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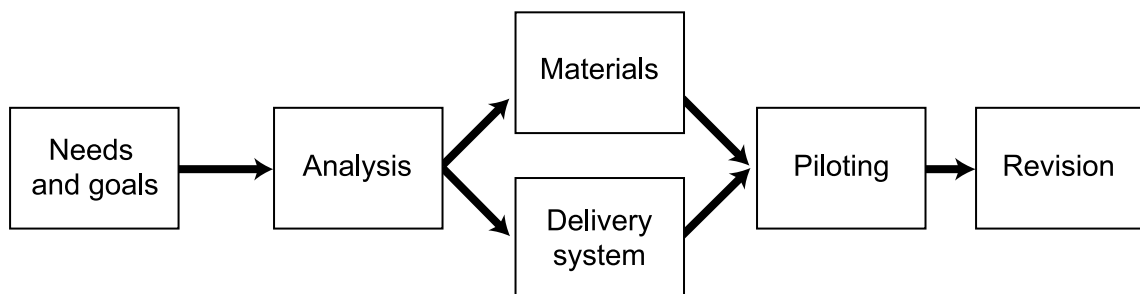
In classroom-based teaching, the basic resource is the teacher. He or she may use other resources such as textbooks or audio-visual aids, but the teacher remains the central component of the system. He or she performs many functions. He or she:

- 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.

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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) $0.28571\dot{4}$	(c) $3.\ddot{6}\ddot{4}$	(d) $7.\dot{1}\dot{2}$
(e) $0.\dot{5}4\dot{3}$	(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.