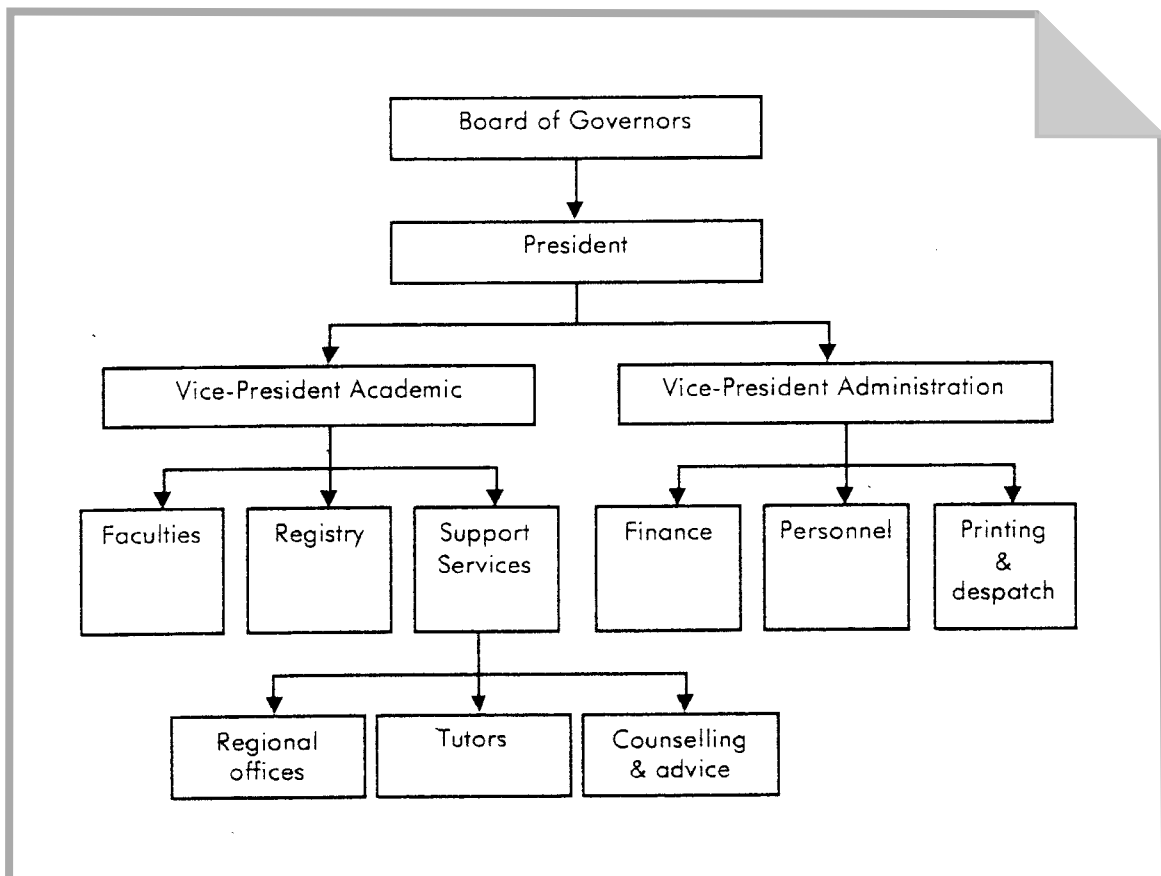
Source: *Introduction to Distance Education*. M2, p. 66 (International Extension College, Cambridge)

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

START   PROCESS   DECISION

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

Learner routes

As the following diagram shows, the series structure reflects the process of learning, applying and then evidencing skills. The components can be used in conjunction with each other and students can access the series from different starting points, depending on their level of skills and confidence.

| Learning | Applying | Evidencing |

STARTING POINT

Student needs to develop a discrete skill but is unsure of their strengths and weaknesses

Student uses Skills Check questions in *Applying IT* to test their underpinning knowledge

Student is not confident in some of the underpinning knowledge needed for the skill

STARTING POINT

Student uses *Learning IT* to learn through simple exercises

Student is confident in underpinning knowledge and wants to practise applying skill

STARTING POINT

Student works through contextualised activities in *Applying IT* to practise discrete skills

Student is confident in using a wide range of skills and wants to put them together in order to generate portfolio evidence

Student works through assignments in *Evidencing IT*

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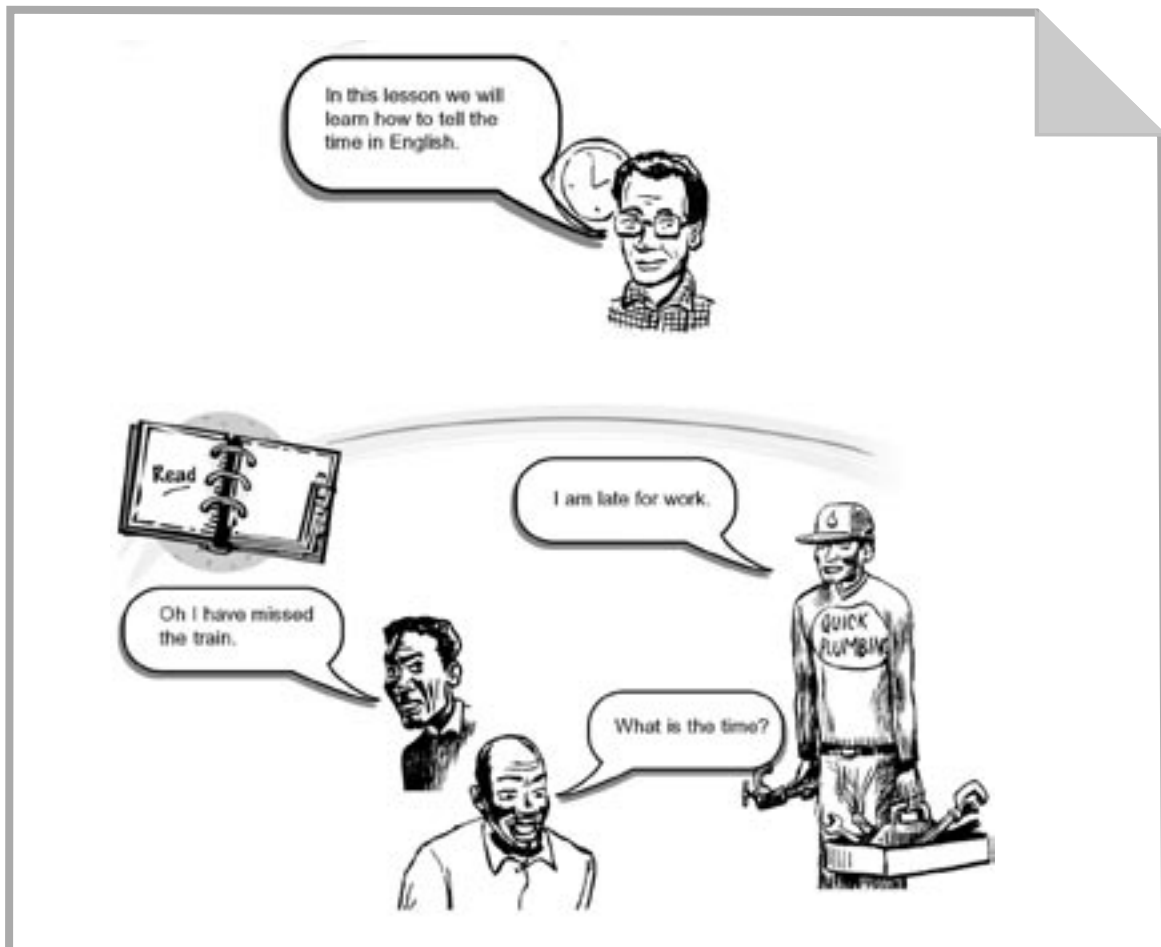
Source: Institute for Adult Basic Education and Training (UNISA)

Icons

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

EXAMPLE 48. Examples of icons
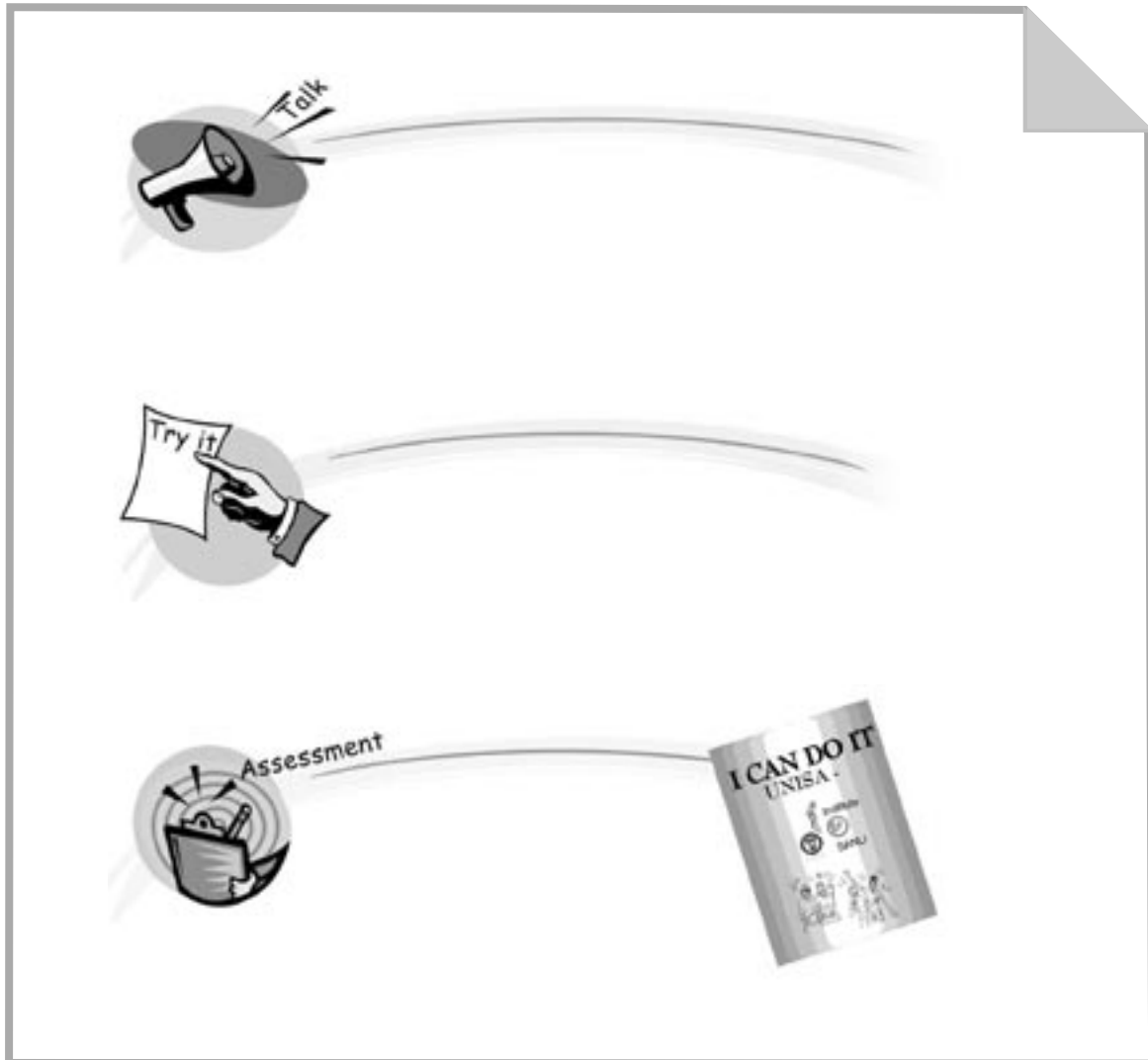
Source: Institute for Adult Basic Education and Training (UNISA)

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_2 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

			Student numbers					
	1990	**1991**	**1992**	**1993**	**1994**			**Average**
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
Totals	**4900**	**5000**	**5400**	**5500**	**5700**	**Totals**		

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	• trends
Bar chart	• categorical data (e.g., male, female; text, audio, computer, radio, television) • breakdowns within categories
Histogram	• continuous data (e.g., marks) • breakdowns within groupings
Pie chart	• comparative percentages of one type of variable (but best avoided)
Tables	• exact quantities

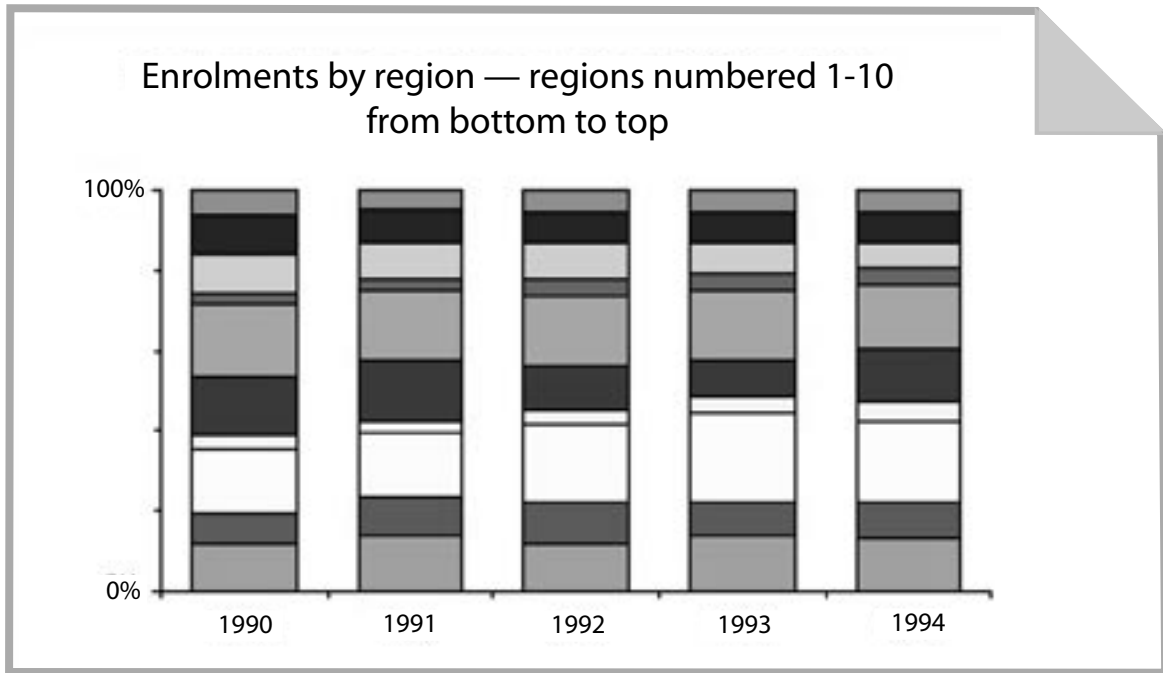## Hints for effective graphs and charts

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)

Enrolments by region — regions numbered 1-10 from bottom to top

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

Enrolments by region — regions numbered 1-10 from bottom to top
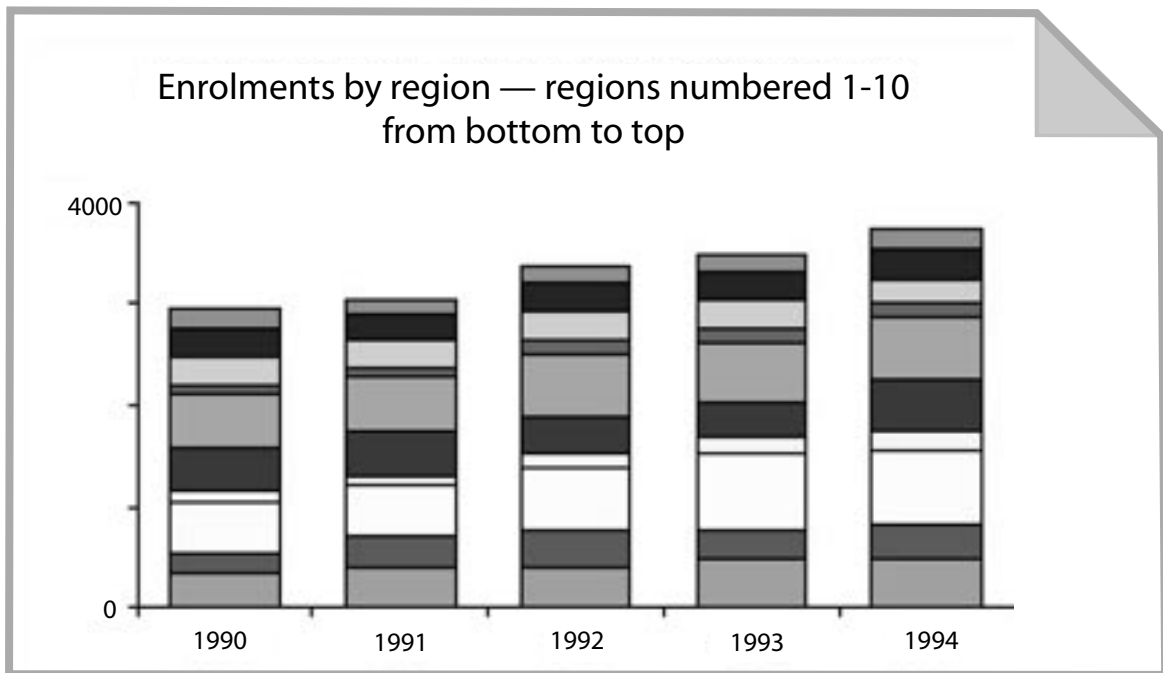
4.4.7 METHODS FOR CREATING EFFECTIVE GRAPHS AND CHARTS

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
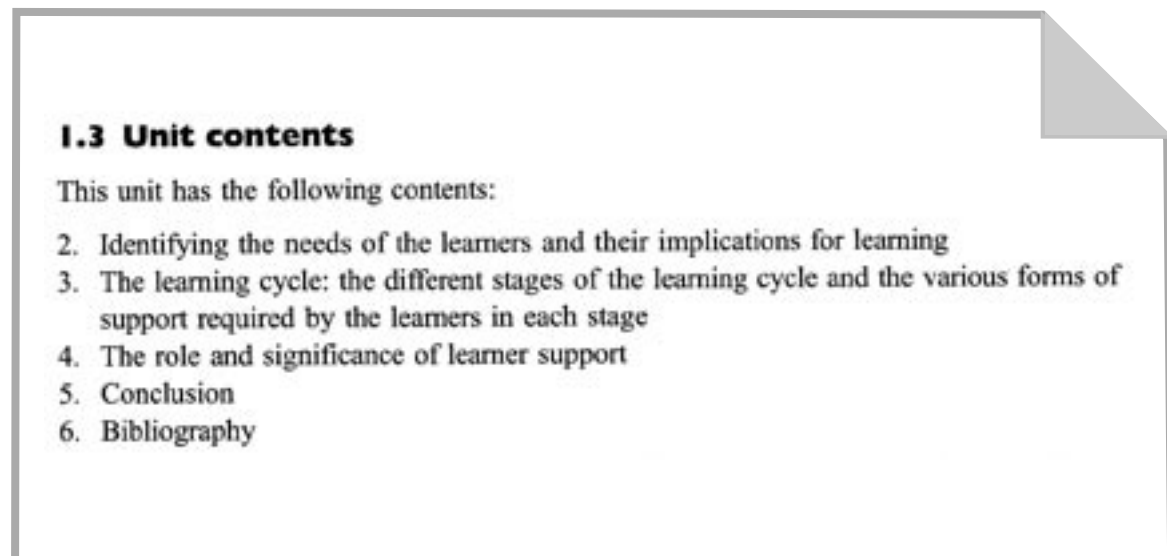
• Basic facts about triangles

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

I.3 Unit contents

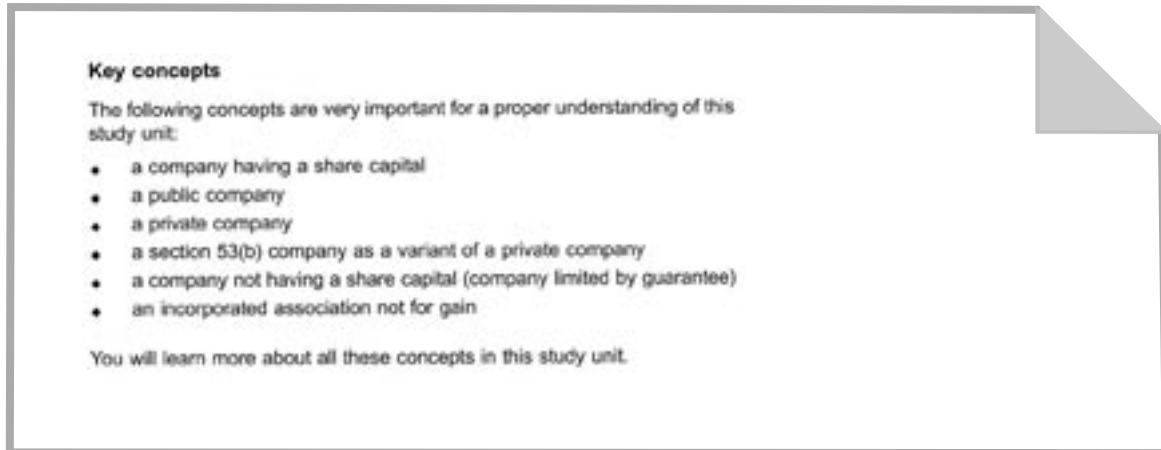This unit has the following contents:

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:

<div align="center">

`Parts`

</div>

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 to 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
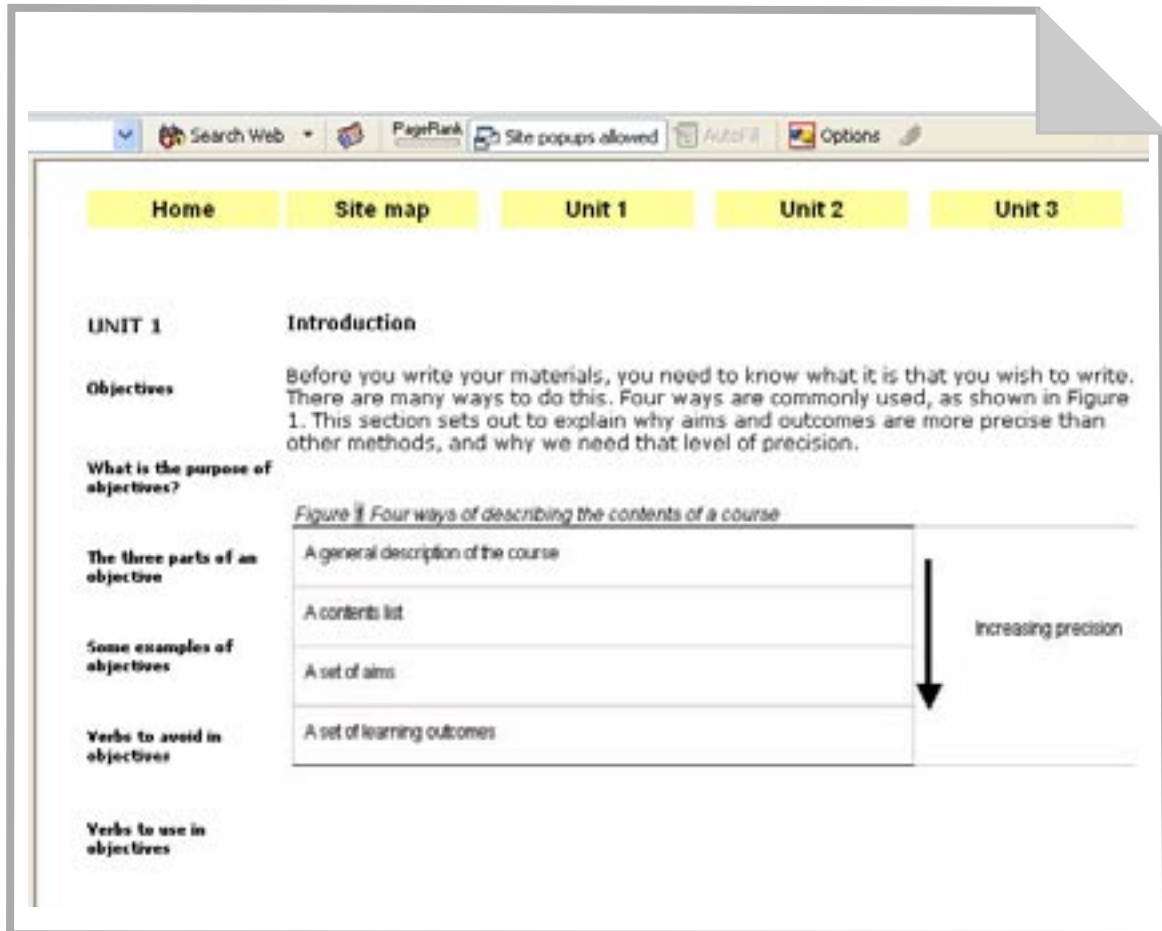
Concept maps

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
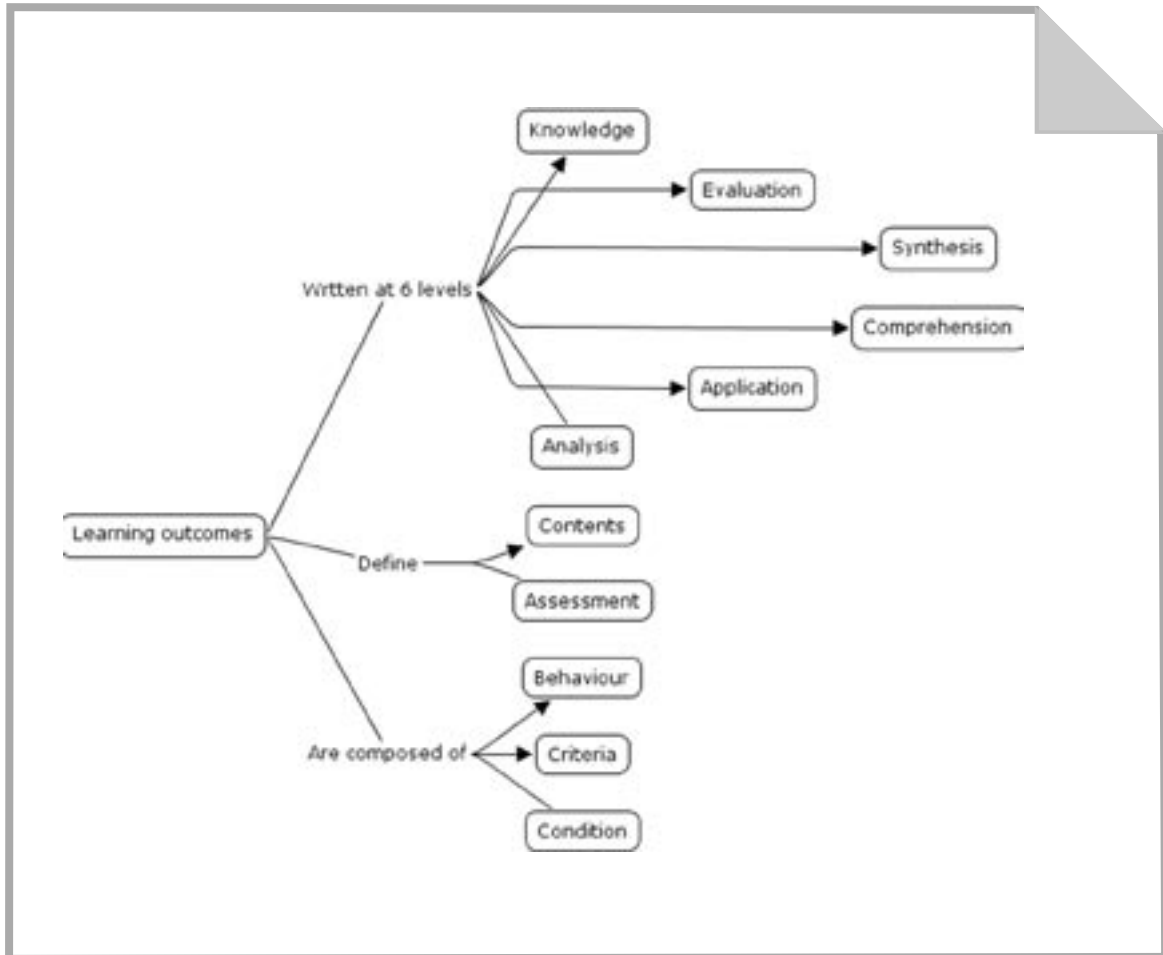
Objectives

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'.

Source: *Develop Your English* (National Extension College, Cambridge)

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

Temporary window to display the glossary.

Main window – learners can click here to
return to the page they are studying.
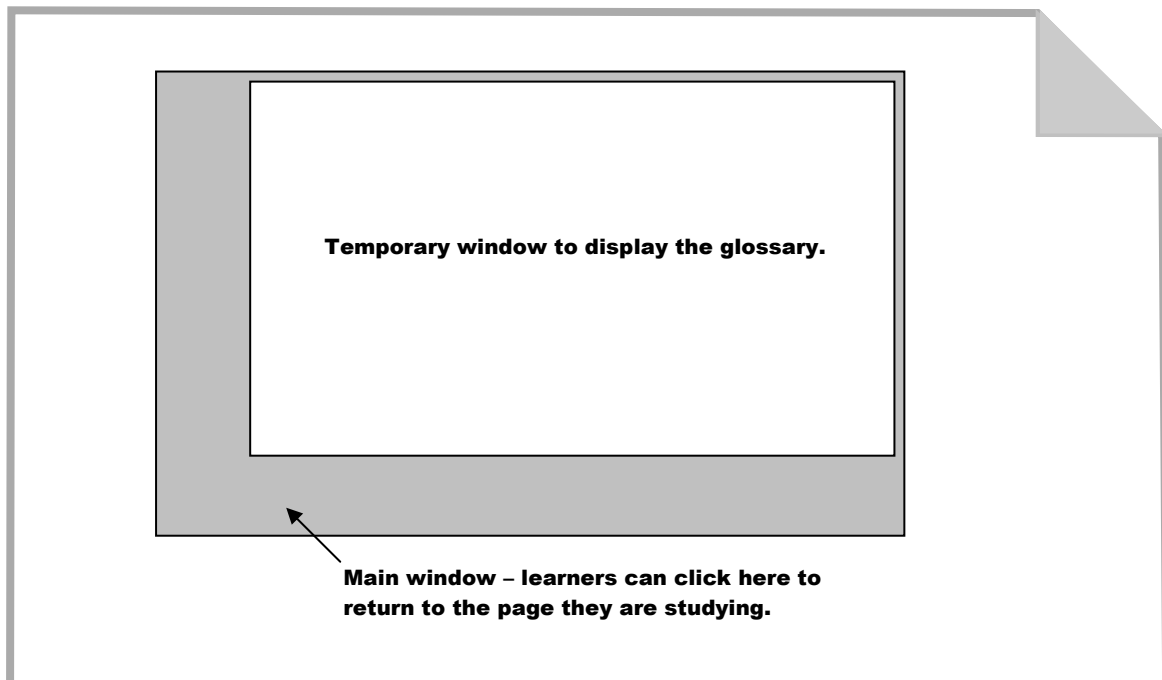
4.5.6 'AFTER DEVICES'

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. $\frac{3}{7} \times 2 = \frac{6}{7}$

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

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

What have we learnt?

Using a mathematical model to teach algebraic concepts involves the following processes:

READING → UNDERSTANDING → MATHEMATICAL LANGUAGE / MATHEMATICAL SYMBOLISM
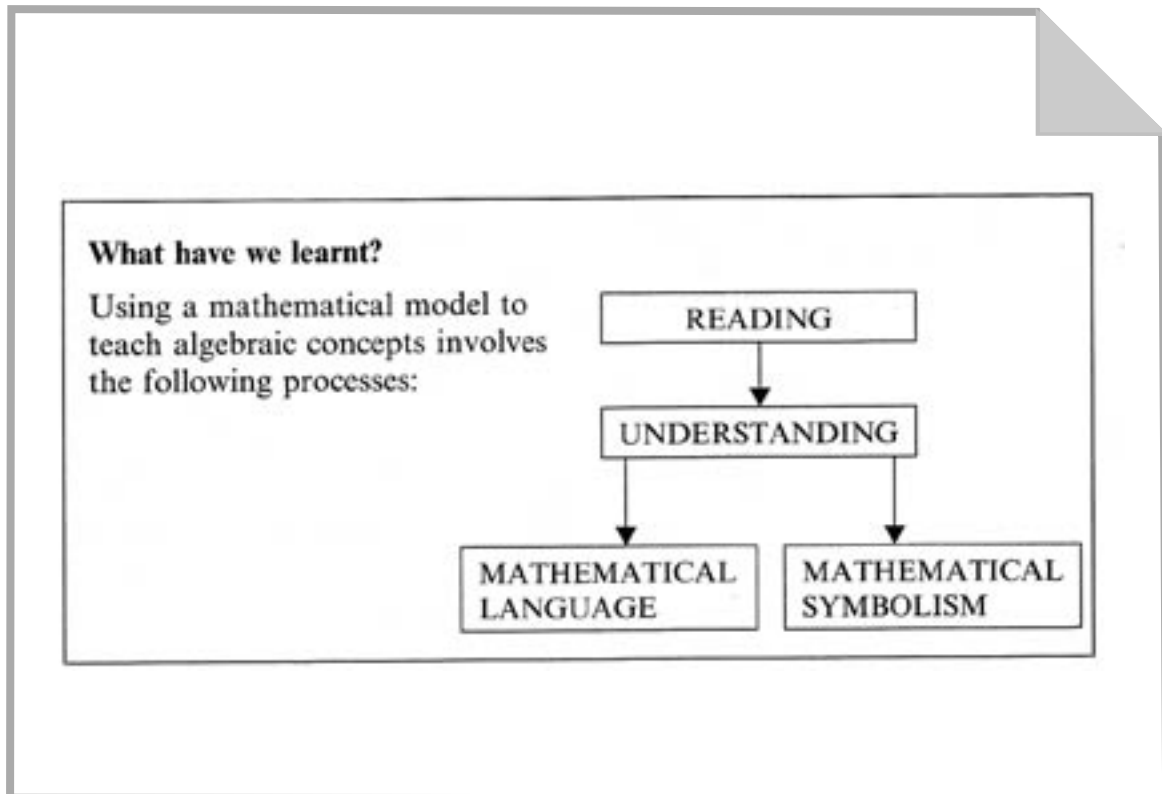
Source: *Trigonometry, Algebra and Calculus.* NPD030-A (UNISA)

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 under-estimate 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

Task	Estimated study time (mins)
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
TOTAL STUDY TIME	**86**

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

Activity 1: Apostrophes with singular words	**Read 0.25 min**
This activity will help you improve your use of apostrophes to show possession.	**Read 0.25 min**
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	**Read 0.5 min**
1. the Queen's palace_____ 2. _____ 3. _____ 4. _____	**Answer** **3 × 1 = 3 min**
Take no more than 5 minutes to do this.	
Total estimated time	**4 min**

SECTION 5: WRITING FOR THE WEB

OVERVIEW OF SECTION 5

Writing for the web is in its infancy, particularly in education, and many course web sites are just print-based courses copied onto web pages. As Forsyth (1996) notes:

> Often a so-called educational and training site is pre-book technology. The information is available and presented in the form of a scroll.

Similar problems have been noted by French et al. (1999) in relation to students searching the web:

> The student must sift through large numbers of examples, developing the wisdom and perception to select only those with the most meaningful application to his or her work.

This section aims to help you avoid these mistakes and to make good, productive use of the web.

When and why to use the web

When a new technology arrives, people's first instinct is to use it to do what they already do. For example, when the telephone was relatively new in France in the early 20th century, subscribers could dial a number to hear a live play from a Paris theatre. Later, in many countries, television started being used to broadcast live lectures. And today, the web is used to present the pages of textbooks and handouts. In fact, each new medium offers new possibilities (and has its own restrictions). In this part you will look at what the web does best and how to exploit those features rather than replicate something from some other medium.

How to plan and structure a course web site

Most educational media offer only one structure: a linear one. Books start at page 1 and work through to the end. So do handouts. Audio and video tapes are difficult to use other than from beginning to end. And so on. But a web site has no particular structure other than that it must start with a home page. This lack of structure is an advantage in certain educational situations, but a hazard in most others. This part looks at some of the structures you could use for your course web site, and the advantages and disadvantages of each.

How to plan and structure print and web pages for learning

Although this part is in the web section of the handbook, it looks at layout both of print and web pages, comparing and contrasting each. Most ODL printed courses appear on A4 paper, which is an excellent size and shape for learning materials. The web, however, comes with a landscape format 'page', with very little top-to-bottom depth – a very awkward shape for learning materials. This part looks at ways to overcome this difficulty.

How to promote activity on the web

Many so-called 'interactive' web sites limit activity to clicking the Next button. This is not what is meant by activity in ODL. By now, you will have seen the richness of activity in ODL texts (see section 4.2, 'Writing Activities') and will be aware of the importance of activity in learning (see section 1.1, 'Instructional Design: What It Is and Why It Is Important in ODL' and section 1.2, 'How Adults Learn'). Many educational web sites seem to have stepped back in time to the epoch when 'teaching' was seen as just being 'telling'. In this part you will look at how you can make your web site 'teach through activity' rather than just tell.

5.1 WHEN AND WHY TO USE THE WEB

5.1.1 INTRODUCTION

There are three basic ways to provide instruction via the web:

- present course material in web pages,

- send course material as downloadable files, and

- teach through discussion using online conferencing.

Because this is a handbook on instructional design, the focus here is on the first two methods, the ones that involve designing materials. (It is worth noting, though, that the third use above is perhaps the most effective way to use the web for education.)

> **Issues for instructional designers**
>
> 1. What can web pages best teach?
>
> 2. When should I use the web to present courses on web pages?
>
> 3. When and how should I put existing material online?

5.1.2 WHAT CAN WEB PAGES BEST TEACH?

Web pages have many similarities with printed text. Like print, web pages are best used to 'teach intellectual and verbal skills' (McManus, 1995) rather than affective skills. McManus also points out that the web is particularly well suited to teaching 'multiple perspectives and knowledge criss-crossing … especially using the hypermedia of the World Wide Web in conjunction with one of the Net's discussion facilities' (McManus, 1995). Thus, the web is a particularly good medium for teaching at the higher levels of Bloom's taxonomy – that is, analysis, synthesis and evaluation (Bloom, 1956). This does not mean that you cannot also use the web at the lower levels (knowledge, comprehension and application), but at those levels some of the special features of the web are less easy to exploit and can even be a handicap. For example, at the lower levels, it is not helpful for learners to be able to go off and explore, since that destroys any carefully constructed learning sequence. At higher levels, where learning is more open and explorative, the web's flexibility is ideal.

5.1.3 WHEN SHOULD I USE THE WEB TO PRESENT COURSES ON WEB PAGES?

Since web pages share many similarities with text, a decision to use the web is likely to be based on what the web can do *better* than text. The areas in which the web is clearly superior to printed text are:

*   **updating** – A page can be updated on screen and, once uploaded (an action that takes seconds), it becomes immediately available world-wide. This makes the web particularly suitable for courses with fast-changing subject matter.

*   **promoting exploration** – Because learners can visit other sites, either using links provided by you or finding their own links with the aid of a search engine, learners can easily explore a wide range of sources of information. This makes the web very suitable for courses with open, broadly defined learning outcomes.

*   **communicating** – Learners can communicate with each other and with tutors either by email or through online conferencing systems. They can also exchange files. This makes the web a good choice when the interchange of ideas between students is an important part of the learning.

- **presenting attractively** – It is easy to make web pages look attractive, through the use of colour, varied fonts, images and so on. It is much more difficult (and costly) to achieve the same effect in print. This makes the web suitable for learners who find it difficult to concentrate on solid text and prefer a more visual and varied form of presentation.

If, therefore, you are contemplating using the web to deliver all or part of your course, you should give careful thought as to how you can best exploit these four key advantages of the web.

5.1.4 WHEN AND HOW SHOULD I PUT EXISTING MATERIAL ONLINE?

You may already have some ODL course material (e.g., Word files) and be wondering how you could put it onto the web. In this situation you have four options:

- make it available as downloadable files,

- convert it to pdf format and make it available as a downloadable file,

- copy it into web pages, or

- restructure it and create web pages for that restructured text.

Make available as downloadable files

The web can be used to send files to learners, either by providing a download link in a web page or by sending files as attachments to emails. This is a very inexpensive method of distributing course material and is always worth considering when you already have good quality, ready-made materials. You need to consider, though, whether your learners would be happy with material in this form and whether they have the facilities (and can afford to print it out).

Convert to pdf downloadable files

Another approach is to take those same files and convert them to pdf format before making them available for download. There are two advantages to this approach. First, learners cannot edit or alter pdf files. So, for example, they cannot copy chunks of the file and re-present them as their own work. Second, a pdf file will always print out to look just like the original file, because it is not dependent on the fonts in the user's computer. Again, you have to consider whether this approach is acceptable to your learners.

Copy into web pages

A third approach is to split your text up into chunks and copy these chunks into web pages, so creating a more-or-less instant web site. For instance, in Example 67 you can see an 'instant web page' made by simply copying and pasting from the manuscript of this handbook into a web-page-making program and then saving the web page.

Clearly this approach is very tempting in terms of speed, skill and effort, but it suffers from three drawbacks:

- First, it does not look much like a web page: it looks dull, too uniform and generally unappealing.

- Second, the long lines are difficult to read.

- Third, it has the structure of a handbook, not of a web site (the importance of this point is discussed in more detail below).

Despite the disadvantages of this approach, it is quite popular with teachers who want to make their lectures more accessible to their students, so the method does have some merit. In some circumstances, where resources are very limited, it may be the only practicable way of sending learning material to remote students.

EXAMPLE 67. An instant web page made from a Word file
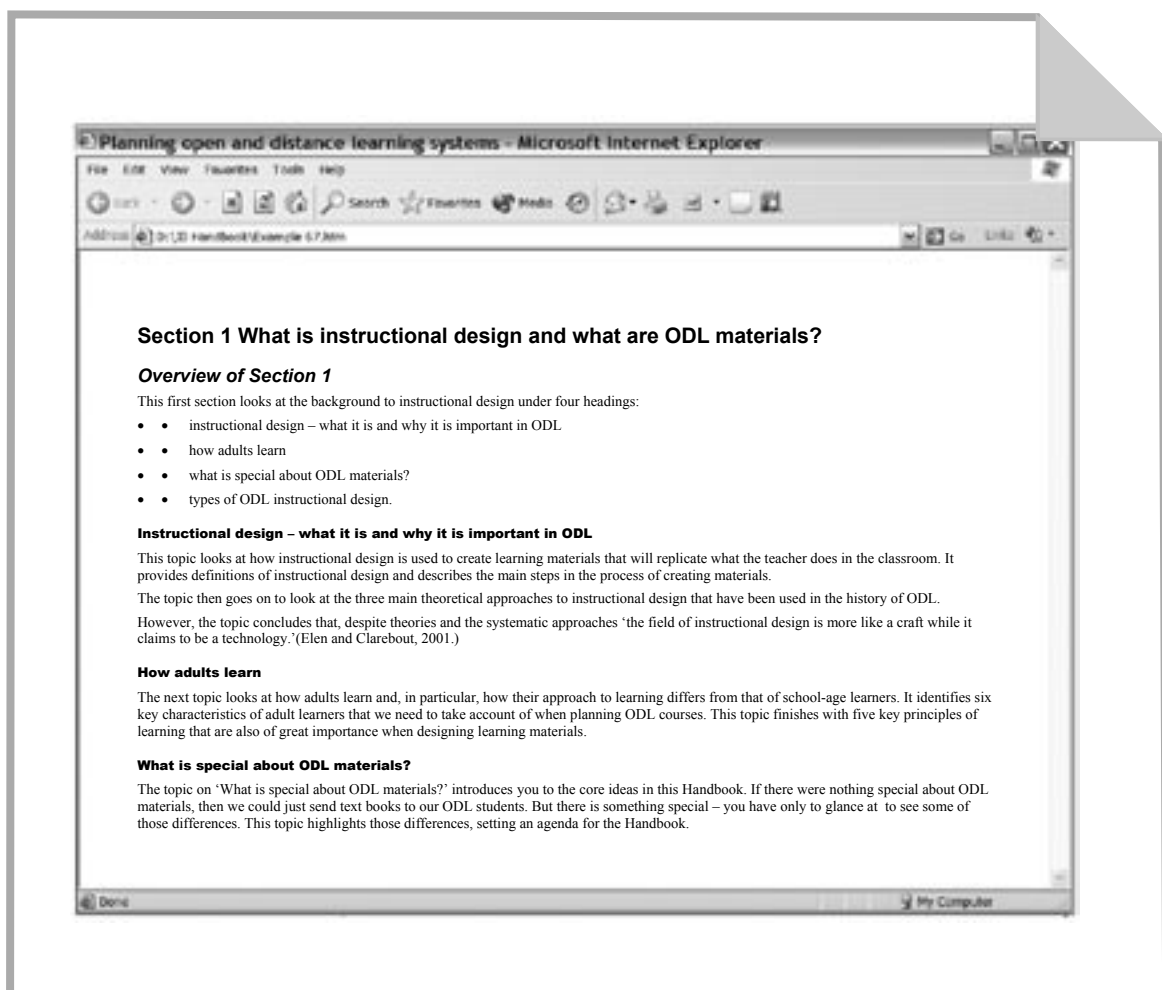
Create web pages

Your final option is to restructure your existing course material into chunks suitable for web pages and then make the pages one by one. 'Restructuring' means breaking the material down into smaller chunks, putting feedback on separate pages and so on. This is quite time-consuming, but if your existing material needs no change to its content, it should be possible to put it into a new structure in web pages at the rate of about 20–30 pages per day.

Web site/page creation tools

The most common way for creating a web site or web pages is with the aid of a web site creation program such as Microsoft FrontPage and Macromedia Dreamweaver.

5.2 HOW TO PLAN AND STRUCTURE A COURSE WEB SITE

5.2.1 INTRODUCTION

When you write an ODL text, you don't have to think much about its structure, since texts almost always start at page 1 and continue until they reach the last page of the last unit. Web sites are rather different – they have no obvious structure. This leaves you free to decide the structure that you think is best for your students. This part outlines some of the standard structures an instructional designer might wish to use. It may be that when you plan your course web site, you will work with a web-designer. If that is the case, you will still need to understand the information presented here, since it is very unlikely that a web-designer will have an in-depth understanding of instructional design.

> **Issues for instructional designers**
>
> 1.   How should I structure a web course?
>
> 2.   How do I make my site easy to use?
>
> 3.   How should I organise the contents of a unit for web presentation?

5.2.2 HOW SHOULD I STRUCTURE A WEB COURSE?

To answer this question, you need to think about the main way or ways in which you want your learners to use the site. For example:

•   Do you want them to work through page by page?

•   Do you want them to work through unit by unit?

- Do you want them to freely explore?

- Do you want them to be able to access the web whilst being in your course site?

There are various site structures that can be used to create different degrees of direction or openness in a course.

Linear structures

If you want to encourage page-by-page use, then you will probably structure your site as in Figure 14. This structure is common in low-level courses teaching at the knowledge and comprehension level. At such levels, the correct order of presentation is important if learners are to learn new concepts, so the site structure is quite restrictive. Many existing low-level ODL texts have essentially this format and so lend themselves to treatment in this way. A word of warning, though: learners cannot jump out of a page-by-page sequence (e.g., to go and check a point on another page), so sequences need to be kept short.

FIGURE 14. A linear site structure
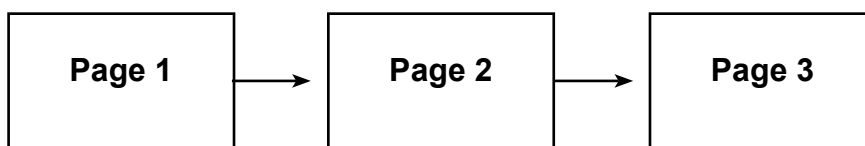
Grid structures

Many course web sites are structured by course unit, using one or two basic approaches.

In the first approach, learners have direct access to any unit and to any topic within a unit (see Figure 15). This mimics a paper-based course, where learners can flick through to look at any page at any time.

FIGURE 15. A grid site with free access to units and to topics
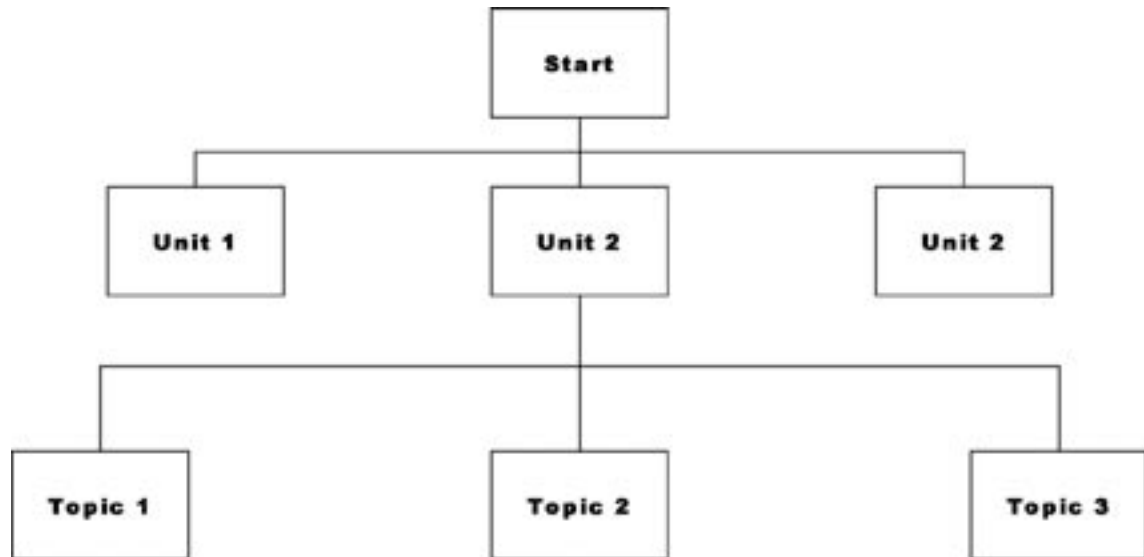
The second basic approach (see Figure 16) allows learners direct access to each unit, but within the unit the topics are presented sequentially. In other words, Topic 2 of Unit 2 can only be reached by studying Topic 1 of Unit 2.

FIGURE 16. A grid site with free access to units, but linear access to topics
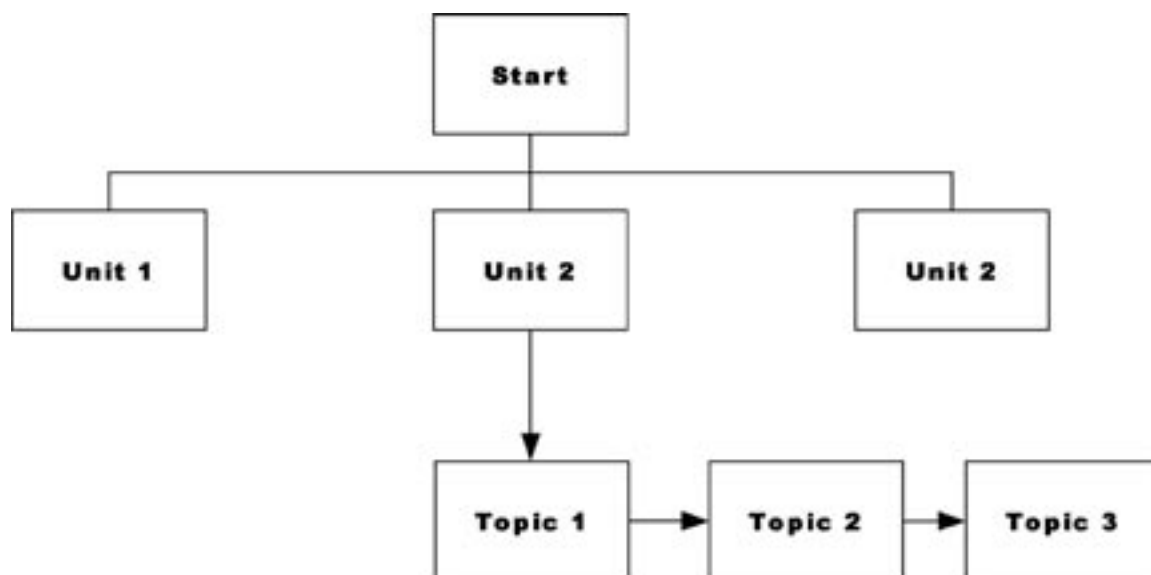
Free structures

Most sites on the internet are of the free exploration type – you can click on various links, moving from page to page in any order that you like. This is essentially what is meant by 'surfing'. Few educational sites are like this since most successful (formal) learning depends on progressing through a carefully planned set of learning activities in which the content and difficulty are precisely matched to the learners' prior knowledge and current capacity for learning.

A particular concern about free exploration sites is that learners can, with a few clicks, find themselves engrossed in a topic that is completely unrelated to the topic they are supposed to be studying. Thus, the lower the learners' capacity for focused, self-directed study, the more risky the free exploration site becomes.

A good discussion of how to organise pages to reflect the structure of your subject matter can be found in Lynch and Horton (1999).

5.2.3 MATCHING STRUCTURES TO INTENDED USE

Lynch and Horton (1999) have suggested that two basic variables govern web site use (and therefore site structure):

• whether the narrative is linear or not, and

• the length of the users' interaction with the site.

As Table 22 shows, training web sites (linear narrative and short use) tend to use a linear structure, whereas teaching sites (linear narrative with sustained use) tend to use a grid structure.

TABLE 22. Four site types based on parameters of narrative and use

	Linear narrative	**Non-linear narrative**
Brief period of use	Training – use a linear structure	Reference – use a free structure
Extended period of use	Teaching – use a grid structure	Self-education – use a free structure

5.2.4 NAVIGATION

Although the freedom and flexibility of the web offer advantages over other media, they can also create problems. When learning on the web, learners can lose track of where they are (Lynch and Horton, 1999). For this reason, the ease with which a site can be navigated is very important.

There are two overriding requirements in the navigation of a site:

*   **consistency** – A given action (e.g., Next page or Home) should always be completed in the same way on every page.

*   **naturalness** – The site should have a 'hierarchy of menus and pages that feels natural to users' (Lynch and Horton, 1999).

At any point in a site, learners should always be able to answer:

*   Where am I now?

*   What should I do now?

*   What should I do next?

*   How can I get back to what I last saw?

*   How can I get back to the course menu/module menu/home page?

There are lots of ways in which this can be done. One way is outlined below for a typical course made up of units and topics (Figure 17). The features of this display are as follows:

*   The top line displays the key navigation buttons (Home and Exit); other buttons such as Help, Glossary and Search might also appear at this level.

*   The next line down contains the buttons for the course units, so students can directly select the unit they wish to work on.

*   At the left-hand side is a display of the topics in the current unit, so students can choose the topic that they wish to work on.

*   The bulk of the screen is the teaching area, where the pages for each topic are displayed. Where a topic has more than one page, these are numbered – the example shows page 3 out of five pages. Buttons for Previous (page) and Next (page) are provided so that students can cycle through the pages of the current topic.

FIGURE 17. The navigation features of a typical course site
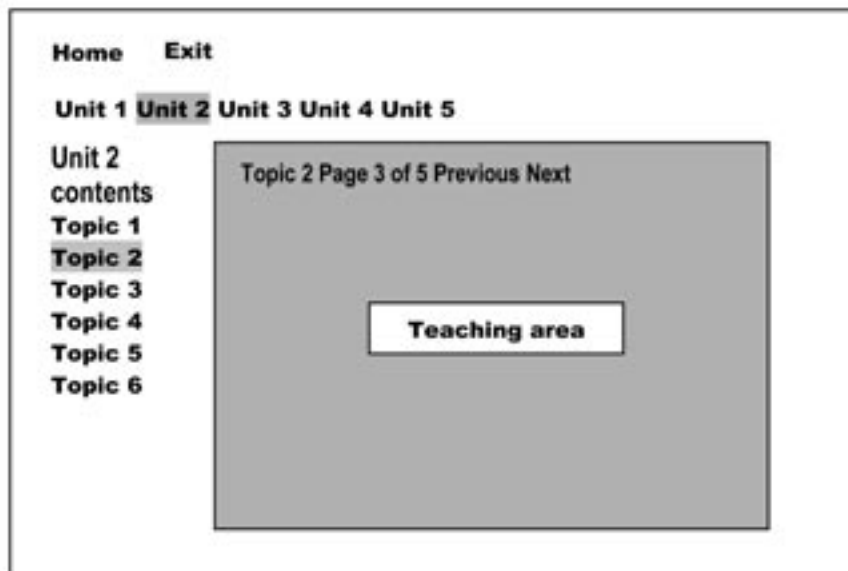
5.3 HOW TO PLAN AND STRUCTURE PRINT AND WEB PAGES FOR LEARNING

5.3.1 INTRODUCTION

Many web pages, when printed out, are the equivalent of 10–25 pages of A4 printed pages. Other sites have so little text on any one page that you spend more time changing pages than reading them. Clearly, neither of these two situations is much good for teaching and learning. This part looks at how you can arrive at a sensible structure for your web pages. As you will learn here, you may need to make some compromises, but this can be done on a rationale basis.

**Issues for instructional designers**

1.   Which page and screen layouts are commonly used in ODL materials, and why?

2.   How should I split up my contents into web pages?

3.   How should I lay out web pages?

4.   How do I make pages easy to read?

5.   How do I make my pages easy to use?

5.3.2 GRIDS ON PAPER AND ON SCREEN

Grid layouts help learners find their way around learning materials, whether in print or on the web. The basic principles of grid layouts for text are set out in Hartley (1994, Chpt 1) and in Lynch and Horton (1999). Three typical print layouts used in ODL are presented here and then it is shown how similar layouts can be produced on the web.

One of the most common ODL text layouts is the 2/3 column on an A4 printed page (see left-hand side of Figure 18). The text is confined to 2/3 of the full page for two reasons: (a) to avoid a line that is so long that it is hard to read and (b) to create an empty column in which learners can write their own notes. Such a layout can be translated to the web as shown in the right-hand side of Figure 18, but since learners cannot make notes on a web screen, the empty left-hand column is omitted.

FIGURE 18. Basic page layout (a)
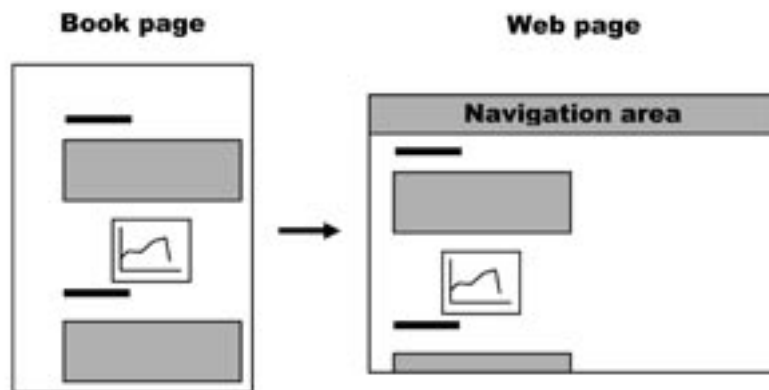
The layout on the right-hand side of Figure 18 is achieved using the grid in Figure 19. The top menu is created by using a two-part frame, the upper part holding the permanent menu and the lower part holding the current page. In the lower part, a hidden table prevents the text from exceeding the chosen line length.

FIGURE 19. Web page grid to achieve the layout in Figure 18
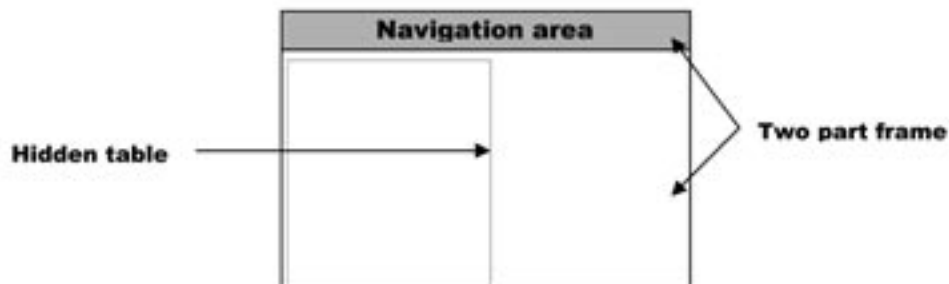
A more complex layout that is also frequently used in ODL texts is the one shown on the left-hand side of Figure 20. The page has the same 2/3 page width main column as in Figure 18, but now uses the left-hand column for headings and for key bits of text (e.g., for glossary definitions or for key formulae). This design can be translated to the web as in the right-hand side of Figure 20. (A web layout such as this one is achieved by the use of a two-part frame and a hidden, two-column table.)

FIGURE 20. Basic page layout (b)
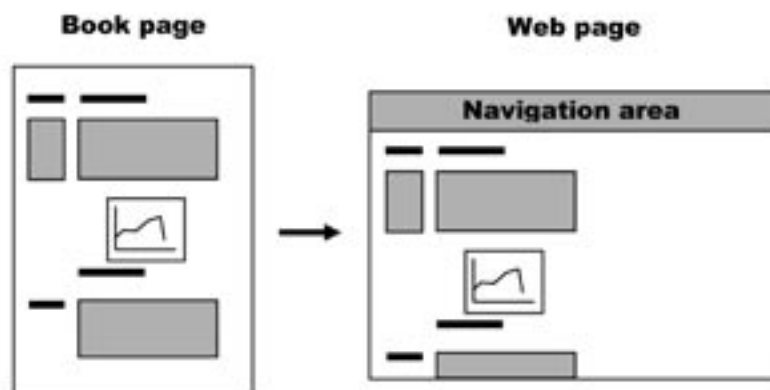
A third, more complex (and not much used) text layout is the one on the left-hand side of Figure 21. The main teaching (including activities, etc.) takes place in the middle column, the left-hand column is used for headings and the right-hand column is used for diagrams. This layout can be reproduced on the web by using a hidden, three-column table as in the right-hand side of Figure 21.

FIGURE 21. Basic page layout (c)
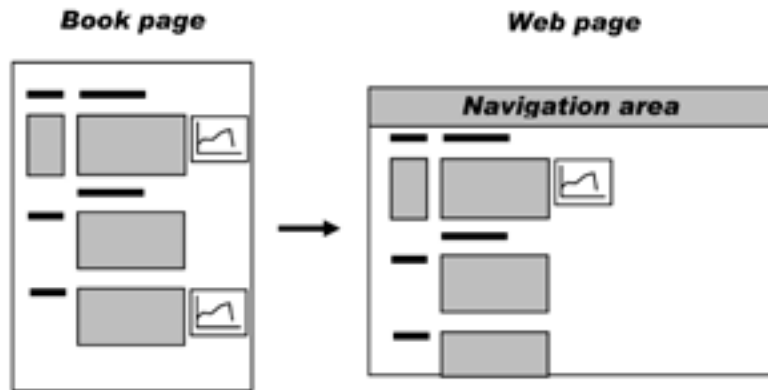
5.3.3 LINE LENGTH ON PAPER AND ON SCREEN

Long lines are said by some researchers to be difficult to read and researchers generally recommend around 10–13 words per line (Lynch and Horton, 1999). One recent study questioned the need for short line lengths (Bernard et al., 2002). However, given the obvious difficulty that most people demonstrate when having to read long lines, the effect those researchers noticed might have been from the artificial, laboratory nature of their studies.

5.3.4 WHITE SPACE ON PAPER AND ON SCREEN

ODL materials designers have often emphasised the importance of 'white space' – that is, of not having a crowded page layout. A recent study concluded that 'white space was … the defining variable in optimising reader comprehension' (McMullin et al., 2002).
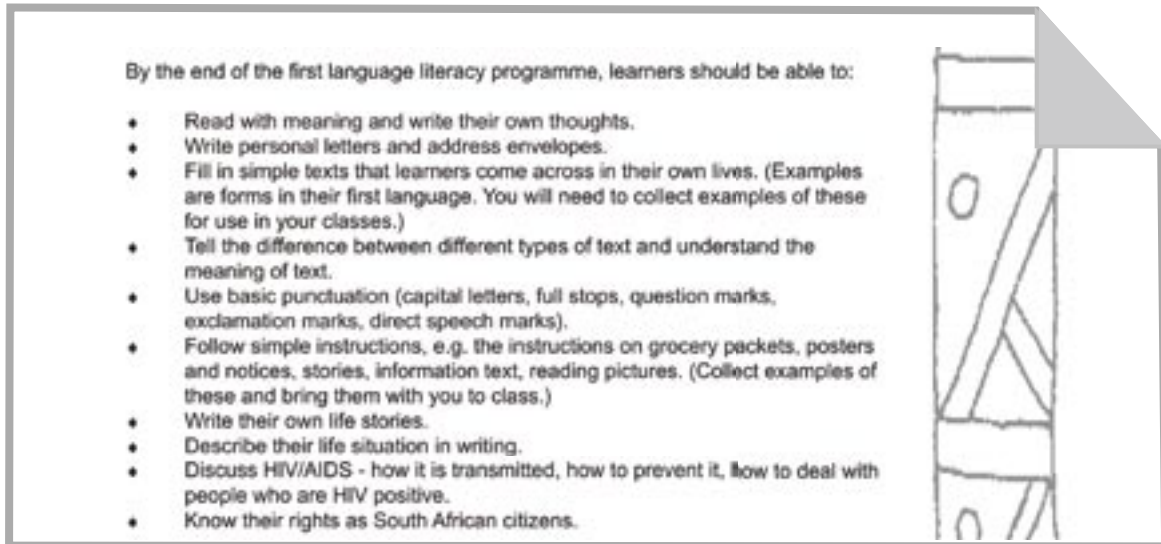
It would seem reasonable, both on the basis of limited research and on the consensus of so many course designers, to keep to the following maxims:

• Use a short line length, leaving white space to the left and right of your main text column.

• Use white space between paragraphs.

• Put white space around all important ideas.

• Use bullets and other devices to make key points stand out.

These guidelines will help to (a) avoid an over-high density of information on the page or screen and (b) ensure that key points stand out on the page or screen.

An example of the effective use of bullets can be seen in Example 68.

EXAMPLE 68. The use of bullets to provide easy access to a list of items

By the end of the first language literacy programme, learners should be able to:

- Read with meaning and write their own thoughts.
- Write personal letters and address envelopes.
- Fill in simple texts that learners come across in their own lives. (Examples are forms in their first language. You will need to collect examples of these for use in your classes.)
- Tell the difference between different types of text and understand the meaning of text.
- Use basic punctuation (capital letters, full stops, question marks, exclamation marks, direct speech marks).
- Follow simple instructions, e.g. the instructions on grocery packets, posters and notices, stories, information text, reading pictures. (Collect examples of these and bring them with you to class.)
- Write their own life stories.
- Describe their life situation in writing.
- Discuss HIV/AIDS - how it is transmitted, how to prevent it, how to deal with people who are HIV positive.
- Know their rights as South African citizens.

Source: *SANLI Programme* (Institute for Adult Basic Education and Training)

You can see the effect of this approach in Example 69, where the first version is a dense paragraph of text and the second version uses a layout that has more white space and is hence much easier to follow.

5.3.5 HOW SHOULD I SPLIT UP MY CONTENTS INTO WEB PAGES?

The following three maxims about web pages provide good design rules-of-thumb:

- A web page should contain a single coherent piece of learning.

- Web pages should not be so long that they are awkward to use.

- Web pages should not be so short that users have to endlessly change pages.

These three maxims are enough to guide you as to what to put onto each web page, but at times compromises need to be made. The consequences of rigorously applying each maxim are described below.

A web page should contain a single coherent thing

We naturally expect that a web page will be coherent and complete, whatever type of site we are visiting. For a course site, that implies that each page should cover just one coherent piece of learning. However, what happens if you are dealing with a complex topic and the smallest coherent chunk of learning is 2,000 words and several diagrams long? A single page of this length would contradict the maxim that 'pages should not be so long that they are awkward to use'.

EXAMPLE 69. Dense and open versions of the same text

Version 1

Reflective action guides take an essentially constructivist approach to materials design. Such materials usually aim to support learners in learning from their own experiences (e.g., at work). Typically such materials will have broadly defined aims, but no precise learning outcomes. They may also set projects or, possibly, set tasks that require the learners to engage with others (who may be other learners or people at work, for example). Such approaches encourage the learners to record and reflect on their own experience (e.g., by keeping a learning journal). You will also find that case studies are much used in reflective action guides and that activities are very open-ended, often being based on the learners' own experiences. This is a format that works well in both print and on the web.

Version 2

Reflective action guides take an essentially constructivist approach to materials design. Such materials usually aim to support learners in learning from their own experiences (e.g., at work). Typically such materials will:

•   have broadly defined aims, but no precise learning outcomes,

•   set projects,

•   set tasks that require the learners to engage with others (e.g., other learners or people at work),

•   encourage the learners to record and reflect on their own experience (e.g., by keeping a learning journal),

•   use case studies, and

•   set activities that are very open-ended, often being based on the learners' own experiences.

This is a format that works well in both print and on the web.

Web pages should not be so long that they are awkward to use

If you follow this maxim rigorously, when any page reaches a certain length (say three screen depths) you would split it in order to make it more manageable. However, this might then result in two pages, neither of which contained a coherent topic.

Web pages should not be so short that users have to endlessly change pages

If you decide to base your pages around coherent topics, and the topics are very small, you will produce a site with a vast number of pages. This will not only be difficult for you to manage as a site, but will result in learners spending more time downloading pages than studying them.

A partial solution

A partial solution to the allocation of content to pages can be achieved as follows:

*   Break your course down into topics.

*   Allocate each topic to a page (e.g., 'Topic XX').

*   If a page is too long, split it into parts (e.g., 'Topic XX Part 1', 'Topic XX Part 2').

This helps to keep pages to a comfortable length for learners while at the same time helping them to see how you have divided the topic up. (It also helps you when managing the site files, since you have file names such as xx1, xx2, etc.)

5.3.6 HOW SHOULD I LAY OUT WEB PAGES?

The following general guidelines will help you design easy-to-read web pages.

Consistent page layout

Perhaps the most important aspect of page design is to be consistent. Whilst there will be variations between pages, overall each page should be based on a basic design that is fixed for that particular course site (Lynch and Horton, 1999).

In particular, items such as the following should be in the same position on every page (other than an opening screen):

*   home button

*   course menu (e.g., Unit 1, Unit 2, …)

*   topic menu (e.g., Topic 1, Topic 2, …)

- site map button

- major buttons specific to that site (e.g., glossary, help)

- the main text for the current page.

Provide a page contents list

It helps if every page has a contents list at the top of the page. These items will be active links so that learners can click on an item to go straight to it. This is especially important when parts of the page are not visible because the page is too long to display all at once.

You may also wish to provide an overview or list of key points at the top of the page. This is what Nielsen (1996) calls 'headline to depth layout' – that is, a layout in which the further down the page you go, the more detail you get. Users can then stop when they have reached the level of detail that they need.

Provide 'Return to top of page' links

If the whole page will not be visible at one time, then 'Return to top of page' links should be inserted at regular intervals down the page. These enable users to quickly return to the page contents list to select another topic.

Limit line length by using tables

Long line lengths are difficult to read, yet web browsers will often spread lines across the full screen width of a user's computer. For example, if we allow the browser to display text as it wishes, we can get a result such as in Figure 22.

FIGURE 22. How a browser displays unrestricted line lengths
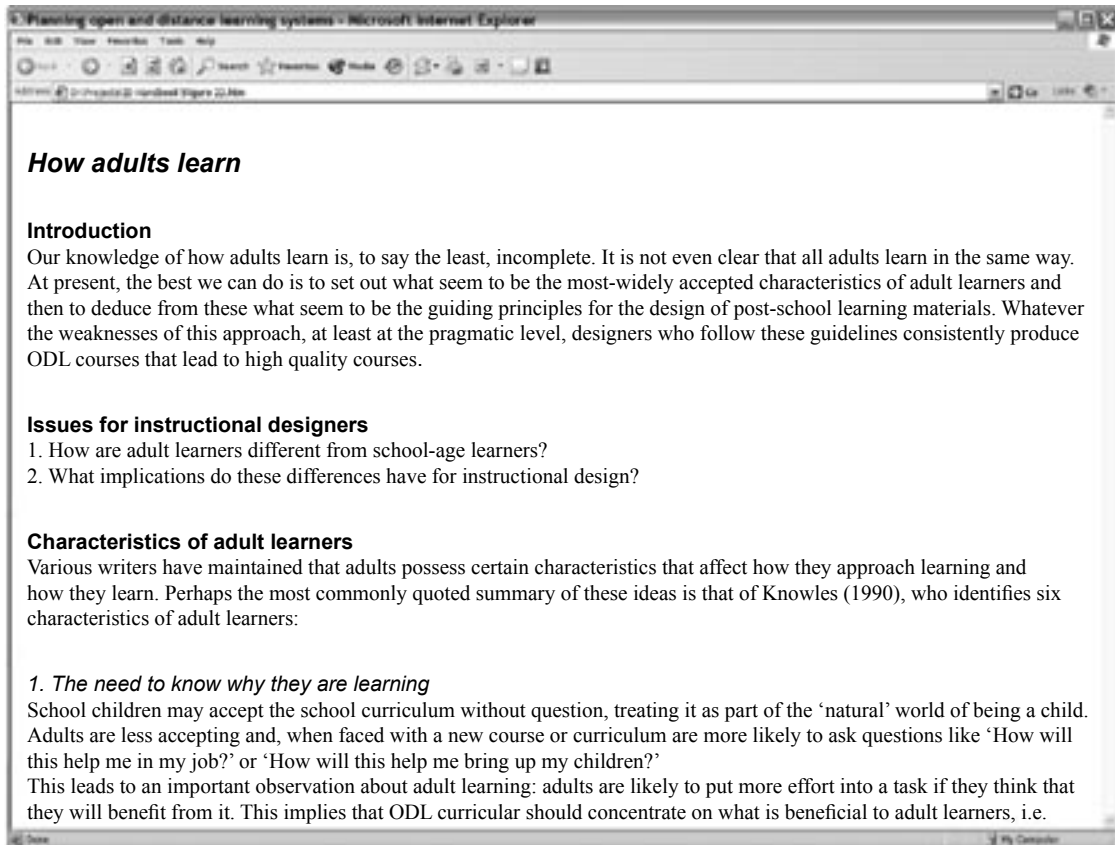
Using tables when constructing web pages can limit line length. For example, Figure 23 displays the same text as Figure 22, but this time the text is held in a table with a width of 535 pixels. This makes the text much easier to read. Short lines of 10–12 words are best (Lynch and Horton, 1999).

FIGURE 23. How a table can be used to constrain line length
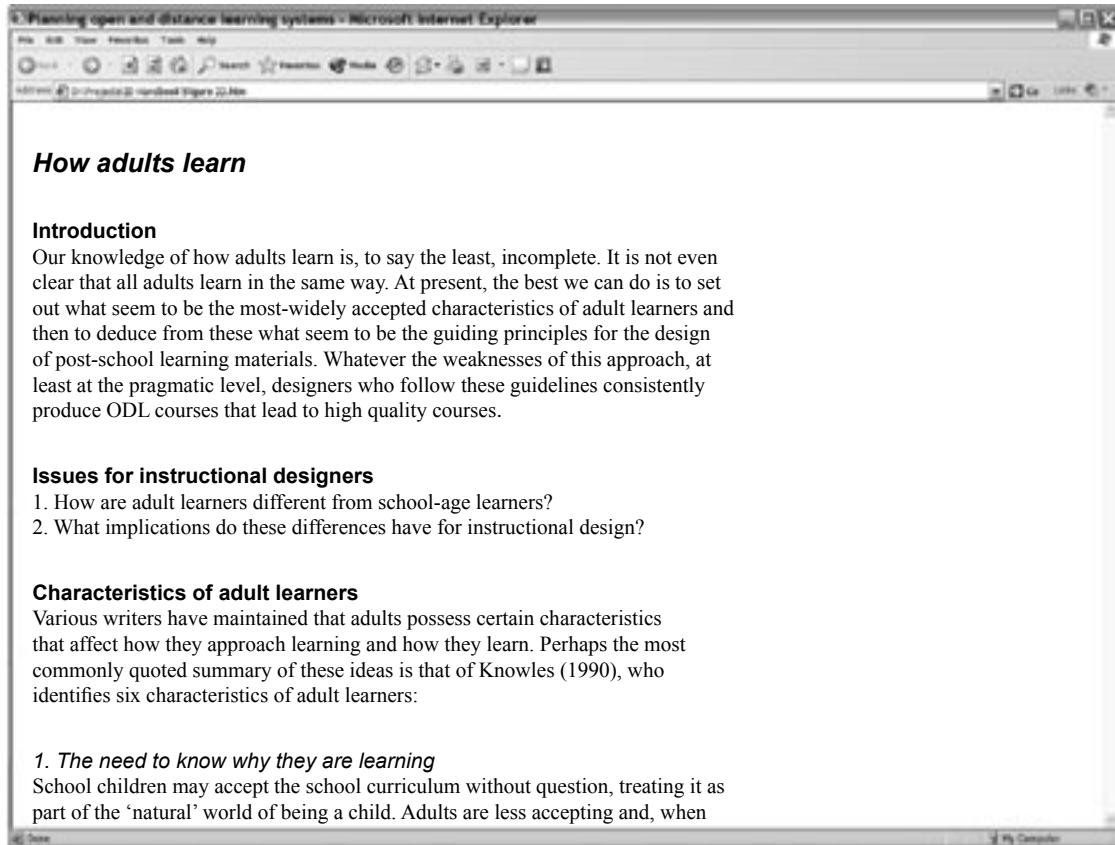
Use suitable fonts

Your computer may allow you to use a wide range of fonts when making web pages. However, what the learner sees is determined by the fonts available on his or her computer, so you need to limit yourself to widely available fonts. Fonts that work particularly well on web pages include Times New Roman, Georgia and Verdana (Lynch and Horton, 1999).

Limit the page area

You have probably had the annoying experience of printing a web page, only to find that the last few words of each line are missing on the print-out. To make sure that this does not happen when learners print your web site, limit the width of each web page. To ensure printing in all possible circumstances, the table width should be 535 pixels (Lynch and Horton, 1999).

5.3.7 WEB PAGE AND SITE LAYOUTS

Summaries of the research data on 50 or so aspects of web page and web site design can be found at http://usability.gov/guidelines/.

5.4 HOW TO PROMOTE ACTIVITY ON THE WEB

5.4.1 INTRODUCTION

Many web courses claim to be interactive, but if you visit them you will find that the limit of the activity required of learners is to click 'Next'.

You have already seen the importance of activity in ODL materials (see section 1.2, 'How Adults Learn' and section 4.2, 'Writing Activities'). You have also seen that ODL text and diagrams contain a rich and deep variety of activities. How can we make web-based learning just as active and just as deep? This part explores that question.

Issues for instructional designers

1. How can I provide activity in web pages?

2. How can I provide feedback in web pages?

5.4.2 THREE WAYS TO ADD ACTIVITY
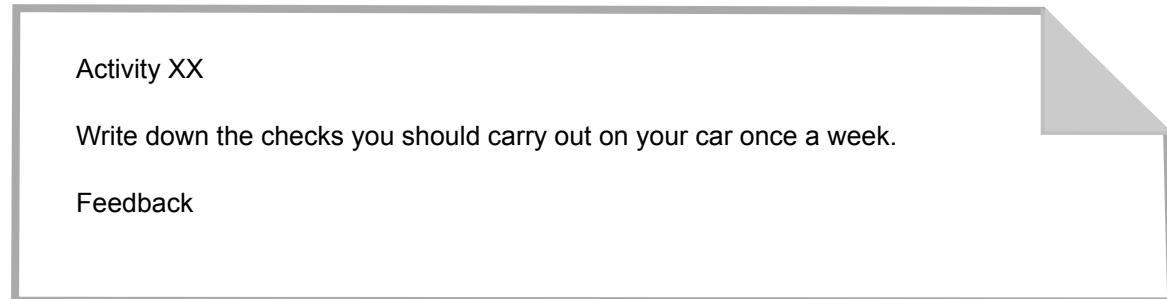
There are three basic ways to put learner activity into web pages:

•   by creating web pages with a web site creation program,

•   by creating tests with a web test creation program, and

•   by using a course authoring tool.

5.4.3 CREATING INTERACTIVE PAGES WITH A WEB SITE CREATION PROGRAM

Programs such as Microsoft FrontPage and Macromedia Dreamweaver for creating web pages generally do not include any tools for creating interactivity (Macromedia has only a very limited Course Builder tool), so the level of interactivity that you can create is limited.
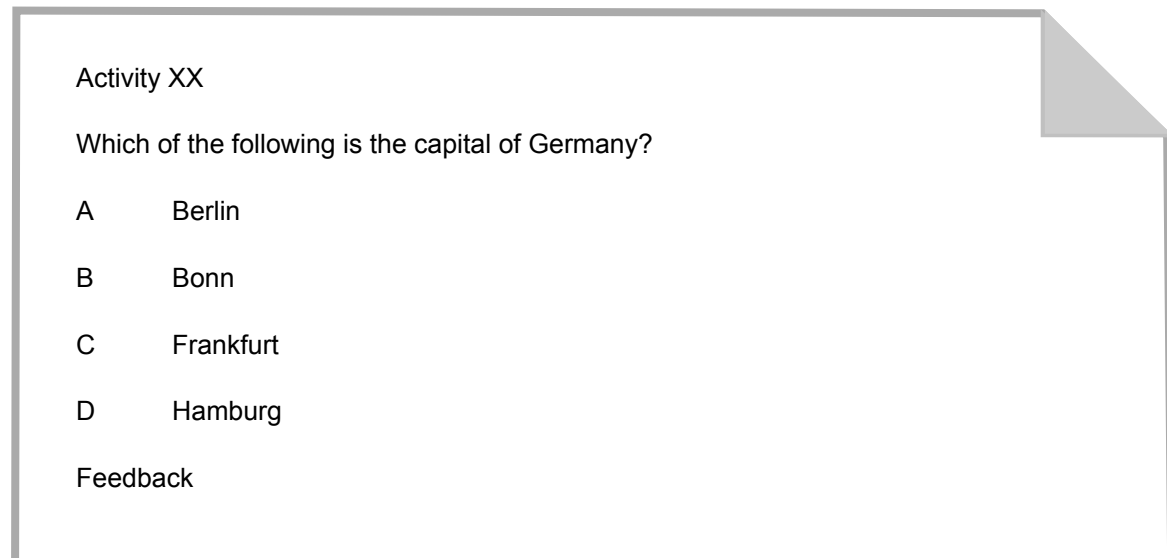
You can, though, set on-screen tasks for learners to do off-screen, as in Example 70 and Example 71. The first activity is an open one: learners can write down any answer that they wish. The second activity is a closed one: learners have to choose from a given list of answers.

EXAMPLE 70. Example of an open activity on a web page

Activity XX

Write down the checks you should carry out on your car once a week.

Feedback

EXAMPLE 71. Example of a multiple-choice activity on a web page

Activity XX

Which of the following is the capital of Germany?

A   Berlin

B   Bonn

C   Frankfurt

D   Hamburg

Feedback

You then have to decide where you are going to put the feedback. You have four basic options:

*   straight after the activity (but you might think this is too visible),

*   at the end of the page,

*   on the next page, and

*   in a new window that opens when the Feedback button is clicked (see Example 72).

EXAMPLE 72. Use of a temporary window to display feedback

Temporary window to display the feedback.

Main window displaying the activity.
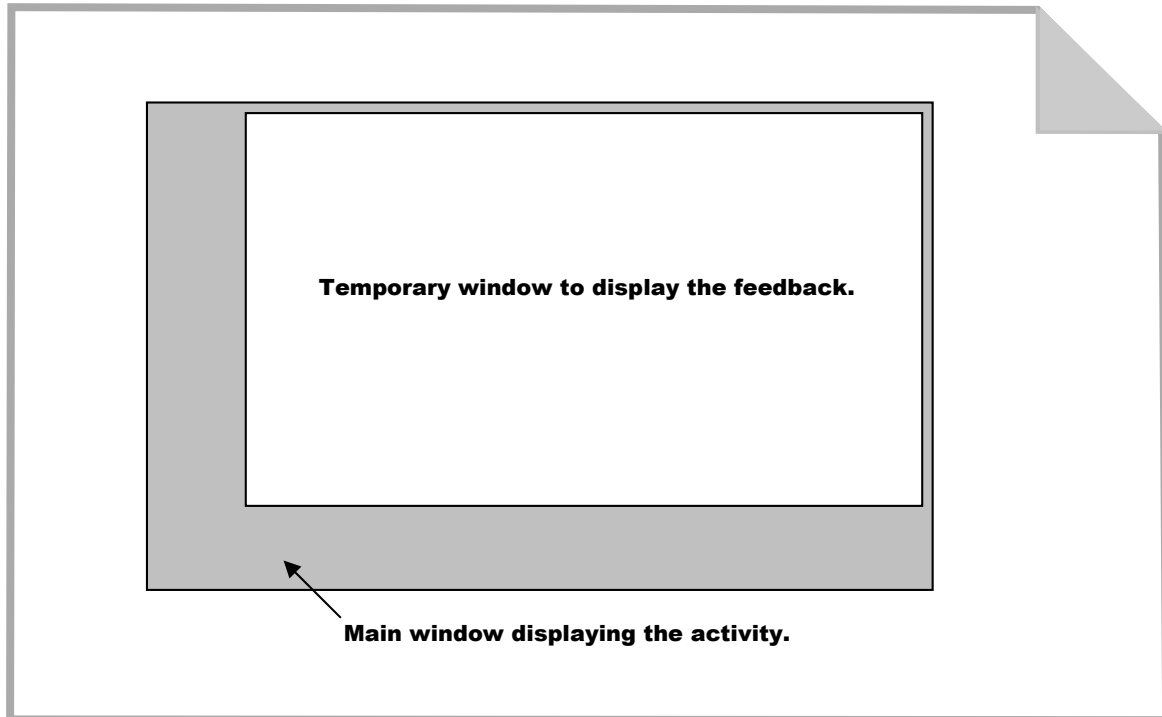
5.4.4 CREATING TESTS WITH A WEB-TEST CREATION PROGRAM

Your second option is to use a web-test creation program. There are a good number of these available, some free, some for purchase. All of them allow you to construct a web-based test without any knowledge of HTML or JavaScript. Some create free-standing tests and some create tests that you can embed within your own web site. Others create tests that run on the program provider's server. Whilst this has some disadvantages (e.g., you cannot integrate the test into your own site), such programs automatically record the results of your students' tests and provide you with management data on their performance. See Table 23.

Most offer the most commonly used objective question formats:

- true-false

- multiple-choice

- matching.

TABLE 23. Some examples of web-test/quiz-making programs

Hot Potatoes	http://web.uvic.ca/hrd/hotpot/
Questionmarker	http://www.questionmarker.com/home.htm
Questionmark Perception	http://www.questionmark.com/uk/perception/index.htm
Quiz Centre	http://school.discovery.com/quizcenter/quizcenter.html
Quizit	http://www.aboveandbeyond.ltd.uk/products/quizit.htm
QuizStar	http://quizstar.4teachers.org/indexi.jsp
Test Builder	http://www.e-learningconsulting.com/products/testbuilder.html
WebQuiz XP	http://eng.smartlite.it/en2/products/webquiz/index.asp

(Note: If you wish to search for programs of this type on the web, include both 'test' and 'quiz' in your search string.)

5.4.5 WEB-SPECIFIC ACTIVITIES

The web has provided opportunities for people to create new types of activity that make particular use of features of the web. Two examples follow.

Subject samplers

This is an activity type that aims to motivate and engage learners. It is constructed as follows:

• You set a topic for your students to explore.

• You give them a list of a few web sites to visit.

• You ask them to produce a personal response to what they have seen and read.

 (For more information, see www.kn.pacbell.com/wired/fil/formats.html#Sampler.)

WebQuests

WebQuests ask learners to solve a problem or to respond to a challenge. They are constructed as follows:

• You give your students a problem or scenario.

• You suggest possible web resources they might consult (but they are free to use other sites).

- The students produce a report on what they have found or concluded.

- In some versions of WebQuests, students work in a group but the overall task is allocated to students working individually or in pairs for the research stage.

Various templates for creating WebQuests have been published. Details of these can be found at www.kn.pacbell.com/wired/fil/formats.html#Sampler.

Both subject samplers and WebQuests are facilitated by a service called Filamentality. This enables teachers and learners to create and store their own web pages using built-in activity formats such as hot lists, samplers and WebQuests. In the case of learners, their pages are a record of learning activities that they have carried out on the web.

5.4.6 COURSE AUTHORING TOOLS

Course authoring tools, such as Macromedia Authorware can be used to create sophisticated sites with varying levels of activity. A list of such tools can be found at www.kn.pacbell.com/wired/fil/formats.html#Sampler.

5.4.7 VIRTUAL LEARNING ENVIRONMENT

A virtual learning environment (VLE) is a system that makes it easy for teachers to create web sites for their students. The VLE software is usually installed on the college or university computer so that teachers can access it to create courses and students can access it to study those courses. The Joint Information Systems Committee (JISC) definition of a VLE refers to those 'components in which learners and tutors participate in "on-line" interactions of various kinds, including on-line learning'. This is necessarily vague since different manufacturers produce different types of VLE. The term LMS (learning management system) is also used for a VLE.

You will also come across the term MLE (managed learning environment). Often this is used synonymously with VLE, but it is more properly used to refer to 'the whole range of information systems' of an institution, including any VLE systems.

Further reading

A useful overview of online assessment issues can be found in Driscoll (2001).

A wide range of detail on online activity can be found at www.e-learningcentre.co.uk/.

More information about VLEs, LMSs and MLEs can be found at http://ferl.becta.org.uk/display.cfm?page=248.

SECTION 6: PLANNING ASSESSMENT

OVERVIEW OF SECTION 6

This section is about applying well-tried assessment principles and methods to the practicalities of ODL.

General principles

The section starts with a short overview of some of the key ideas in assessment, including formative assessment (very important in ODL), summative assessment, validity and reliability. It includes a look at ways to select valid assessment methods for each level of Bloom's taxonomy.

Planning and writing self-assessment

Putting end-tests into units of study material has already been discussed. These are self-assessment items, important in ODL because of the limited time for student-tutor contact. In this part you will look at what makes a good self-assessment test, what to test and how to design the questions. You will see that, as far as possible, questions should be of a diagnostic nature.

Planning and writing assessments

In this topic you will look at how ODL courses can be summatively assessed, including how to select the number and types of assessments in order to produce a valid and reliable assessment.

Planning and writing tutor-marked assignments

The final topic under assessment is that of planning and writing tutor-marked assignments. These assignments are often the main (sometimes the only) source of tutor-student contact, so their design is very important. This part looks at the many purposes (sometimes conflicting) that tutor-marked assignments serve, what sort of tasks and questions work best in tutor-marked assignments and how to produce marking criteria for assignments.

6.1 GENERAL PRINCIPLES

6.1.1 INTRODUCTION

Arguably, there is nothing special about the assessment of distance learning; the same principles apply as in face-to-face teaching. What is different is that you may have to assess your students under certain practical constraints (e.g., you may have to assess them without being able to observe them). This viewpoint is supported by Morgan and O'Reilly (1999) who discuss a wide range of assessment methods that are equally useful for ODL and face-to-face assessment.

You may wonder how important assessment is in instructional design. The answer is 'Very important!' This is for two reasons:

*   First, many of the decisions you need to make (what to teach, to what depth, etc.) are best answered by referring to the assessment plan for the course. The course should reflect the assessment and vice versa.

*   Second, most students are assessment-focused – that is, they look at what is to be assessed and then base their study around those topics. You can use this behaviour to help your students study more deeply and effectively. All you have to do is design 'deeper' and more effective assessment tasks.

> **Issues for instructional designers**
>
> 1. How can I meet learners' needs for formative assessment?
>
> 2. How can I meet learners' needs for summative assessment?
>
> 3. How can I make sure that the assessment is valid and reliable?
>
> 4. What should be the balance between continuous and final assessment?

6.1.2 THE ROLE OF FORMATIVE ASSESSMENT

According to Morgan and O'Reilly (1999), 'Formative assessment comprises all those activities designed to motivate, to enhance understanding and to provide learners with an indication of their progress.'

In the classroom, formative assessment often takes place informally as the teacher asks questions, responds to learners' questions and walks around giving advice. Although this form of learner-teacher interchange is often informal and unplanned, it is an important part of teaching.

In ODL, there is almost no opportunity for any informal interchange, since learners and tutors rarely meet. This means that formative assessment must be consciously designed into the learning materials. This can be done using devices such as:

• in-text questions

• activities

• self-assessment tests

• quizzes.

These devices are of great importance in ODL. Without them, learners have little idea as to how much progress they are achieving and may be unaware of any mistakes they are making.

Formative assessment methods in ODL include:

• activities and their feedback,

• self-assessment tests (print and online),

• non-assessable tutor-marked assignments and their feedback, and

• comments from peers in group work, both face-to-face and online.

6.1.3 THE ROLE OF SUMMATIVE ASSESSMENT

ODL institutions need to provide summative assessment on each course in order to:

• inform learners of the standard that they have achieved,

• find out whether the course is effectively reaching its aims,

• certify to third parties (e.g., employers) the level of knowledge that each student has reached, and

• make decisions about students' eligibility for further courses.

Summative assessment is carried out against the stated aims and objectives of the course. That is, summative assessment answers the question 'To what extent have the learners met the stated aims and objectives of the course?' (See section 3.3, 'Setting Aims and Objectives for Your Course'.)

Summative assessment methods in ODL include:

- tutor-marked assignments,

- computer-marked assignments,

- course work, and

- exams.

6.1.4 VALIDITY AND RELIABILITY

All assessment (whether in ODL or face-to-face teaching) is based on two fundamental principles: the need for validity and the need for reliability.

Validity

Validity refers to the extent to which a given assessment method assesses what it is meant to assess. So, for example, if a course contains the learning aim 'to be able to conduct a simple conversation in Russian', a written exam in Russian would not be a valid assessment since that would test *writing* skills, not *speaking* skills. Generally, validity is a problem in all education since the classroom environment limits both what can be taught and what can be assessed. For example, business courses concentrate on discussing and writing about business – not on running businesses; and teacher training courses concentrate on theorising and writing about education, not on teaching. As a result, most assessment tends to lack validity. Unfortunately, the constraints under which ODL often operates also create problems of validity in ODL assessment. In ODL, we tend to assess what is practical to assess rather than what should be assessed.

That said, it is important to strive for validity as far as is possible. One way to do this is to ensure that the assessment method matches the active verb in the learning outcome. For example, three possible learning outcomes on a first-aid course might be:

- **describe** the ABC (airway, breathing, circulation) procedure for resuscitating a patient,

- **explain** the ABC procedure for resuscitating a patient, and

- **use** the ABC procedure for resuscitating a patient.

The active verbs in each case (in bold above) are at three different Bloom levels (knowledge, comprehension and application) and so require different assessment methods if they are to be validly assessed (Bloom [editor], 1956). For example, we could assess these three items as in Table 24. In the first column, the main verb for each of the three learning outcomes is emphasised. In the second column, the key word that describes an appropriate assessment method is emphasised.

TABLE 24. Matching the test item to the desired Bloom level

Outcome	Assessment method
Describe the ABC	Ask for a verbal or written **description** of the ABC procedure.
Explain the ABC procedure	Ask for a verbal or written **explanation** of the ABC procedure.
Use the ABC procedure	Ask the student to **simulate** the ABC procedure on a dummy.

A more complete listing of assessment methods matched to the Bloom taxonomy levels is given in Table 25.

Reliability

Reliability simply refers to the idea that, if a person is assessed on more than one occasion, the outcome should be the same. For example, suppose you have a class of 30 students and you give each one a pass/fail exam at the end of term. You would hope that, if you had given them the same exam on a different day, the same students would have passed or failed.

In practice, there are always variations in assessment outcome: learners perform differently on different days, different teachers give different marks, and learners perform differently according to the type of test used.

These variations can be reduced by applying the following procedures:

- Have more than one assessment. Three assessments, for example, are much more reliable than one.

- Spread the assessments out over time.

- Use more than one assessment method – some learners do better with certain methods.

6.1.5 CONTINUOUS VERSUS FINAL ASSESSMENT

The final issue is whether to use continuous or final assessment. As you have seen above, having more than one assessment increases reliability, so that is one argument in favour of continuous assessment. Other arguments for and against continuous and final assessments are set out in Table 26.

TABLE 25. Valid assessment methods for certain 'Bloom verbs'

Level	Typical active verbs	Valid assessment methods
Knowledge	Describe	Ask for a verbal or written description
	List	Ask for a verbal or written list
	State	Ask for a verbal or written statement
Comprehension	Explain	Ask for a verbal or written explanation
	Outline	Ask for a verbal or written outline
	Predict	Ask for a verbal or written prediction
	Translate	Ask for a verbal translation if objective is 'to speak'
		Ask for a written translation if objective is 'to write'
Application	Construct	Require the learner to construct (e.g., create a spreadsheet, build a wall, bake a cake)
	Solve	Require the learner to provide a solution, being clear as to whether he or she is to show the method (e.g., when solving a maths problems) or just to show the result (e.g., a solution to a crossword puzzle)
	Use (a method)	Require the leaner to apply the method. This may be written (e.g., use the net present value method to evaluate an investment) or physical (e.g., use the ABC method to resuscitate a patient; carry out a heart by-pass operation).
Analysis	Analyse	Ask for a verbal or written analysis of a given scenario
	Compare	Ask for a verbal or written comparison of two or more scenarios/situations
	Contrast	Ask for a verbal or written contrast of two or more scenarios/situations
	Distinguish	Ask for a verbal or written distinction of two or more scenarios/situations
	Explain	Ask for a verbal or written explanation of one or more complex situations. (Simple explanations are at the comprehension level.)
Synthesis	Compose	Ask the learner to compose a piece of music
	Construct/create	Ask the learner to construct something original (e.g., a statue, an electronic circuit). (Note: At this level, 'construct' implies 'design' as well.)
	Create	Ask the learner to create an original work (e.g., a poem)
	Design	Ask the learner to design something (e.g., a stage set)
	Plan	Ask the learner to produce a plan (e.g., a plan for a new traffic system, a plan for a new garden)
Evaluation	Choose	Provide data and ask the learner to make a choice
	Decide	Provide data and ask the learner to make a decision
	Justify	Provide data and ask the learner to justify a choice, decision, etc.
	Prioritise	Provide data and ask the learner to prioritise it
	Rate	Provide data and ask the learner to rate it against certain criteria (the criteria may or may not be provided)
	Select	Provide data and ask the learner to select one or more options

TABLE 26. Comparison between continuous and final assessment

	Advantages	**Disadvantages**
Continuous assessment	• encourages course designer to plan a build-up of knowledge and skills • helps students consolidate what they have learnt • helps students reflect on their progress • may be less stressful for students than a final assessment • more reliable	• may be more costly • requires more organisation • requires more record-keeping • may lead to a fragmentation of the curriculum • may lead to over-assessing lower level (cf Bloom) objectives
Final assessment	• students can relax more while taking their course – they are not repeatedly being assessed • students have time to reflect and consolidate material before being assessed • assessment is 'whole course' rather than topic-based • simpler to organise	• stressful for some students • one assessment is a less reliable measure of learning than several assessments

6.2 PLANNING AND WRITING SELF-ASSESSMENT

6.2.1 INTRODUCTION

Self-assessment is not of much importance in face-to-face teaching, but it is in ODL.

In the classroom, learners have many opportunities to (informally) measure their progress: they answer questions set by the teacher, they do short tests and they hear discussion of problems raised by other learners. For the ODL learner, there are far fewer opportunities to assess their own progress. At the same time, learner-tutor contact is necessarily limited (because of expense)

in ODL. Overall, then, ODL learners generally have insufficient means to judge their own progress. Self-assessment tests are one means of making up for this deficiency.

Generally, self-assessment tests cover a specific section of a course – say, one unit or one chapter. Each test aims to:

•   provide learners with summative feedback on their learning of that section,

•   help learners identify any errors and misunderstandings they may have, and

•   provide learners with advice on additional (remedial) study to deal with those errors.

> **Issues for instructional designers**
>
> 1.   What methods can I use to build self-assessment into the learning materials?
>
> 2.   What should the self-assessment test?
>
> 3.   How much self-assessment should I build into the ODL courses?
>
> 4.   What types of questions make good self-assessment?
>
> 5.   How can I give feedback as a result of the self-assessment tests?

6.2.2 WHAT SHOULD BE THE FORMAT OF THE SELF-ASSESSMENT TEST?

A good self-assessment test:

•   takes the minimum amount of time necessary to give the learners a clear picture of their progress,

•   tests as much of the content of the section as possible,

•   is a reasonable length in comparison with the length of the study section,

•   uses questions that are diagnostic in character, and

•   provides feedback on correct answers and likely wrong answers.

More detail on the latter four points is provided below.

Testing section contents

Ideally, a self-assessment test should test all the new learning in a section, that is:

•   all new vocabulary

•   all new concepts

- all new rules

- all new facts

- all new theories

- all new methods

- all new problem-solving methods

- all new methods of creating things (e.g., reports, spreadsheets)

- all new skills of analysis.

However, there are two practical reasons why it is not always possible to test all of these items. First, such a test might be too long (see below). Second, some things are very difficult to test by self-assessment (e.g., synthesis) and are best assessed by tutors. So, in practice, the contents of a self-assessment test are a compromise between the ideal and the feasible.

Setting test length

If the test is over-long, learners will not complete it. A good guide to length is to say that the length of the test should not be disproportionate to the length of the section of learning that it tests. Thus, if you have a 2-hour unit of learning, 15 minutes might seem a sensible maximum test time. On the other hand, a 10-hour unit of learning might merit a test of 45 minutes.

Using diagnostic questions

If the learning material is well written, most of the students will correctly answer most of the questions in the self-assessment test. However, when they make mistakes, they need to know where they went wrong and what to do about it. This means that the questions should be of a diagnostic nature, where you (the question writer) can predict likely wrong answers.

Consider the question 'What is the value of 2^3?' This has one correct answer (8). Additionally, learners make three common errors in answering questions of this type. A question like this – one with a single correct answer and a small number of predictable wrong answers – makes an ideal self-assessment question, as in Example 73. Depending on the answer that the learner chooses, it is possible for the teacher to identify where the learner went wrong. Thus, the question is diagnostic in its purpose.

EXAMPLE 73. A diagnostic-style self-assessment question

What is the value of 2^3?

A   6

B   5

C   8

D   9

Providing feedback on answers

Once you have a diagnostic-type question, you can give feedback that is precisely matched to the error the learner makes (see Example 74).

EXAMPLE 74. Giving feedback to a diagnostic-style self-assessment question

Feedback

The correct answer was C.

If you chose A, then you have calculated 2 × 3. In fact the question asks you to calculate 2 to the power of 3 (i.e., 2 × 2 × 2 = 8).

If you chose B, then you have calculated 2 + 3. In fact the question asks you to calculate 2 to the power of 3 (i.e., 2 × 2 × 2 = 8).

If you chose D, then you have calculated 3 × 3. In fact the question asks you to calculate 2 to the power of 3 (i.e., 2 × 2 × 2 = 8).

6.2.3 WRITING THE TEST QUESTIONS

The following steps will help you create questions that work well in self-assessment tests:

1. Start with an idea for the question.

2. Write down the *answer* that you expect.

3. Use the answer to help you write a question that requires the answer that you want.

4.   Write down the common mistakes you expect students to make. (If you can't think of any likely common mistakes, look for another question idea.)

5.   Write the feedback to those common mistakes.

By writing down the answer (Step 2) before you write the precise question, you will be better able to choose exactly the right wording for the question.

Some examples of typical test questions are shown in Examples 75 and 76.

EXAMPLE 75. The first page of a physics self-test

Self Test taken from Physical Science IGCSE

1.   The diagrams show a bus at four different stages of a journey.
     At which stage does the bus with its passengers have the **lowest** centre of mass?

stage A   *stage B*   *stage C*   *stage D*
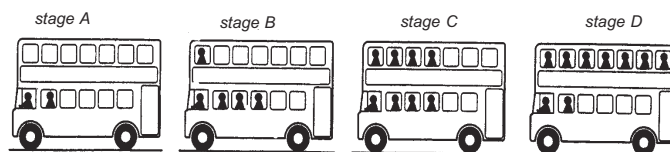
2.   The diagram shows a toy bird which balances on its beak.
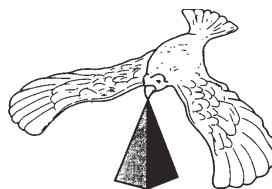
(a)   The weight of the bird is 0.65 N. Calculate its mass. (g = 10 N/kg)

(b)   Mark, **on the diagram above**, a possible line on which the centre of gravity of the bird lies.
(c)   The diagram shows a view from above the bird.

5 cm

plan view
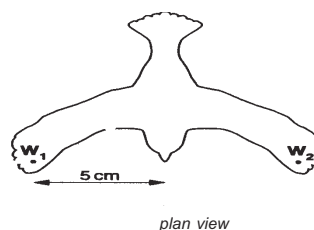
The bird balances because there are weights in each wing. The weights (W_1 and W_2) are each 0.3 N. Stating the formula you use, and showing your working, calculate the moment of W_1 about the bird's beak.

Source: Namibian College of Open Learning (NAMCOL)

EXAMPLE 76. Using an activity as self-assessment

Self Mark Activity

1. Looking at Mrs Angula's activities for one day, fill in the following grid to decide whether she is a good leader.

Leadership Quality	Does Mrs Angula show this quality? YES/NO	Pick out one phrase from the diary entries above to illustrate your answer.
Has vision		
Leads by example		
Coordinates		
Communicates		
Listens		
Delegates		
Supervises		
Supports		
Is transparent		
Is fair		
Understands		
the team		
Networks		

2. In your own words, please say whether or not Mrs Angula is a good leader and give reasons for your answer.

....
....
....
....

Source: Namibian College of Open Learning (NAMCOL)

6.2.4 SELECTING THE QUESTION FORMAT

Some question formats work better than others at the various Bloom's taxonomy levels. Table 27 summarises some of the more common matches. Notice that methods suitable for self-assessment appear in column 2.

TABLE 27. Choosing an appropriate question format

1 Category	2 Suitable self-assessment formats	3 Additional methods suitable for teacher-marked assessments
Knowledge	• multiple choice (one or more correct answers) • true/false • matching • fill in the blank • short answer	
Comprehension	• multiple choice (one or more correct answers) • true/false • matching • fill in the blank • short answer	• essays
Application	**Where recognition of how to apply is sufficient:** • multiple choice (one or more correct answers) • true/false **Where actual application of a theoretical method is required:** • short answer • fill in the blank • create/do something (e.g., type a letter; create a database; change a car wheel) **Where actual application of a practical method is required:** • create/do something (e.g., type a letter; create a database)	• short answer
Analysis	**When you wish the learner to identify elements/relationships that you regard as being the correct answers:** • multiple choice (one or more correct answers) • true/false • matching • short answer • fill in the blank **When you wish learners to produce original analyses where you are unable to predict the answers:** • short answer • essay outline • report outline • project outline	• essay • essay • report • project
Synthesis	• essay outline • report outline • project outline	• essay • report • project
Evaluation	• multiple choice (one or more correct answers) • true/false • short answer • fill in the blank • essay outline	• essay • report • project

6.3 PLANNING AND WRITING ASSESSMENTS

6.3.1 INTRODUCTION

This handbook is not the place to provide comprehensive guidance on planning and writing assessments and, in any case, assessment in ODL follows the same principles as face-to-face assessment. Therefore, this part just touches on some of the questions that you need to ask yourself in order to arrive at a sensible plan for the assessment of an ODL course. If you wish to go into more depth on the topic of assessment, you will need to consult a more specialised work such as Brown et al. (1997), Freeman and Lewis (1998) and Morgan and O'Reilly (1999).

In this part, the general word 'assessment' is used rather than the more specific 'exam'. You may decide to assess your course using one or more end-of-course exams, or you may decide to use other assessment methods such as projects and portfolios. Whatever you choose to use, the same principles discussed here will apply.

Issues for instructional designers

1. How do I decide how many assessments to provide?

2. How do I decide what assessment methods to use?

3. How long should the assessments be?

4. At what points in the course should I place the assessments?

5. Which outcomes should I test in the assessments?

6. How can I ensure that the assessments are valid and reliable?

6.3.2 HOW MANY ASSESSMENTS?

You have seen that having more assessments helps to increase reliability so, in general, you should always have more than one assessment. However, having *too many* assessments is a burden for students (and expensive to the institution), so you need to choose a sensible balance. Typically, shorter courses might have two assessments and longer ones have three.

6.3.3 WHAT TYPE OF ASSESSMENTS?

The type of assessments should be primarily determined by the learning outcomes to be assessed. Recall that for self-assessment (Table 27), your choice of methods was restricted to the

middle column of the table. For teacher-marked assessments, you can use any of the methods, including those in the third column of the table.

6.3.4 HOW LONG SHOULD THE ASSESSMENTS BE?

Length needs to be considered from two points of view:

• How long will learners have to do the assessment?

• How long will it take a teacher to mark?

How long will learners be allowed to do the assessment?

Assessments need to be long enough to provide a valid assessment of what learners have learnt. For example, you cannot test a learner's understanding of theories of perfect markets in five minutes. Equally, if assessments are too long, learners will become tired and will cease to give a valid demonstration of what they know and can do. As ever, you need to choose a sensible balance, bearing in mind the characteristics of your learners.

How long will it take a teacher to mark?

The marking time is an important practical constraint on the design of assessments, since marking costs money. You need to decide, as part of your business planning for your ODL system, how much you can afford for assessment. (See the companion handbook in this series, *Planning Open and Distance Learning Systems: A Handbook for Decision Makers*.)

Where the cost of marking is a problem, one possible solution is to mark part of the assessments by computer. Computerised marking systems can mark most forms of objective question (e.g., multiple-choice, true/false, fill-in-the gap, etc.) and, with reasonable numbers of learners, cost less per assessment than human marking.

6.3.5 WHEN SHOULD THE ASSESSMENTS TAKE PLACE?

If there is only one assessment, it should be at the end of the course in order to assess all the outcomes of that course. With more than one assessment, you need to decide where to place the assessments. There is a case for placing them evenly through the course (e.g., three assessments at intervals of three months), but it is even more important to ensure that each assessment covers a coherent collection of outcomes. For example, the hypothetical course in Example 77 is made up of three coherent topics with durations of 5, 5 and 12 weeks. If each topic is to be assessed by itself, the assessments must necessarily be spaced at irregular intervals.

EXAMPLE 77. Sub-division of a hypothetical course

Topic	Duration	Assessments
1	5 weeks	Assessment 1
2	5 weeks	Assessment 2
3	10 weeks	Assessment 3

6.3.6 DO THE ASSESSMENTS COVER COURSE AIMS AND OUTCOMES?

The starting point of any assessment is the aims and outcomes of the course. To be valid, the assessment (or assessments) must cover as broad a selection of these aims and outcomes as possible. Where (as is often the case) not all can be covered, the selection to be covered must be made with care. Example 78 shows an example of how this might be done. Column 2 shows the spread of course study time over the six levels of Bloom. An ideal assessment system (column 3) would exactly reflect this balance. However, the ideal version might not be feasible within the assessment time available, so the course designers would need to change the balance between the categories. One possible option (column 4) is to decide to not directly assess the knowledge at all, on the grounds that it is indirectly assessed at all the other levels. That leaves more time for the assessment to higher level outcomes. It is important to note that if you need to re-balance the outcomes in order to fit the assessment to the time available, there are no rules to follow. If you decide that your assessment will not be evenly spread over all the learning outcomes, you will have to decide on what basis you are going to select what to assess and what not to assess.

EXAMPLE 78. Example of allocation of assessment time

1	2	3	4
Category	Spread of study time (%)	Spread of assessment time (ideal) (%)	Spread of assessment time (actual) (%)
Knowledge	20	20	0
Comprehension	30	30	40
Application	20	20	25
Analysis	20	20	25
Synthesis	0	0	0
Evaluation	10	10	10

6.3.7 ARE THE PROPOSED METHODS VALID?

As before, you will need to make a valid selection of methods from Table 27.

6.3.8 ARE THE PROPOSED METHODS RELIABLE?

Since reliability is enhanced by having more numerous assessments and a variety of assessments, this question is a reminder to check that:

- there are enough assessments (i.e., more than one, if at all possible); and

- the assessments are as varied as possible (e.g., if you have two assessments, one might be an essay-type and the other a project).

6.3.9 ARE THE ASSESSMENTS PRACTICABLE, GIVEN ANY CONSTRAINTS IN YOUR SYSTEM?

As you have seen, designing an ideal assessment or assessments can result in something that is not practicable – it may be too long for learners, take too long to mark, or involve equipment and assessment centres that are not available to you. In the end, all assessments are constrained by practical factors such as these.

6.4 PLANNING AND WRITING TUTOR-MARKED ASSIGNMENTS

6.4.1 INTRODUCTION

In ODL, the term 'tutor-marked assignment' is commonly used as short-hand for any piece of work that a tutor responds to. That piece of work may or may not be marked, and it may or may not be assessed. What is certain, though, is that the tutor will be expected to comment (often in detail) on the learner's answers.

Issues for instructional designers

1. In our course, what will be the purposes of our assignments?

2. What sort of questions will best meet those purposes?

3. What sort of marking guidance will our tutors need?

6.4.2 PURPOSES OF TUTOR-MARKED ASSIGNMENTS

Tutor-marked assignments have many purposes (Rowntree, 1997; Race, 1992). For the courses you are designing, you need to choose the purposes that are most appropriate to the type of course in question and to your students. Some of the most common reasons for setting tutor-marked assignments are to:

- help learners to identify the most important parts of a course;

- help learners to see the standard of work that is expected on the course, if marked formatively;

- contribute to overall assessment, if marked summatively;

- provide an opportunity for tutor-learner dialogue;

- provide detailed and personalised feedback to learners;

- help learners relate what they are learning to their own situation (e.g., assignment tasks based on their job); and

- help pace learners through the course.

It is worth noting that different assignments may have different purposes in the same course. For example, some assignments may be formative and some summative.

6.4.3 SELECTING AND WRITING THE QUESTIONS/TASKS

An assignment will normally consist of one or more questions or tasks. The following guidelines (after Race, 1992, and Rowntree, 1990) will help to produce an appropriate set of questions/tasks:

- Make the task clear by specifying the required format of the answer (e.g., bullet list, essay, table, diagram) and length (e.g., how many words, how many examples learners should give).

- Choose tasks that provide good opportunities for giving feedback to learners.

- Make sure that every learner will be able to do at least one question well.

- Use active verbs in the tasks (see Table 10 in section 3.3). These help give students a clear idea of the type of response that you want (e.g., list, calculate, explain).

- Ensure that the selection of questions/tasks provides good coverage of the learning outcomes for the section of learning covered by the assignment.

- Check that the sort of task required in the assignment has been adequately prepared for in the activities – and if it has not, adjust the activities. (Tasks in assignments should not be

radically different from tasks in the learning material. The assignment is there for learners to show they can do the sort of things taught in the materials.)

- Consider whether you want the assignment to reflect the sort of tasks and the standard of tasks that will be set in the final assessment. (This is likely to be the case only for assignments towards the end of the course.)

- Consider having specific exam-practice assignments towards the end of the course.

- Tell learners what the marking criteria are for each question. This helps students produce a higher standard of work.

6.4.4 MARKING CRITERIA

Two words are commonly used to describe how a tutor responds to an assignment: 'marking' and 'commenting'. At times, only commenting is involved – that is, no mark is awarded and the tutors are expected to respond in a positive, helpful and friendly way to the learner's work. At the other extreme, a particular assignment may be a part of the summative assessment, so the tutor has to mark it according to precise criteria, as shown in Example 79.

EXAMPLE 79. Sample marking criteria for a task on creating a word-processed letter

Task	Criteria
Using your word processor, open a new document and write a letter replying to the following job advertisement: <advertisement not shown here>	• sender's address correctly laid out • date correctly given • reference given in the advertisement is quoted correctly • appropriate form of salutation • appropriate heading for the letter • appropriate paragraphs of text for a covering letter • appropriate closing to the letter • spelling correct • grammar correct • appropriate choice of font • appropriate layout

Generalised marking criteria can be created for different types of assessment tasks. For example, Freeman and Lewis (1998) provide marking criteria for:

- plans

- reports

- dissertations

- artefacts

- presentations

- diaries, logs and journals

- problem-solving.

6.4.5 MODEL ANSWERS

Distance learning schemes have a long tradition of providing model answers as part of the tutoring process, but some teachers argue that there are no 'right' or 'best' answers in their subject and so they cannot provide model answers. This, though, ignores the fact that isolated ODL learners have few or no opportunities to compare their work with others and have a strong need to see examples of good practice (Race, 1992).

Where it is not possible (or is too time-consuming) to produce model answers, then outline answers or answer guidance can be given. This might include:

- the appropriate structure for an answer,

- points that should be included in a good answer,

- points to make to gain a good mark, and

- mistakes and omissions that will lose marks.

SECTION 7: STUDY GUIDES

OVERVIEW OF SECTION 7

The term 'study guide' is used in two different senses in ODL. Sometimes it refers to a course guide, written to explain to learners how to use a particular ODL course. At other times, it means a guide to some previously published learning resources, which converts those resources into a new, specific ODL course. (This type of study guide is also called a wrap-round course.) This section is based on the second meaning and looks at how to develop study guides to previously published learning resources.

7.1 INTRODUCTION

A course based on a study guide typically consists of:

•   one or more resources in any media (e.g., an existing textbook); and

•   the ODL study guide to guide learners through those resources.

The key point to bear in mind here is that a study guide aims to create an ODL course by adapting existing resources that were not necessarily written for ODL. When the study guide adaptation method works well, it is cheaper and quicker than writing a self-contained ODL course from scratch.

There is very little difference (in terms of skills and techniques) between producing a self-contained course and producing a study guide. The substantive difference is the time taken, not the skills employed. In other words, if you wish to write a study guide, you still need to be proficient in all the skills presented in the other nine sections of this handbook. What will be new is that you will be applying those skills to already existing materials.

Issues for instructional designers

1.   Is a study guide the right approach for this organisation?

2.   What should I put into the study guide?

3.   How do I choose resources for our course?

7.2 PURPOSES OF A STUDY GUIDE

Duchastel (1988) has identified four purposes for a study guide:

•   orientation – providing an overview of the course and setting goals;

•   task direction – setting reading tasks and activities;

•   learning assistance – 'assisting the student to focus on the essential' and clarifying and helping learners to structure, understand and remember new material; and

•   self-assessment.

7.3 IS A STUDY GUIDE THE RIGHT APPROACH FOR THE ORGANISATION?

There are two principal ways to produce an ODL course: (a) to write a self-contained course or (b) to base your course around existing resources.

Generally, the self-contained course is the better option because, in theory, you can optimise every aspect of the course to meet the needs of your learners. In practice, however, this approach can be costly and may take 1–2 years. When you need to produce a course more quickly or at a lower cost, the study guide approach is a good solution. As you will see, though, this approach is only feasible if you can find a suitable resource around which to base your guide.

7.4 WHAT SHOULD A STUDY GUIDE CONTAIN?

It is difficult to say what a study guide should contain since, by definition, its role is to make up for the deficiencies of the resources you have chosen to use. Perhaps the best way to think about a study guide is to say that it will contain *any* of the items in Table 28 *that are not already present in the resources* – that is, the better that your resources match the items in Table 28, the less you have to put into your study guide.

7.5 WHAT MAKES A GOOD RESOURCE?

Study guides are only practicable if you can find a suitable resource around which to base your course. The more features from Table 28 that a resource contains, the less new material you will need to write in your study guide, and hence the more suitable that resource is. There is, though, quite a wide range of issues you need to consider in choosing a resource. The most important of these issues are set out in Table 29.

TABLE 28. Potential contents of a study guide

For the course as a whole	For each course unit
• an overview of the course	• unit number and title
• the aims of the course	• an introduction
• a statement of any pre-requisite knowledge and skills that the course assumes	• contents list
	• statement of pre-requisite knowledge (or a pre-test)
• a list of contents	• learning objectives for the unit
• an explanation of the structure of the course (e.g., how it is divided into units)	• list of any equipment needed for studying the unit
• a list of the various components (e.g., workbooks, cassettes, web pages) and some explanation of what they are for	• other resources needed for the unit (e.g., a textbook)
	• time required for the unit
• a course schedule with dates of key events such as exams	• examples
	• explanatory text
• details of the support system and who to contact about different types of problem	• activities with feedback
	• diagrams and illustrations
• an explanation of the assignments to be submitted and the system for submitting them	• topic summaries
	• unit summary
• how and when the course will be assessed	• self-test based on the unit learning objectives
• how to use the course (e.g., how to use activities, self-assessment and objectives)	• link forward to the next unit
• study skills advice (e.g., how to plan your time, make notes, learn from the web).	

TABLE 29. Issues to consider when choosing a resource

Aspect	Issues
1. Is resource content appropriate?	The essential function of a core resource is to provide the content the learner needs in order to attain the outcomes you have chosen to teach.
	There is no point in using a resource that requires you to write much of the content yourself.
2. Is the level of difficulty right?	If the level of the resource is too difficult for your learners, your study guide cannot constantly have to explain the resource in simpler terms. That is not a very helpful approach for the learners.
3. Is the content up-to-date?	The content needs to be sufficiently up-to-date for you not to have to add masses of updating material.
4. Is the content accurate and authoritative?	The resource needs to be accurate and authoritative, otherwise too much of your study guide will involve 'correcting' the resource.
5. Is the coverage comprehensive?	Study guides are easiest to prepare when you can find one resource that covers all the course content. The more resources that you have to use, the higher the cost to the learners and the more complex the course becomes.
	If there is no single resource available, another approach is to create a booklet (usually called a 'reader') made up of a number of chapters or articles.
6. Is it clearly structured?	Ideally, the resource will have frequent headings, introductions and summaries, a contents list, index and glossary. This point, though, is less applicable to articles.
7. Is it well written?	'Well written' covers such matters as tone, vocabulary, sentence and paragraph structure and use of examples and illustrations. These qualities will help both you in writing the study guide and the students in using the core resource itself.
8. Is it attractively presented?	'Attractively presented' refers to the physical characteristics of the resource: the way it is packaged, including not only its appearance but also its convenience and durability in use.
Activities	
9. Quantity and quality of activities	Ideally, there should be at least one activity per learning outcome. In practice, many resources have *no* activities, and adding activities is a major part of writing the study guide.
	The activities need to be of sufficient quality for you to wish to use them.
Self-assessment tests	
10. Quantity and quality of self-assessment tests	Ideally, there should be at least one self-assessment test per unit. In practice, however, many resources have *no* self-assessment tests.
	The tests need to provide a good coverage of the learning outcomes.
Miscellaneous	
11. Is it acceptable in terms of cost?	Acceptability in cost terms covers both the initial purchase and any ongoing costs, for example, purchase of additional equipment necessary to use the resource. If you are ordering a substantial number of copies to pass on to students, you may be able to negotiate a discount. It is also a good idea to find out from the publisher if any price rises are imminent.
12. Will it remain available?	Availability is very important. You could be in serious difficulty if the resource goes out of print or is reissued with significantly different content, leaving all your chapter and page references out of date. Before committing yourself to a particular resource, ask the publisher about its continued availability and whether any new editions are planned. With today's shorter production runs and the technical ease of customising, you may find the publisher willing to print for you on demand or, alternatively, license you to produce copies for your own use.
13. Will it be acceptable to the tutor team?	The tutors who subsequently deliver your course need to have confidence in the core resource. Ideally, tutors should be identified early on and their views sought.

[1]A more extensive checklist for choosing a resource can be found in Lewis and Paine (1986).

7.6 STRUCTURE OF STUDY GUIDES

A typical unit in a study guide has the following structure:

Introduction
Content
Outcomes
Resources needed for this unit
Read <pages from resource>
Read <new text, written by you>
Do <activity written by you>
Do <self-assessment test written by you>
Key points

This cycle
might be repeated
several times.

7.7 ACTIVITIES IN STUDY GUIDES

What is the best way to set reading activities? Compare the activity in Examples 80 and 81.

EXAMPLE 80. A passive form of reading activity

Activity 1

Read pages 61–70 of Rowntree (1990).

Example 80 regards reading in itself as an activity. Example 81, however, provokes a much more active approach to reading by setting much more specific activities. This second version sets very specific tasks that:

•   focus the reading, and

•   require the learners to respond to what they have read.

EXAMPLE 81. An active form of reading activity

Activity 1

1. Read pages 61–70 of Rowntree (1990).

2. Choose two methods of ordering topics, both of which you think would work for your unit.

3. List the strengths and weaknesses of these two methods in relation to your unit.

4. Which method do you conclude is the best?

5. Why?

	Strengths	**Weaknesses**
Method 1		
Method 2		

SECTION 8: LANGUAGE, WRITING STYLE AND LAYOUT

OVERVIEW OF SECTION 8

However well planned and constructed your course is, it may fail to work well if the language used is not appropriate to your student population. This section looks at some of the issues that arise in language and provides some suggestions for writing in an accessible way.

Readability indices

This part looks at readability indices. These are mathematical measures of how easy or hard a piece of text is to read. Although the indices are not perfect, they are better than performing no check at all on a piece of text.

Some of the indices available are described, as are ways you can use the indices built into Microsoft Word.

The use of indices is balanced by also looking at the key ideas of coherence and cohesion. These factors, which are not measured by readability indices, also contribute to the readability of text.

Writing clearly

This part offers a range of suggestions for writing in a way that clearly communicates what you intend to say, including: using familiar words, using short words, using short sentences, removing unnecessary material, being specific, writing in a logical order, being positive, maximising cohesion, using the first and second person, and preferring active to passive tenses.

Writing for learners whose first language is not English

This part notes a few points that cause particular difficulty for learners whose first language is not English using ODL materials produced in English.

8.1 READABILITY INDICES

8.1.1 INTRODUCTION

There are many ways of saying the same thing. Some are easier than others for students to understand. This part looks at various formulae that have been developed for measuring the reading difficulty of a piece of text and discusses the usefulness of these formulae to ODL instructional designers.

Issues for instructional designers

1. How difficult is the text that I have written?

2. What changes would make the text easier for the learners?

3. How useful are readability scores in helping me decide what changes are needed?

8.1.2 READABILITY SCORES

For many years, researches have argued that texts (on paper or on screen) with lots of long sentences and lots of long words are difficult to read. They have therefore developed methods for measuring the readability of a text. The most commonly used methods are the Gunning Fog Index, Flesch Reading Ease and Flesch-Kincaid Grade Level.

The Gunning Fog Index

To calculate this index (see Example 82):

•   Take a sample of text, at least 100 words.

•   Calculate the average number of words per sentence.

•   Count the number of words of three or more syllables and express this as a percentage of the total number of words.

•   Add the *Average number of words per sentence* to the *Percentage of long words.*

•   Multiply by 0.4.

The result tells you the reading level in terms of US school grade levels.

EXAMPLE 82. Calculation of the Gunning Fog Index

The text below was measured using the Gunning Fog Index. This gave the following results:

Average number of words per sentence = 23.5

Percentage of long words = 13.8

Fog index = (23.5 + 13.8) × 0.4 = 14.9

Text used for the test

Our knowledge of how adults learn is, to say the least, patchy. 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.

Flesch Reading Ease

This index is based on sentence length and word length. The formula can be found in Hartley (1994), but you don't need it if you use Microsoft Word, which will calculate the index for you. To do this with Word, first select **Tools**/**Options** on the menu bar. Then select the **Spelling and Grammar** tab. Then tick **Check grammar as you type** and tick **Show readability statistics**.

When this index is applied to the piece of text in Example 82, a score of 56.0 is obtained (see Figure 24). This corresponds to 'fairly difficult' or to US Grade 10 to 12. (With Flesch Reading Ease, the lower the score, the harder is the piece of text.)

FIGURE 24. Readability scores for an excerpt from section 1.2, ' How Adults Learn' from this handbook

Flesch-Kincaid Grade Level

Another index offered by Word is the Flesch-Kincaid Grade Level. This is slightly more convenient than the Flesch Reading Ease Index, since the number that you get is a US grade level.

For the piece of text in Example 82, the Flesch-Kincaid Grade Level is 11.2 (see Figure 24). The 'counts' section of the figure tells you how much text has been graded – in this case, 450 words. Under 'averages', you can see how long the sentences were on average – 23.5 words. The final section, 'readability', gives you the two reading scores, Flesch Reading Ease (FRE) and Flesch-Kincaid Grade Level (FKGL).

The example shows there is reasonable agreement between the two scores.

How changing wording can affect readability scores

Example 83 explores the effect of sentence length and word length on readability scores. Case 1 shows the original piece of text, which has a grade level of 11.2 – quite difficult. In Case 2, the length of some of the sentences has been reduced, but the words have not been significantly changed. This has reduced the grade level to 9.4, which is a little easier. In Case 3, the wording has been drastically changed, thus reducing the grade level to 6.5, which rates as 'easy' on the Flesch-Kincaid Grade Level Index.

EXAMPLE 83. Variations in wording and their effect on readability scores

Case 1

Our knowledge of how adults learn is, to say the least, patchy. 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.

FRE 56.0

FKGL 11.2

Case 2

Our knowledge of how adults learn is, to say the least, patchy. 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. Then we can 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.

FRE 60.8

FKGL 9.4

Case 3

We know little about how adults learn. It is not even clear that all adults learn in the same way. We have to work from known characteristics of adult learners. From these we can deduce some principles for designing post-school learning materials. This approach may have weaknesses, but it seems to produce high quality courses.

FRE 68.0

FKGL 6.5

8.1.3 USEFULNESS OF READABILITY SCORES

Readability scores need to be used with care since they only take account of a very limited range of factors about a piece of text. From the learner's viewpoint, the difficulty of a piece of text is dependent on factors such as:

- the subject matter,

- how the text is expressed (its cohesion and coherence),

- sentence length, and

- the vocabulary.

If a text is difficult to read, then learners will have difficultly learning from it. One view is that cohesion and coherence affect difficulty much more than do sentence length and word length (Co-Metrix, 2004). (There is more discussion of cohesion and coherence in section 8.2, 'Writing Clearly'.) The two cases in Example 84 illustrate the problem.

In the first version, the cohesion is low, making it difficult to understand, whereas the second version has higher cohesion and is easier to understand. However, the Flesch-Kincaid Grade Level reverses the difficulty, saying that the first version is the easier.

EXAMPLE 84. How cohesion affects readability

One part of the cloud develops a downdraft. Rain begins to fall.	Low cohesion	Flesch-Kincaid Grade Level = 3.4
One part of the cloud develops a downdraft, which causes rain to fall.	High cohesion	Flesch-Kincaid Grade Level = 4.9

(http://csep.psyc.memphis.edu/cohmetrix/readabilityresearch.htm)

The cases in Example 84 illustrate the need for caution in interpreting readability scores: they are worth calculating, but do not tell the whole story about a piece of text.

8.2 WRITING CLEARLY

8.2.1 INTRODUCTION

This part provides a selection of techniques for writing clear English. Unfortunately, clear English cannot be achieved simply by following rules and guidelines, but the following aids can be helpful with practice.

Unless otherwise mentioned, these guidelines apply equally to text on paper and text on the web.

> **Issues for instructional designers**
>
> 1.   What are the main guidelines for making text accessible to learners?

8.2.2 USE FAMILIAR WORDS IN PREFERENCE TO LESS FAMILIAR

Text is always easier for readers to understand if they are familiar with the words being used. Example 85 lists some examples of less familiar words together with more familiar alternatives.

EXAMPLE 85. Some familiar words and their more familiar alternatives

Less familiar word	More familiar word
facilitate	help
attenuate	reduce
detriment	harm
influx	arrival

Various resources available on the web can help here. For example, the commonest 1,000 words are listed at http://esl.about.com/library/vocabulary/bl1000_list1.htm; the 2,500– 5,000th most common words are listed at http://elc.polyu.edu.hk/cill/common2-5000words.htm.

Occasionally, of course, you will need to use the less familiar word because it is the only one that can convey your meaning with precision. This is particularly true when using technical terms.

8.2.3 USE SHORT WORDS IN PREFERENCE TO LONG ONES

Generally, short words are easier to understand than longer ones, as shown in Example 86.

EXAMPLE 86. Short words to use in place of longer ones

Long word	Short word
fundamental	basic
intoxicated	drunk
indistinct	hazy
inundation	flood
pernicious	evil

Sometimes, though, the longer word is the more familiar, so it should be used in preference to the shorter one.

8.2.4 USE SHORT SENTENCES IN PREFERENCE TO LONG, BUT NOT AT THE EXPENSE OF COHESION

Generally, long sentences are more difficult to understand than short ones, but overuse of short sentences can destroy cohesion (see Example 84).

A more elaborate example of the problem is shown in Example 87. Version A shows a paragraph of first-draft text from this handbook and Version B shows the sentences shortened as much as is possible. The first version has a grade level of 12 and an average sentence length of 26 words. The second version has around half the sentence length and a grade level of 7.2. However, the second version is stilted and disjointed – it has lost some cohesion.

This example does not mean that you should not keep a careful watch on sentence length – you should. However, it does mean that, when you shorten sentences, you should take care not to destroy cohesion in the process.

EXAMPLE 87. How cohesion can decline as sentences are shortened

Version A – original

Producing a new ODL course from scratch is usually a lengthy business. In well-established ODL institutions, the time from identifying a need to having materials ready for use is rarely under a year, more typically two years and can be as much as three years. In an institution that is new to ODL, it is unrealistic to think that good courses can initially be produced in under 18 months to two years since, in the early stages, new skills will need to be learnt and new systems established. For many developing countries, this delay in having the first courses ready may be totally unacceptable.

26 words per sentence

Grade level = 12

Version B – Short sentence version

Producing a new ODL course from scratch is usually a lengthy business. In well-established ODL institutions, the time from identifying a need to having materials ready for use is rarely under a year. Often it will take two years. It can be as much as three years. In an institution that is new to ODL, it is unrealistic to think that good courses can initially be produced in under 18 months. You might need two years since, in the early stages. In these stages, new skills will need to be learnt. Also, new systems will need to be established. For many developing countries, this delay in having the first courses ready may be totally unacceptable.

12.7 words per sentence

Grade level = 7.2

8.2.5 REMOVE UNNECESSARY WORDS AND PHRASES

Many books suggest that you should remove unnecessary words and phrases from a text, but their advice is often rather limited. For example, Race (1992) suggested changing phrases such as 'in the immediate vicinity of' to 'near'. This is good advice, but very limited. Most first draft texts contain far more words than necessary. In fact, you can probably expect to cut down almost any ODL first draft by at least 25% – and sometimes even more than 50%. To achieve this word-cutting rate, you should be prepared to take some radical steps, as follows:

- Read through the text and identify each point being made, but ignore repeated points. A good way to do this is to highlight the key points as you find them.

- Copy these points into a new Word document.

- Turn the copied points back into a cohesive text by adding in any necessary linking and other phrases.

You can see an example of this method in Example 88. Version 1 is a piece of text from workshop notes. In Version 2, the key points have been extracted from Version 1. And in Version 3, the key points have been recombined into a cohesive prose. As a result of this heavy edit, the original 138 words have been cut down to 69 – a reduction of 50%. (In this case, the grade level has gone up slightly, but not enough to worry about.)

EXAMPLE 88. The use of the 'key ideas' technique to remove unnecessary words

Version 1 – original

In a historic sense, we rarely know where a school's culture comes from. A school's culture is accumulated from thousands of experiences and moulded by hundreds of staff over time. However, the head teacher can change the culture, provided he or she sets about it in the right way. So, in this sense, one can say that the culture comes (or should come) from the head.

Culture change should start with the beliefs and values of the head. Heads have to be clear in their own minds what they believe is important. Culture change starts with what Tony Blair recently referred to as irreducible core values. Whatever change the head wishes to introduce must be backed by a reason as to why it is right and important to do it – a reason that the head fervently believes in.

138 words

Grade level = 7.2

Version 2 – key points

• Many historical factors contribute to a school's culture.

• The head teacher is the main determiner of that culture.

• The head teacher is also the main source for changing that culture.

• Culture change should start with the beliefs and values of the head teacher.

• The head teacher must have good, strong reasons for each change he or she introduces.

56 words

Grade level = 5.8

Version 3 – the key points with added cohesion

Many historical factors contribute to a school's culture, but we know for certain that the head teacher is the main determiner of that culture. The head teacher is also the main source for changing that culture. When the head teacher wishes to change a school's culture, he or she should start with his or her beliefs and values. At the same time, the head teacher must have good, strong reasons for each change introduced.

69 words

Grade level = 7.7

8.2.6 PREFER THE SPECIFIC TO THE GENERAL

We tend to understand specific, concrete instances better than vague or generalised ones. For this reason, it is best to use specific examples or precise data whenever the context permits it. See Example 89.

EXAMPLE 89. Converting general cases to specific ones

General/vague	Specific/precise
write a short answer	write about 300 words
many people	around 65% of adults
very fast	over 150 km/hr
poor quality hinge	a hinge that breaks after 500 flexings

8.2.7 WRITE IN A LOGICAL ORDER

Probably the best way to ensure a logical order is to plan your course or unit in a systematic way – a process which, in itself, helps to force a logical order on your writing. Figure 25 shows one way of doing this.

FIGURE 25. Outlining a unit of learning in a logical way

Topic 1
Sub-topic 1.1
Sub-topic 1.2
Sub-sub-topic 1.2.1
Sub-topic 1.3
etc.
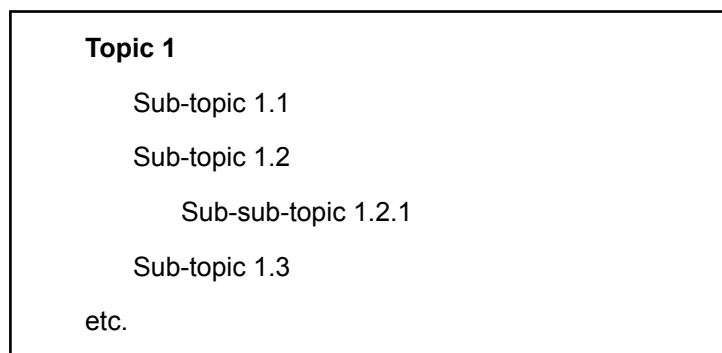
What constitutes a logical order will depend on the subject matter. Some samples of logical orders are shown in Example 90.

EXAMPLE 90. Some methods of applying a logical sequence to a unit or a course

Method	Detail	Example
Historical	Presenting events in the order in which they occurred	The day-by-day events from 28 June, 1914, to 1 August, 1914, leading to the outbreak of the First World War
Developmental	Presenting a topic in the order in which it developed	The development of manned flight
Order of creating something	Presenting a method in the order of its steps	The creation of a cash flow on a spreadsheet
Conceptual	Presenting a subject by the build-up of its concepts, starting from some initial level	The explanation of the atomic structure of matter

8.2.8 PREFER THE POSITIVE TO THE NEGATIVE

On the whole, it is easier to understand a statement in a positive form than in a negative one. In Example 91, you can see some typical negative sentences which, when transformed into positive ones, become easier to understand.

EXAMPLE 91. Negatives and how to avoid them

Negative version	Positive version
It is not a good idea to ignore the warning signs.	Pay attention to the warning signs.
The expert witness did not contradict what the accused said.	The expert witness supported what the witness said.
The author did not omit to send in her manuscript on time.	The author remembered to send in her manuscript on time.

There are some occasions, though, when the negative is clearer or essential. For example: 'Danger. Do not touch.'

Double negatives

Double negatives are particularly difficult to understand and are interpreted differently in different cultures. For these reasons, they are best avoided. See Example 92.

EXAMPLE 92. Double negatives and how to avoid them

Double negative	The (better) positive equivalent
It is not the case that the students do not have enough time to do the assignments.	The students have enough time to do the assignments.

8.2.9 MAXIMISE COHESION

Cohesion is clear relationships being established between the words in a piece of text. For example, pronouns that refer back to a noun help create cohesion, as does the use of linking words such as 'thus', 'however' and 'in the next example'.

Cohesion is promoted by:

•   repetition of key words, and

•   the use of transition words and phrases.

Repetition of key words

The cohesion of a piece of text is increased by the repetition of key words or phrases, which help the reader see how points in a series are logically related. In Example 93 (which is a passage taken from the first draft of this handbook), you can see how the repeated use of the words 'tutorial', 'navigation' and 'web' help to bring cohesion to this paragraph.

EXAMPLE 93. How key words give cohesion to an argument

It is worth noting that the **tutorial** style was developed for use in print ODL materials. It can be extended to the web, but care needs to be taken in the **navigation** of **web tutorial** sites. The **tutorial** method assumes a carefully controlled order in the presentation of input, activity and feedback. If learners are allowed to freely **navigate** a web site, this order will be lost and the **tutorial's** structure undermined. This problem can be avoided by constructing course **web sites** with …. and by careful control of hypertext links within the site.

Use of transitional words and phrases

Transitional words and phrases are ones that show:

- sequence and order

- relationships

- the flow of an argument

- cause and effect

- exceptions and parentheses.

Examples of transitional words and phrases include:

- also

- in addition

- moreover

- firstly

- for example

- first of all

- at the same time

- to return to the point I made earlier

- however

- on the other hand

- to summarise

- in conclusion.

It is those clues within a text that tell us that we are reading a tightly integrated piece and not a random collection of sentences.

8.2.10 USE FIRST AND SECOND PERSON

There is widespread agreement among experts that ODL writing should address the learner as 'you' and the author should be 'I' or 'we'. Example 94 shows the difference between the two styles. In the first column, the style is remote and impersonal, which has the effect of distancing the learners from the course writer. In the second column, you can see the more personal, friendly version, which helps the learners feel closer to the writer.

EXAMPLE 94. Uses of first and second person to create friendly text

| Traditional academic style	More friendly ODL style
The student should note that …	You should note that …
Students should prepare an essay on …	You should now write an essay on …
It can be seen that …	You can see that …
It is understood by most instructional designers that they should expect to cut …	As instructional designers, we can expect to have to cut …

8.2.11 USE LOTS OF SIGNPOSTING

'Signposting' refers to all of those devices that we use to help learners find their way around a text or the web site. These are considered to be important for two reasons. First, many ODL learners have little experience of learning from text or web sites, and so need as much help as possible. Second, ODL materials tend to have a fairly complicated structure, with lots of separate components (e.g., activities, examples, tests), so learners need help in working their way through the materials.

Examples of signposting include the use of:

- headings and subheadings

- contents lists

- summaries

- indexes

- icons (see Example 95)

- different fonts and type sizes to indicate different aspects of the text, for example:

    - 11-point Times Roman for explanatory text

    - 11-point Arial for activities

- phrases such as:

    - 'on the next page …'

    - 'in the last section …'

    - 'the next example will show you…'

EXAMPLE 95. Sample of icons in ODL courses

Icon	Use to indicate
⊲🔊	
?	A question to answer
📝	Work to be sent to your tutor
🎧	Listen to the audio tape
📖	Read from your textbook
→	Next page
Home	Return to Home page
⧗	Time to spend on a task
💾	Open a file from your diskette

8.2.12 USE ACTIVE RATHER THAN PASSIVE VOICE

Although much formal and academic writing uses the passive voice (writing sentences with an object-verb-subject order), the active voice (sentences with a subject-verb-order order) is generally more direct and easier to understand. For this reason, most ODL writing should avoid the passive voice. Example 96 gives three cases where a passive sentence is better replaced by its active version.

EXAMPLE 96. Passive sentences contrasted with easier, active versions

Passive version	Active version
Experiments on gravity were carried out by Galileo.	Galileo carried out experiments on gravity.
The test was marked by the tutor.	The tutor marked the test.
This task was found to be difficult by over half the students.	Over half the students found this task difficult.

Exceptions to the avoid-the-passive rule

Avoiding the passive voice does not mean eliminating it altogether. At times, the passive is clearer, as discussed by Pinker (1994). If you read the two versions of the short paragraph shown in Example 97, you will probably find the second version more immediately understandable, even though the second sentence is in the passive voice. The reason is that the key idea that links the first and second sentence (*feedback*) occurs early in the second sentence. By writing the second sentence in passive form, the cohesion of the paragraph is increases.

EXAMPLE 97. When the passive voice can be easier to understand

Version 1

Many authors have stressed the importance of feedback in learning, and this applies to ODL as much as to other forms of learning. The inclusion of plenty of activities, questions and self-assessment tests is a very good way of providing feedback.

Version 2

Many authors have stressed the importance of feedback in learning, and this applies to ODL as much as to other forms of learning. Feedback can be provided by the inclusion of plenty of activities, questions and self-assessment tests.

8.3 WRITING FOR LEARNERS WHOSE FIRST LANGUAGE IS NOT ENGLISH

8.3.1 INTRODUCTION

Learners who study in a language other than their first language can face considerable difficulties. This is especially so for learners using English language texts when their first language is not English. There are many hidden complexities in both everyday and academic English that can impede understanding. This section describes the key sources of those difficulties and what you can do to avoid them in your writing.

Some of the advice is the same as that which applies to writing generally (e.g., keeping sentences as short as is compatible with maintaining cohesion), but other points are more specific to learners for whom English is a second language.

Issues for instructional designers

1. What language uses cause most problems for second-language speakers?

2. How can I avoid these problems?

8.3.2 TECHNIQUES FOR KEEPING LANGUAGE CLEAR

Today, vast numbers of learners study in English even though it is not their first language. This can create difficulties for them both in understanding what they read (and hear) and in expressing themselves in writing and speech. As an instructional designer, one of your jobs is to help ensure that the language used in the learning materials is as straightforward as possible, so as to minimise the problems that second-language learners have. Some of the ways that you can do this are:

- Use the active voice rather than passive voice.

- Keep sentences as short as is compatible with maintaining cohesion.

- Avoid using complex sentence structures. The key difficulties here are subordinate clauses and modifiers. Example 98 shows how a subordinate clause and a modifier create a complex sentence. In the second version, the point being made is much more accessible.

EXAMPLE 98. Avoiding complex sentence structures to improve clarity

Version 1 – Complex

Generally, when designing ODL materials, particularly for learners whose first language is not English, activity tasks should be worded with particular care.

Version 2 – Simpler

Activity tasks must be written clearly and simply. This is particularly important to do when you are writing for learners whose first language is not English.

- Avoid double negatives.

- Avoid idioms (e.g., avoid phrases such as 'know like the back of your hand' or 'as easy as pie').

- Use non-phrasal verbs more than phrasal ones. For example, say:

  - 'explain' rather than 'set out'

  - 'empty' rather than 'clear out'

- Use common, familiar words rather than unusual or more formal words.

- Avoid words that have a double meaning. (This can be difficult, since about half the words in the English language are said to have at least two meanings.) For example, in 'Since exercising is good for you, include regular exercise in your schedule', a learner new to English might read 'since' to mean 'from the time when' – not its other sense, 'because'.

Useful sources

The following web sites offer useful advice and examples on writing for learners whose first language is not English:

http://coe.sdsu.edu/eet/Articles/clearwriting/index.htm

http://www.writing-world.com/international/schell.shtml

SECTION 9: DRAFTING AND TESTING

OVERVIEW OF SECTION 9

Drafting text

ODL texts always go through several drafts, and most ODL institutions have a set of defined draft stages. In this part, you will look at why drafting is so important in ODL and how it is organised. Most drafting involves various readers critiquing at various stages. Here you will learn about how to choose the readers and how to brief them so that they produce the types of comments you need. A five-stage drafting process is suggested for use.

As well, use of Microsoft Word's outliner to help organise and re-organise drafts is discussed.

Developmental testing

The second part describes how to test what you have drafted so that you can improve it to better meet learners' needs. The two principal methods of testing – face-to-face and field trials – are presented and a wide range of data collection methods is summarised.

9.1 DRAFTING TEXT

9.1.1 INTRODUCTION

Producing a course of, say, 120 hours in length can involve writing five or six drafts. These drafts may be printed out, read and commented on by several people, resulting in hundreds of comments. In other words, preparing course materials involves a lot of paper and many computer files and has considerable potential for chaos. For this reason, each ODL organisation needs a system for managing the drafting of text.

Issues for instructional designers

1. Why can't an ODL course be written in a single stage?

2. What are the keys to successful ODL drafting?

3. What should be the various stages of drafting?

4. What are the key issues at each stage?

9.1.2 WHY DRAFTING IS IMPORTANT IN ODL

It is not possible to write a whole ODL course in one single writing stage. There are two main reasons:

•   ODL courses are usually produced by teams of people, including subject experts, instructional designers and tutors. They must all be given the opportunity to contribute fully through several drafting, commenting and revision stages.

•   ODL courses are complex.

9.1.3 THE KEYS TO SUCCESSFUL DRAFTING

The keys to successful drafting are to:

•   use methods that address the key problems at an early stage;

•   ensure readers know what their role is; and

•   provide readers with response frameworks.

Use methods that trap the key problems at an early stage

Certain decisions need to be made at an early stage, such as what the aims and outcomes of the course should be or what its pre-requisites are. Other decisions can be left to a late stage, such as the precise phrasing of expressions. A good drafting system is one that encourages writers and readers to concentrate on the appropriate issues at each stage.

Make sure that your readers understand their roles

When circulating drafts for comment, you will want different comments from different people and different comments at different stages. For example, your readers might include a subject expert, a tutor and an employer, so you might want each to look at different aspects of the material – you might ask the subject expert to concentrate on whether the material is accurate and up-to-date, while you might ask the employer whether the content covered the important knowledge and skills needed by new recruits.

Set response frameworks

The fact that you will want different comments from different people at different stages highlights the importance of giving a response framework to each of your readers. Example 99 shows such a framework for the first stage of drafting (see section 9.1.4). Readers are asked to comment on just five items (column 1 of the table) and they are given precise points to comment on (column

2). By implication, they are not expected to comment on anything that is not mentioned in the framework. This helps focus reader comment on what is important at each of the various stages of drafting.

EXAMPLE 99. A response framework for use in commenting at the first stage of drafting

Item	Please comment on
1. The course description	• any points you disagree with • anything we have omitted
2. The list of pre-requisite knowledge and skills	• any items you think we should not assume learners will already possess • any additional items you think should be in the list
3. The course aims	• any aims you disagree with • any aims that we have omitted
4. The learning outcomes	• any outcomes you disagree with, and please explain why • any outcomes we have omitted
5. The draft final assessment	• the level – is it right? • other items you think should also be tested • items you think we can omit from the assessment

9.1.4 Stages of drafting

It is useful to think of drafting as a five-stage process. There is no need to follow exactly these stages – each organisation has its own approach to drafting. What matters is that your organisation decides on its standard stages for drafting courses and defines what should happen at each of those stages.

Stage 1: Content of the course

The issues to explore at Stage 1 are all to do with the appropriateness of the content and level of the proposed course to the target audience. These issues may be explored by preparing course descriptors such as:

- a course description,

- a list of pre-requisite knowledge and skills,

- a set of aims,

- a set of learning outcomes, and

- a draft final assessment.

The more of these devices that you use, the more precise will be your description of the course.

Once you have drafted your course descriptors, these should be circulated to those people who need to approve the contents of the course (e.g., subject experts, tutors, employers). By obtaining their agreement to the course description at an early stage, you avoid costly rewriting later on.

Stage 2: Content of each unit

The second stage (unit contents) is also about content, but at a more detailed level. The proposed content of each unit is explored in depth. This can be done by preparing and circulating items such as:

- a description for each unit,

- a set of learning outcomes for each unit, and

- a self-assessment test for each unit.

These unit descriptions should also be approved by those responsible for the course.

Note: Some organisations combine Stages 1 and 2 (i.e., the course and unit contents are drafted in one stage).

Stage 3: Sample unit

The third stage explores the proposed approach to teaching the content defined in Stages 1 and 2. This is usually done by preparing a sample unit. The purpose of this stage is to:

- develop and agree on the approach to teaching,

- develop examples of the sorts of activities that the course will use, and

- develop the other components to be used in a typical unit of the course (e.g., examples, summaries, self-assessment).

The sample unit is then circulated for comment.

Stage 4: First draft version

Once the content and the approach to be taken in each unit have been decided, the writer (or writers) can then produce the first draft version. For the first draft version, the most important aspects to concentrate on are:

- the activities,

- the examples, and

- the self-assessment.

This version is then circulated for comment and any necessary changes are made before the materials are tested.

Stage 5: Revised version

After the pilot, any further changes are made and the final version is produced.

9.1.5 MECHANICS OF DRAFTING

Most organisations draft their courses as Word documents and store the various drafts and comments on computer discs. Having such backups is essential, but must be done well to ensure there are no version mix-ups. The following tips for using Word and computer files will help you produce an efficient drafting system.

Use Word's outlining system

Word has a built-in system that allows you to label the headings in a file at various 'outline levels'. The easiest way to use this system is to use Word's default heading styles (Heading 1, Heading 2, etc.). Doing this enables you to then use the outliner to show you the structure of your writing. For example, Figure 26 shows Section 1, outlined at Level 1. Figure 27 shows the same section outlined at Level 2, and Figure 28 shows it outlined at Level 3.

The importance of this when drafting is twofold:

- You can see whether you have each topic at the right level – perhaps a topic needs to be moved up or down a level. If so, you can do this with one click in outline mode.

- You can see whether you have each topic in the right place. If it isn't, you can drag (at whichever level you wish) the topic to another place in the sequence. (When you drag a title in outline mode, you drag all the text associated with that title at the same time.)

FIGURE 26. Section outlined at Level 1

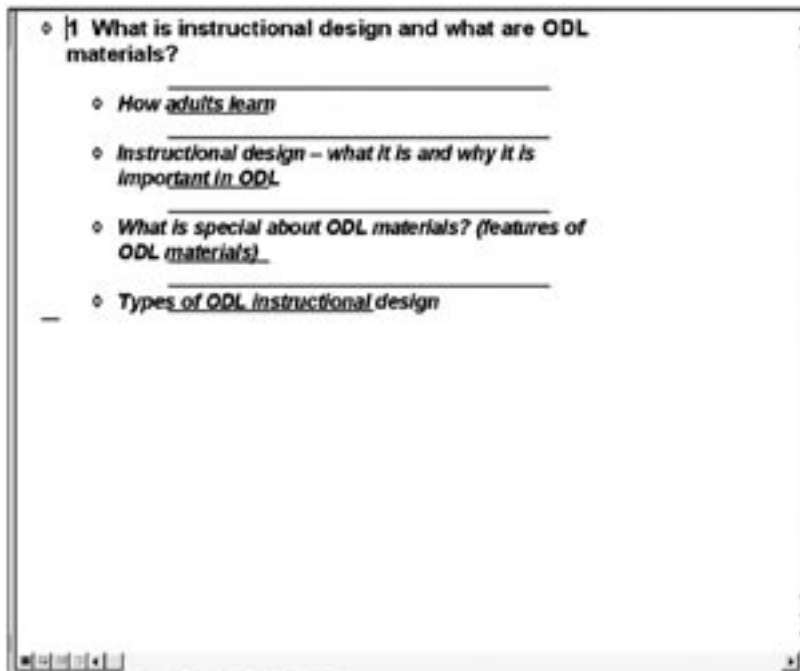**FIGURE 27.** Section outlined at Level 2

FIGURE 28. Section outlined at level 3

Using the outliner

To use the Word outliner:

- Use the Word default headings when you create your document (i.e., Heading 1, Heading 2, etc.). You can change the font, font size, and other characteristics of these headings and they will still remain at their built-in levels.

To see your work in outline:

- Set your document in **Print Layout** (click **View/Print Layout**).

- Click **View/Outline.**

- When the numbers **1 2 3 4 5 6 7** appear below the menu bar, click the level you wish to view (e.g., to view at Level 3, click 3).

- Return to **Print Layout** and click **View/Print Layout.**

Use systematic file names

Once you have more than one version of a file, it is easy for the versions to become mixed up. The best way to avoid this is by:

- creating a systematic method of naming files, and

- inserting the file name into the footer of each document.

Creating a systematic method of naming files – Imagine a course called Course 1 is being developed:

• All files for Stage 1 should have file names starting with *course1_stage1*. All files for Stage 2 should have file names starting with *course1_stage2,* and so on.

• All files at the unit level should be named *course1_stageX_unit1*, and so on.

• All files of different versions at any given stage should have the version number added to their name (e.g., *course1_stage4_v2*).

Inserting the file name into the footer of each document – To avoid uncertainties about the status of a printed draft, you can get Word to automatically insert its file name into the document's footer as follows:

• Click **View/Header and Footer.**

• On the toolbar that appears, click the footer image in the **Switch Between Header and Footer** icon (see Figure 29)

Use **Insert AutoText** to insert **Filename** into the document's footer.

FIGURE 29. How to select the footer

9.1.6 SELECTING READERS

The people you ask to read your materials are likely to fall into two categories:

• those whose approval you might need administratively; and

• those you choose because they are expert in certain areas and will offer you constructive comment.

Burt (1977) concluded that the people who make good readers:

- have experience of teaching,

- empathise with students,

- are subject experts,

- are conscientious, and

- are creative.

9.1.7 ESTIMATING STUDY TIME

Burt (1977) asked his readers to estimate how long they thought it would take students to study a unit. He found that their estimates varied 'by about a factor of two', but that the mean times they gave for the various units were 'of the right order … when compared with the students' mean study time a year later'. This capacity of a non-consulting group to produce accurate estimates and predictions has recently been confirmed by Surowieck (2004).

9.2 DEVELOPMENTAL TESTING

9.2.1 INTRODUCTION

You can see from the range of topics covered in this handbook that ODL course design is a complex process. However carefully you apply the ideas presented here, in the end you will still need to test the materials to be sure they work well. This process of testing is called **developmental testing** or **piloting**.

> **Issues for instructional designers**
>
> 1. What issues should I explore through developmental testing?
>
> 2. What methods can I use?

9.2.2 PURPOSE

The purposes of developmental testing are:

- to confirm which parts of a course are working well,

- to identify which parts of a course are causing problems for learners, and

- to identify those changes that will remedy the problems that learners have.

Nathenson and Henderson (1976) have pointed out that most developmental testing fails to achieve the third purpose – that is, most testing methods do not produce any suggestions for improving the materials. The authors offer a testing method that can deliver such suggestions (see 'In-text Devices' in section 9.2.4, 'Methods', below).

9.2.3 WHAT YOU CAN FIND OUT

Developmental testing can explore a wide range of issues, but there is rarely time or resources to explore all of them. Rather, you need to select what you think are the most important issues for your course. Some you might want to explore are shown in Table 30.

9.2.4 METHODS

Rowntree (1990) suggests that there are two basic methods of testing materials:

- face-to-face, where you sit down with the learners while they work through the materials; and

- field trials, where you send the materials to learners who are elsewhere.

Some authors (e.g., Zand, 1994) also list 'expert review' as a means of developmental testing.

Face-to-face developmental testing

This method is very simple and can be carried out quickly. The method works as follows:

- Arrange a time to work together with one learner, leaving enough time for the learner to work through, say, one unit of your material.

- Meet in a quiet, relaxing place.

- Explain that the purpose of the session is to test the unit, not the learner.

- Explain that you want the learner to work through the unit, including doing the activities and the self-assessment.

- If possible, start with a pre-assessment so you can find out how much the learner learns from the unit.

- Ask the learner to tell you what he or she is thinking and feeling at each stage (e.g., 'This looks difficult', 'I didn't understand that sentence' and 'This seems too simple').

TABLE 30. Some issues to explore in developmental testing

Item	Issues
Objectives	Are they clear?
	Are they sufficiently detailed?
	Are they too detailed?
	Do learners make use of them?
Pre-requisites	Are these correct for the target population?
	Did we assume some things that learners do not know?
Course structure and components	Is the course structure clear to learners?
	Do learners understand the function of each component?
	Are learners able to use all the components in an effective way?
Learning	To what extent do learners achieve the course outcomes?
	To what extent do learners achieve the outcomes of each unit?
Activities	To what extent do learners complete the activities?
	How helpful do learners find the activities?
Self-assessment	To what extent do learners complete the self-assessment?
	How helpful do learners find the self-assessment?
Language	How clear is the language in the course?
	What difficulties do learners have in understanding the language?
Level	Is the course at the right level?
	Or too easy?
	Or too hard?
Pace	Is the course at the right pace?
	Or too fast?
	Or too slow?
Time	How much time does each unit take?
Interest and motivation	How interesting is the course to students?
	To what extent does the course motivate students to want to study it?

- As the learner works, make notes about what he or she says and what you observe. Your observations might include things like 'Learner skipped pp. 3–5', 'Learner kept going back to p. 7' and 'Learner spent 20 minutes on Activity 4'.

You will then need to repeat this process with a few other learners to identify what sort of problems the typical learner has.

This method has two great advantages over field trials: it is quick and you can ask the learners to explain their comments. The method does, however, require considerable interpersonal skills on the part of the tester. Without such skills, learners will be too nervous to reveal their true response to the materials.

Field trials

Field trials involve sending the draft learning materials to learners who will work through them and send back their comments to you. To be effective, this approach usually requires 10–30 learners.

Before sending out the materials, you need to decide which method (or methods) you are going to use to collect data from your learners. Options include:

- before and after questions

- log sheets

- questionnaires

- in-text devices

- post-trial interviews

These methods are discussed in more detail below.

Before and after testing – Some developmental testing includes 'before and after testing' of learners – that is, learners are given a test before they study the trial materials and then they do the same test after they have studied the trial materials. The difference in the scores between the tests shows how much the learners have learnt from the trial materials. However, this method cannot tell you what is wrong (if anything) with your text.

Log sheets – Log sheets are sheets of paper on which learners record their comments as they work through the draft material. They might record things like:

- how long they spent on each activity,

- parts of the text they could not understand, and

- difficulties they had with particular activities.

Using the log sheets will tell you exactly where the problems are in your text or web site.

Questionnaires – Questionnaires are the most common way of collecting data from ODL learners. There are seven main question types you can use in questionnaires, summarised in Table 31.

The first question type, open questions, is the most informative, but it produces a mass of data that are hard to analyse. For this reason, it is best to use question types 2–7 wherever possible. Those are all examples of closed questions – ones where the responses are restricted to given choices. The responses to closed questions are fairly easy to analyse using computer programs such as Excel or specialised programs for survey analysis.

Important to remember is that questionnaires need to be designed carefully and, when possible, tested. Poorly designed questionnaires can result in low response rates, biased responses or data that is of little value. You might want to seek specialist advice on how to design a questionnaire, or consult a standard work such as Oppenheimer (1992).

In-text devices – Although questionnaires are used extensively in field trials of ODL materials, they rarely locate precisely where the text is difficult, and even more rarely suggest a solution to the difficulty. Three methods have been designed to overcome this problem, two of which involve inserting special field trial questions into the draft course material.

*   *Completing the activities*: The first method is to ask learners to write down all their answers on the pages of the trial materials. These materials are then sent back to the ODL organisation. By examining learners' answers to the activities and self-assessment, you can see where they had problems and what sorts of misunderstandings they had. These errors and problems provide the course designers with good information on what they need to do to improve the course.

*   *In-text data collection questions*: The second method is to use in-text data collection questions. These are questions that are inserted at key points in the course material (e.g., after each activity) to ask learners for their detailed reactions to particular items (see Example 100). One caution is not to overload your test students with these questions.

TABLE 31. The main types of question for use in ODL questionnaires

Question type	Comment	Example
1 Open question	Respondents can write down anything they want to say	What were the best aspects of this course for you?
2 Dichotomous question	Offers respondents two choices	Did you complete Assignment 1? Yes ☐ No ☐
3 Multiple choice question	Offers respondents more than two choices. It is important to cover every possible response. Sometimes this can only be achieved by including a category 'Other'.	In which region do you live? A. North ☐ B. South ☐ C. East ☐ D. West ☐ E. elsewhere ☐
4 Likert scale	Provides a statement. Respondents express their strength of agreement with the statement	Distance learning is the ideal method for me. Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree ☐
5 Semantic differential scale	Provides a scale with two extremes. Respondents indicate where they would place themselves on the scale. The scales usually have 5 or 7 points.	The activities in this course are: Useful ⌐ │ │ │ │ │ ⌐ Usless
6 Ranking question	Respondents are asked to rank a list of items	Please rank from 1 to 5 the following course items. 1 = 'most useful to you'; 5 = 'least useful to you' | Item	Rank
---	---
Module guide	
Study guide	
Assignments	
Tutorials	
Audio cassettes		
7 Numeric question	Respondents are asked for a numeric value	How many assignments did you complete on this course? _____

EXAMPLE 100. A set of in-text data collection questions

Your reactions to Activity 7

Please tell us how you used this activity.

1. Did you complete Activity 7? (If not, please tell us why.)

2. How easy/hard did you find it?

3. Was this activity useful to you? If it was, in what way was it useful?

4. How did your response compare with the one suggested in the feedback?

5. Was the feedback helpful to you? If it was, in what way was it helpful?

6. Was there anything that you still could not understand after having done the activity?

- *In-text data feedback questions*: This third approach involves inserting special tests into the material to find out what the learner has and has not learnt at various points in the unit. According to Nathenson and Henderson (1976), in comparison with other methods, these feedback questions pinpoint 'specific problems in the instruction' and suggest 'possible solutions to those problems'.

This approach is probably the most elaborate development testing system ever devised for ODL. The effort, though, seems to be worthwhile: as the authors note in a later study, the revised course materials resulted in higher student grades and lower study times (Henderson et al., 1977).

Post-trial interviews – A final method is to interview learners after they have completed the trial course. Because interviews allow you to explore issues in depth, you can obtain high quality data on learners' motivations and reactions to a particular course. However, interviews are not an effective way of collecting page-by-page comments.

9.2.5 SCALE AND TIME

Most ODL organisations seem to test courses with 10–25 learners, although they may only receive detailed responses from 5–10 learners. Nevertheless, there is some evidence to suggest that small numbers of testers can provide a valid picture of the strengths and weaknesses of a course (Nielsen, 2000).

SECTION 10: QUALITY ASSURANCE SYSTEMS

OVERVIEW OF SECTION 10

If you decide to follow the advice and ideas set out in this handbook, and to use some of the sources referred to, you will already be taking steps to assure the quality of what you do. In other words, high quality materials arise from the day-to-day, consistent application of good practice, and from reflection, discussion and testing. This section, however, discusses several more formal methods of quality assurance systems.

10.1 INTRODUCTION

Quality assurance systems are simply formal procedures for specifying:

- what is to be done,

- who should do it, and

- to what standard it should be done.

It is important to note that quality assurance is not the same as evaluation. Evaluation is something that is done once a course has been created; quality assurance is a day-to-day process used during the creation of the course.

Issues for instructional designers

1.   What system can I use to ensure the quality of the learning materials?

10.2 PROCEDURES

The first part of a quality assurance system is that of establishing procedures. Procedures are a description of 'the way we do things'. Their purpose is twofold:

- to define what the organisation considers to be good practice, and

- to ensure that staff apply that good practice consistently to current projects.

10.2.1 RANGE OF PROCEDURES

An ODL organisation might have procedures for:

• recruiting writers

• recruiting subject experts

• specifying a course

• writing a course unit

• testing a course.

10.2.2 WHAT A PROCEDURE LOOKS LIKE

A procedure simply says how a standard task will be done and who is responsible for coordinating that task. A simplified version of a possible procedure for producing a course specification is shown in Example 101.

10.3 STANDARDS

In addition to procedures (which set out tasks to be done), many quality assurance systems also have standards – specifications identifying the level or degree to which something is to be done. Standards might be produced for such items as:

• writing a unit of learning (see Example 102),

• manufacturing an audio cassette tape, and

• marking and commenting on an assignment.

EXAMPLE 101. A typical procedure

Procedure for specifying a course

1   Every course shall have a course specification, prepared by the instructional
     designer for that course.

2   The specification shall include:

     •   a working title

     •   the course aims

     •   learning outcomes

     •   the target audience for the course

     •   expected number of enrolments per year

     •   expected life of the course

     •   the need for the course

     •   course length (study hours)

     •   course components and media (e.g., workbook, audio cassette) and extent of
          each (e.g., 120 p.)

     •   prior learning to be assumed

     •   entry restrictions (if any)

     •   tutorial support (e.g., number of tutor-marked assignments, number of local
          centre meetings)

     •   assessment methods

     •   award on successful completion of the course.

3   Course specifications must be approved by the Course Approvals Committee
     before course writing commences.

EXAMPLE 102. A typical standard for writing a unit of learning

Unit writing standard

Every course unit shall contain the following items:

- course number and title

- introduction, setting out:

    - what will be learnt in the unit

    - why that material is important to the learners

- unit contents list

- unit learning outcomes

- for each outcome:

    - appropriate examples

    - a range of learning activities

    - a key points list

- at least one self-assessment question.

10.4 CHECKING PROCESSES

Once procedures and standards have been set, the organisation needs to check that both are being applied. This should be the responsibility of the relevant managers in each area of the organisation. Thus, the manager for materials development would oversee the use of the procedures and standards for materials development.

Further reading

Quality assurance is a fairly technical area of materials production. To learn more, see Freeman (1991).

REFERENCES

Ausubel, D. 1960. The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology* 51: 267–272.

Ausubel, D. and Robinson, F. 1971. School Learning: An Introduction to Educational Psychology. London: Holt, Rinehart and Winston.

Bernard, M., Fernandez, M. and Hull, S. 2002. The effects of line length on children and adults' online reading performance. *Usability News* 4 (2).

Bligh, D. 1998. What's the use of lectures? *Exeter Intellect*.

Bloom, B. (editor) 1956. *Taxonomy of Educational Objectives: Handbook 1: Cognitive Domain*. New York: Longmans Green.

Brookfield, S. 1995. Adult learning: an overview. In: Tuinjman, A. (editor). *International Encyclopedia of Education.* Oxford: Pergamon Press.

Brown, B., Bull, J. and Pendlebury, M. 1997. *Assessing Student Learning in Higher Education*. London: Routledge.

Burgess, H. [nd]. *Problem-based Learning*. Available at: www.swap.ac.uk/learning/pblearning1.asp. Accessed 8 April 2005.

Burt, G. 1977. How do readers comment on the structure of teaching materials? *Teaching at a Distance*, November 1977.

Coldeway, D. 1986. Learner characteristics and success. *Distance Education in Canada,* pp. 81–87.

Co-Metrix. 2004. Readability formulas. Available at: http://csep.psyc.memphis.edu/cohmetrix/readabilityresearch.htm.

Davis, H. and Smith, A. 1996. Changing apples into pears: transforming existing materials. *Open Learning* 11: 10–20.

Dhanarajan, G. and Timmers, S. 1992. Transfer and adaptation of self-instructional materials. *Open Learning* 7: 3–11.

Distance Education at a Glance. Available at: www.uidaho.edu/eo/distglan.html.

Driscoll, M. 2001. *Building Better E-Assessments*. Available at: wwwlearningcircuits.org/2001/jun2001/driscoll.html.

Duchastel, P. 1988. Toward the ideal study guide. *The British Journal of Educational Technology* 14: 216–220.

Elen, J. and Clarebout, G. 2001. Instructional design, towards consolidation and validation. *Interactive Educational Multimedia* October: 1–11.

Forsyth, I. 1996. *Teaching and Learning Materials and the Internet*. London: Kogan Page Limited.

Freeman, R. 1991. Quality assurance in learning materials production. *Open Learning* 6: 24–31.

Freeman, R. 1997. *Managing Open Systems*. London: Kogan Page.

Freeman, R. 2004. *Planning Open and Distance Learning Systems: A Handbook for Decision Makers*. Vancouver: Commonwealth of Learning.

Freeman, R. and Lewis, R. 1998. *Planning and Implementing Assessment*. London: Kogan Page.

French, D., Hale, C., Johnson, C. and Farr, G. 1999. *Internet Based Learning: An Introduction and Framework for Higher Education and Business*. London: Kogan Page.

Fry, H., Ketteridge, S. and Marshall, S. 1999. *A Handbook for Teaching and Learning in Higher Education*. London: Kogan Page.

Gagné, R.M. 1968. *The Conditions of Learning*. New York: Holt, Rinehart and Winston.

Gibson, C. and Graff, A. 1992. Impact of adults' preferred learning styles and perception of barriers on completion of external Baccalaureate Degree Programs. *Journal of Distance Education* 7(1): 39–51.

Harrow, A. 1972. *A taxonomy of the psychomotor domain*. New York: David McKay Co.

Hartley, J. 1994. *Designing Instructional Text* (3rd edition). London: Kogan Page.

Henderson, E., Hodgson, B. and Nathenson, M. 1977. Developmental testing: the proof of the pudding. *Teaching at a Distance,* pp. 77–82.

Henderson, P. 1993. *How to Succeed in Exams and Assessment*. London: Collins Educational and National Extension College.

Holmberg, B. 1995. The evolution of the character and practice of distance education: Börje Holmberg. *Open Learning* 10: 47–53.

Instructional Design Theories. Available at: www.indiana.edu/~idtherory/home.html.

Jonassen, D., Mayes, T. and McAleese, R. 1993. Manifesto for a constructivist approach to technology. In: Duffy, T., Jonassen, D. and Lowyck, J. (editors). *Designing Constructivist Learning Environments*. Heidelberg, FRG: Springer-Verlag.

Kember, D. 1991. *Writing Study Guides*. Bristol: Technical and Educational Services Ltd.

Kember, D. and Murphy, D. 1994. *53 Interesting Activities for Open Learning Courses*. Bristol: Technical and Educational Services Ltd.

Knowles, M. 1990. *The Adult Learner: A Neglected Species*. Houston, TX: Gulf Publishing Company.

Krathwohl, D., Bloom, B., and Masia, B. 1956. *Taxonomy of Educational Objectives. Handbook II: Affective Domain*. New York: David McKay.

Laurillard, D. 2002. *Rethinking University Teaching*. London: Routledge-Falmer.

Lawless, C. 1994. Course design: order and presentation. In: Lockwood, F. (editor). *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing Ltd., pp. 55–63.

Lewis, R. 1990. *How to Write Flexible Learning Materials*. London: NCET.

Lewis, R. and Paine, N. 1986. *How to Find and Adapt Materials and Select Media*. London: Council for Educational Technology.

Lockwood, F. 1992. *Activities in Self-Instructional Text*. London: Kogan Page.

Lockwood, F. (editor) 1994. *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing.

Lynch, P. and Horton, S. 1999. *Web Style Guide*. New Haven, CT: Yale University Press.

McManus, T. 1995. *Special Considerations for Designing Internet Based Instruction*. Available at: http://www.svsu.edu/~mcmanus/papers/special.html.

McMullin, J., Varnhagen, C., Heng, P. and Apedoe, X. 2002. Effects of surrounding information and line length on text comprehension from the web. *Canadian Journal of Learning and Technology* 28.

Mager, R. 1962. *Preparing Instructional Objectives*. Palo Alto, CA: Fearon Publishers.

Martens, R. 1998. Does embedding support devices have an effect in independent learning? *European Journal of Distance Education*. Available at: www.eurodl.org/eurodlen/index.html.

Marton, F. and Säljö, M. 1976. On qualitative differences in learning 1: outcome and process. *The British Journal of Educational Psychology* 46: 4–11.

Mishra, S. 2001. *Designing Online Learning*. Vancouver, BC: Commonwealth of Learning.

Mishra, S. and Gaba, K. 2001. *Learning Activities in IGNOU Study Materials*. Indira Gandhi National Open University (IGNOU).

Morgan, C. and O'Reilly, M. 1999. *Assessing Open and Distance Learners*. London: Kogan Page.

Murphy, D. 2000. *Instructional Design for Self-Learning for Distance Education*. Vancouver, BC: Commonwealth of Learning.

Murphy, E. [nd.]. Moving from theory to practice in the design of web-based learning using a learning object approach. *e JIST* 7. Available at: www.usq.edu.au/electpub/e-jist/.

Nathenson, M. and Henderson, E. 1976. Developmental testing: a new beginning. *Teaching at a Distance,* pp. 28–41.

National Cancer Institute. [nd.]. *Usability Research-Based Web Guidelines: Page Layout*. Available at: http://usability.gov/guidelines/. Accessed 11 April 2005.

Nielsen, J. 1996. *Writing Inverted Pyramids in Cyberspace*. Available at: www.useit.com/alertbox/9606.html.

Nielsen, J. 2000. *Why You Only Need to Test with 5 Users*. Available at: www.useit.com/alertbox/20000319.html.

Nielsen, J. 2002a. *Drop-Down Menus: Use Sparingly*. Available at: www.useit.com/alertbox/20001112.html.

Nielsen, J. 2002b. *Site Map Usability*. Available at: www.useit.com/alertbox/20020106.html.

Novak, J.D. and Gowan, D.B. 1984. *Learning How to Learn*. Cambridge: Cambridge University Press.

Oppenheimer, A. 1992. *Questionnaire Design, Interviewing and Attitude Measurement.* London: Pinter Publishers Ltd.

O'Rourke, J. 2003. *Tutoring in Open and Distance Learning: A Handbook for Tutors.* Vancouver: Commonwealth of Learning.

Pennsylvania State University. [nd.]. *Definitions of Instructional Design*. Available at: www.umich.edu/~ed626/define.html.

Pinker, S. 1994. *The Language Instinct*. London: Penguin Books.

Poon, S., Tang, C. and Reed, S. 1997. Problem-based learning in distance education. In: *Proceedings of the 5th International Conference on Modern Industrial Training,* Jinan, China, pp. 593–600.

Race, P. 1992. *53 Interesting Ways to Write Open Learning Materials*. Bristol: Technical and Educational Services Ltd.

Romiszowksi, A.J. 1981. *Designing Instructional Systems*. London: Kogan Page.

Romiszowksi, A.J. 1986. *Developing Auto-Instructional Materials*. London: Kogan Page.

Romiszowksi, A. 1988. *The Selection and Use of Instructional Media*. London: Kogan Page.

Rowntree, D. 1990. *Teaching Through Self-Instruction*. London: Kogan Page.

Rowntree, D. 1994a. Existing material: how to find it, evaluate it and customize it. In: Lockwood, F. (editor). *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing Ltd., pp. 79–88.

Rowntree, D. 1994b. *Preparing Materials for Open, Distance and Flexible Learning*. London: Kogan Page.

Rowntree, D. 1997. *Making Materials-Based Learning Work*. London: Kogan Page.

Schön, D. 1991. *The Reflective Practitioner*. Aldershot: Arena Ashgate Publishing Ltd.

Sicilia, M. and García, E. 2003. On the concepts of usability and reusability of learning objects. *International Review of Research in Open and Distance Learning*. Available at: www.irrodl.org/content/v4.2/sicilia-garcia.html.

Sosteric, M. and Hesemeier, S. 2002. When is a learning object not an object? A first step towards a theory of learning objects. *International Review of Research in Open and Distance Learning,* October 2002.

Surowieck, J. 2004. *The Wisdom of Crowds*. London: Little, Brown.

Swales, C. 2000. *Editing Distance Education Materials*. Vancouver, BC: Commonwealth of Learning.

Toeplitz, O. 1963. *The Calculus: A Genetic Approach*. Chicago: The University of Chicago Press.

Tufte, E. 1983. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press.

Ward, C. 1981. *Preparing and Using Objective Questions.* Cheltenham: Stanley Thornes.

Wiley, D. 2000. Learning objects need instructional design theory. In: Wiley, D.A. (editor). *The Instructional Use of Learning Objects*. Available at: http://reusability.org/read/.

Woodley, A. and Ashby, A. 1994. Target audience: assembling a profile of your learners. In: Lockwood, F. (editor). *Materials Production in Open and Distance Learning*. London: Paul Chapman Publishing Ltd.

Zand, H. 1994. Developmental testing: monitoring academic quality and teaching effectiveness. In: Lockwood, F. (editor). *Materials Production in Open and Distance Learning.* London: Paul Chapman Publishing Ltd., pp. 121–130.