Indira Gandhi National Open University
Staff Training and Research
Institute of Distance Education

MDE-412
INSTRUCTIONAL DESIGN

FOUNDATIONS OF LEARNING

Behaviouristic School of Thought

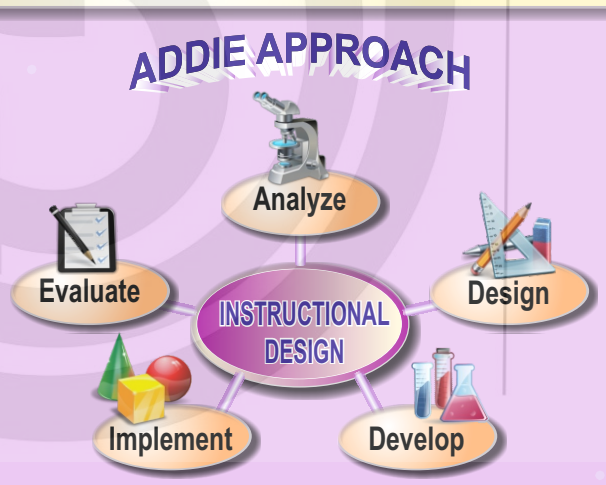
Cognitivist School of Thought

Constructivist School of Thought

INSTRUCTIONAL DESIGN THEORIES AND MODELS

Elaboration Theory

The 4C-Instructional Design Model



Characteristics of Learners and Learning Styles

Instructional Design and Multi-media

Instructional Design and E-Learning

UNIT DESIGN

Structure

Introduction and Objectives

Subject Matter/Content

Section-1	Section-2	Section-n
In-Text Questions	In-Text Questions	Activities
Self Check Exercises	Self Check Exercises	In-Text Questions
Activities	Activities	Self Check Exercises

Summary

Answers to Check Your Progress

Assignments

Volume 2

MDE-412
Instructional Design

Indira Gandhi National Open University
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Distance Education

VOLUME 2

Block 3
INSTRUCTIONAL DESIGN PROCESSES 13

Block 4
INSTRUCTIONAL DESIGN IN PRACTICE 91

Block 5
DEVELOPING PORTFOLIOS 183

MDE-412: Instructional Design

Course Outline

Block 1 Foundations of Learning

Unit 1 Learning and Instruction

Unit 2 Behaviouristic School of Thought

Unit 3 Cognitivist School of Thought

Unit 4 Constructivist School of Thought

Block 2 Instructional Design: Theories and Models

Unit 5 Instructional Design: An Overview

Unit 6 Component Display Theory (CDT)

Unit 7 Elaboration Theory

Unit 8 Cognitive Load Theory (CLT) and Cognitive Flexibility Theory (CFT)

Unit 9 Theory of Multiple Intelligences

Unit 10 The 4C/ID (The Four Component/Instructional Design) Model

Block 3 Instructional Design Processes

Unit 11 The ADDIE Approach (Analyze, Design, Develop, Implement and Evaluate)

Unit 12 Learners' Characteristics and Learning Styles

Unit 13 Designing Learning

Unit 14 Development of Learning Resources

Unit 15 Evaluation of Learning

Block 4 Instructional Design in Practice

Unit 16 Instructional Design in Classroom

Unit 17 Instructional Design in Training

Unit 18 Instructional Design in Distance Education

Unit 19 Instructional Design in Multimedia

Unit 20 Instructional Design in e-Learning

Block 5 Developing Portfolios

Unit 21 Portfolios: A Review

Unit 22 Design and Development of ePortfolios

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MDE-412: Instructional Design

(New Course in place of ES-312: Design and Development of Self-Learning Print Materials)

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REVISITING THE COURSE MDE-412: INSTRUCTIONAL DESIGN

Dear Learner!

We welcome you to the Course MDE- 412: Instructional Design.

Rapid advances in Information and Communication Technology (ICT) have led to a tremendous increase in the number of programmes and courses offered through Open and Distance Learning (ODL) for diversified groups of students. This has resulted in a need for designing and developing courses and programmes in a dynamic way which are offered to distance learners based on the philosophy of open learning. In recent years, many ODL institutions have started offering programmes through computer based instruction along with other media such as online, print, audio, video and multimedia. Consequently, the need for designing instructional materials in varied formats for meeting the demands of the distance learners is growing. It is to meet this need that the Course MDE-412 'Instructional Design' has been developed by STRIDE of IGNOU as an M.A. (Distance Education) course.

The mechanisms to design programmes and courses in ODL institutions are continuously evolving and are as dynamic as the philosophy of open learning and are changing with the development of ICT. Many innovations that take place in the process of course/ programme development and delivery have been incorporated, and it has led to the growth of a systematic approach to the process of designing courses and programmes in ODL.

This course offers you a knowledge base for designing instruction starting from print media to multimedia and e-learning for effective distance teaching. In this course, we offer a structure and rationale to underpin all aspects of designing instruction by maintaining a balance between a sound theory and model as well as practical implications. The influences of ICT, trends and divers over the last few decades, as well as current imperatives and initiatives have been presented in this course. In other words, this course aims at identifying the steps in the instructional design process and implementing them to create learning materials and environment. The purpose of this course 'Instructional Design' is to help you to meet the demanding task of designing instruction in distance education for facilitating learning in students.

Volume 1 (Block 1 & 2)

This course begins with Block 1 named '*Foundations of Learning'*. This Block provides a basic idea of what learning is and how we learn. This Block focusses on the specific terms, instruction, learning, and the dominant theories of learning namely Behaviouristic School of Thought, Cognitivist School of Thought, and Constructivist School of Thought. In this Block, we look at the theories of learning in a broad sense in order to give a framework for a more detailed discussion pertaining to designing instruction for distance learners that follows in consequent Blocks.

In Block 2, we focus on several '*Instructional Design: Theories and Models*' and introduce you to a number of reference points that must be considered for designing courses and programms. There are two important threads that emerge from this block: the use of instructional technology and the need for including them in the design process where we consider that design is a process of reflection in action. The six units presented in this Block represent a combination of the published work on instructional design and the research on best practices of teaching, learning and assessment strategies pertaining to theories and models of ID. Although there are a variety of models, but this Block focuses only a few relevant models for designing instruction.

Volume 2 (Block 3, 4 & 5)

Block 3 named '*Instructional Design Processes'* provides a detailed discussion on various processes of designing instruction. In Unit 11 of this block, the ADDIE approach is explained which is an acronym for analyze, design, develop, implement and evaluate. ADDIE is considered as an illustration of the important steps involved in instructional design processes. As you read this Block of instructional design processes, you should keep in mind the models you have studied in Block -2 (previous volume), which can help you plan the instructional events after assessing the needs of distance learners. Once the need assessment activities have been carried out and the learning characteristics have been identified as discussed in Units 11 and 12, the instructional designer is required to set the objectives of a course or programme. In Unit 12, we have discussed the learner characteristics and learning styles and the implications for designing instruction that meet different learning preferences. Unit 13 provides guidance on writing learning outcomes and matching your content to the outcomes. Unit 14 focuses on developing learning resources for diverse learners and supporting related learning environment of the design cycle. This unit discusses features and types of learning resources and guidelines for designing learning resources. Unit 15 discusses evaluation of learning which explains how we can find out if the learners have learnt or not. We look at the Why? What? When? and How? aspects of assessment with reference to 'Kirkpatrick's levels of evaluation'.

Block 4 describes *'Instructional Design Practice'*. This Block presents you instructional strategies and models carried out in designing classrooms, distance teaching study materials, training programmes, multimedia and e-learning. A comprehensive structure for lesson planning, course design, unit design, use of ADDIE approach in multimedia and e-learning strategies, etc., are presented for providing knowledge and insight that you will use while designing instructions at various levels.

Block 5 is on '*Developing Portfolios'*, which provides basic information pertaining to concept of a portfolio, components of portfolios, purpose of using portfolios, and how to develop an ePortfolio pertaining to instructional design.

The course coordinators are grateful to the content editor, various unit writers, and colleagues at STRIDE and distance learners for readily cooperating for completion of this course.

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We hope you will find this course, underpinned by a sound theory, as a practical guide that helps you to design and develop units/courses/programmes for distance learners.

Best wishes

Basanti Pradhan & Anita Priyadarshini
Course Coordinators

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MDE-412
Instructional Design

Block

3

INSTRUCTIONAL DESIGN PROCESSES

UNIT 11
The ADDIE Approach (Analyze, Design, Develop, Implement and Evaluate) **13**

UNIT 12
Learners' Characteristics and Learning Styles **27**

UNIT 13
Designing Learning **44**

UNIT 14
Development of Learning Resources **59**

UNIT 15
Evaluation of Learning **72**

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BLOCK INTRODUCTION

Welcome Learners!

As you are aware that the purpose of this Course MDE-412: Instructional design is to help you to meet the challenging task of designing instruction and facilitate student learning in ODL. Keeping in view the needs and importance of this learning task the present *Block 3: Instructional Design Processes* is prepared to provide you the application of the theories of learning and models of instructional design.

There are many instructional design models (Ref.: Block 2, Unit 5), which are used for preparation of the instructional materials i.e., print, video, audio or multimedia programmes, learning objectives and e-learning content. Most of these instructional design models are spin-offs or variations of the ADDIE approach, (analyze, design, develop, implement and evaluate).

Unit 11: The ADDIE approach is a framework that lists generic process used by instructional designers and course developers. In this unit, we have discussed the steps involved in ADDIE approach and its implication for designing instruction for a given topic/theme.

In Unit 12, we have discussed an important stage of instructional design process i.e. learner analysis. We have also explained the characteristics of learners and corresponding design procedures for learning. We have also discussed learner-centric approach and concept of learning styles. One of the most important topics that are described in this Unit are families of learning styles and their implications for designing instruction.

Unit 13: Designing learning focuses on writing objectives, identifying appropriate content and different taxonomies of learning outcomes. We have also discussed Bloom's taxonomy of learning objectives, SOLO taxonomy and revised Bloom's taxonomy by Anderson et al., 2001.

Unit 14: Development of learning resources explains different types of learning resources, which you can use for designing instruction. These learning resources include text, diagrams, pictures, audio, video and web components, which aim to promote and guide student learning.

Unit 15: Evaluation of learning describes purpose of assessing learning, evaluation measures (Criterion-Reference assessment and Norm-Reference assessment) and types of assessment in ODL. In this unit, we have also presented Kirkpatrick's Model of Evaluation, which helps us to ascertain the effectiveness of the instructional design components and training programmes in ODL.

We hope you will find this *Block 3: Instructional Design Processes* covering Units 11 to 15 interesting and it would help you to design courses/programmes for students and also for training purposes.

Best wishes

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Course Coordinators

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UNIT 11 THE ADDIE APPROACH (ANALYZE, DESIGN, DEVELOP, IMPLEMENT AND EVALUATE)

Structure

11.1 Introduction

11.2 Learning Outcomes

11.3 Instructional Design (ID) Approach: ADDIE

11.4 Analysis Phase: Learning Environment Analysis

- 11.4.1 Defining Learning Environment
- 11.4.2 Components of a Learning Environment

11.5 Design Phase: Designing for Learning

- 11.5.1 Formulating Learning Objectives
- 11.5.2 Identifying Appropriate Content
- 11.5.3 Selecting Suitable Methods of Delivery
- 11.5.4 Evaluating Learning Outcomes

11.6 Development Phase

- 11.6.1 Instructional Design and Materials Development
- 11.6.2 Stages of Developing Instructional Materials and Writing a Story Board

11.7 Implementation Phase

11.8 Evaluation Phase: Evaluation of Learning

11.9 Adaptation to the ADDIE Approach (Rapid Prototyping)

11.10 Let Us Sum Up

11.11 Check Your Progress: Possible Answers

11.1 INTRODUCTION

In Blocks 1 and 2 (volume 1) of this course, you have studied the meaning of learning and instruction. You have also studied in the previous units various learning theories and the perspectives of learning from various schools of thoughts such as behaviouristic, cognitivist and constructivist (Block 1). Besides, you have also studied various theories and models of instructional design (Block 2). These models of instructional design help you to acquire information, skills and attitude through a plurality of approaches, methods and techniques. These methods have a positive effect on the learners, including the way they learn. Therefore, no single model, method, approach and technique best suits all situations. Hence there is a need to explore and use a variety of models to facilitate students learning. Even these may differ from unit to unit, subject to subject while addressing a heterogeneous group of learners. This demands the need for selection of approaches of instructional design.

In this unit, we have discussed the ADDIE approach of instructional design. They are analyze, design, develop, implement and evaluate (ADDIE). You will also learn about adaptation to ADDIE approach (rapid prototyping).

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11.2 LEARNING OUTCOMES

After going through this unit, you should be able to:

- define instructional design;
- identify different phases in ADDIE approach;
- describe the analysis phase;
- explain the design phase;
- describe the development phase, developing materials and writing a story board;
- explain the implementation and evaluation phases; and
- differentiate between classic design approach and rapid prototyping approach.

11.3 INSTRUCTIONAL DESIGN (ID) APPROACH: ADDIE

Instructional Design is a process for the design of learning situations and there are common tasks involved in most of the models available or on practice. The instructional designers and trainers use instructional design for different purposes. Whether it is designing a face-to-face or distance education or online course, a lesson plan for students of a particular class, writing a media script for the production of a programme (audio, video or film) and designing multimedia script or story board for multimedia packages and learning objects, instructional design is commonly used. Certainly, the effectiveness of a programme or a course, a unit, a lesson plan, script and storyboard depends on the type of instructional design selected and developed for the purpose. A good instructional design certainly influences the learning environment and helps to enhance the quality of education in general.

Instructional Design is a systematic process for facilitating human learning. The process of instructional designing includes steps such as analysing the learner's profiles, listing the instructional objectives and goals, development of materials, planning of intervention to facilitate transfer of learning.

Therefore, instructional design is the process of maximizing the effectiveness, efficiency of instruction and other learning experiences. This process consists broadly of determining the current state and needs of the learner, defining the end goal of instruction, and creating some 'intervention' to assist in the transaction of learning.

There are many instructional design models (Ref. Block 2, Unit 5), which are used for the preparation of the print, video, audio or multimedia programmes and learning objects. Most of the current instructional design models are spin-offs or are some variations of this approach.

According to Brown and Green (2016), 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.

One of the most commonly used descriptions of instructional design/development is ADDIE, which is an acronym for analyze, design, develop, implement, and evaluate (see figure 11.1). Although many ID practitioners use ADDIE as a prescriptive model for developing instruction, it is actually a means of describing the essential components of any instructional design model (Molenda, 2003).

Scholars generally agree that ADDIE is an illustration of the essential steps of the instructional design/development process (Molenda, 2003; Reiser & Dempsey, 2002). According to Brown and Green (2016), ADDIE is particularly useful as a framework for comparing and contrasting more formally and completely developed instructional design/development models.

According to Morrison, Ross, Kalman, and Kemp (2011), ADDIE is an acronym referring to the major stages in the generic Instructional Systems Design (ISD) process: Analysis, Design, Development, Implementation and Evaluation.

The ADDIE approach is a framework that lists a generic process that instructional designers and training developers use as an effective training and performance support tool. It has five phases i.e., analysis, design, development, implementation and evaluation. Instructional theories and models also play an important role in the design of instructional materials. Learning theories such as behaviorism, constructivism, social learning, and cognitivism help to shape and define the outcomes of the instructional materials.

A graphical presentation of the ADDIE approach is given in Fig. 11.1.

Fig. 11.1: ADDIE Approach

The ADDIE approach which has evolved from many models is a very popular approach used by the instructional designers across the world. The ADDIE approach provides a framework for instructional designers and training developers. The five phases — Analyze, Design, Develop, Implement, and Evaluate (ADDIE) — represent a dynamic, flexible guideline for building effective training and performance support tools. One commonly accepted improvement to this approach is the use of rapid prototyping. This method is followed mainly for receiving continual or formative feedback while instructional materials are being created. You will read about this method in section 11.9 of this unit. The ADDIE approach is also used for development of multimedia programmes and learning objects.

The ADDIE approach was introduced by the Center for Educational Technology at Florida State University to explain the processes involved in the formulation of an Instructional Systems Development (ISD) program for military inter service procedures intended for the Army, Navy, Air force and Marine Corps to train individuals to do a particular job. This approach has five phases and the idea is to complete each phase (analyze, design, develop, implement, and evaluate) before moving to the next.

Let us discuss each phase in detail.

11.4 ANALYSIS PHASE: LEARNING ENVIRONMENT ANALYSIS

It is seen that before starting development of any unit/lesson plan/audio/video/multimedia programme, several questions come to the mind of an instructional designer, i.e., who is the target audience? What is their learning styles? What is the purpose of developing the material? What should be the nature of content and subject matter? These questions need to be answered in certain terms. While analysing the learners' background profile, the exposure and conditions in which the instructional materials are to be used needs to be analysed. For example, if we are developing a multimedia programme for students, their interests, motivation level, etc., need to be considered. Even the hardware and

software requirement for playback of multimedia programmes needs to be studied and taken into consideration. Also, it is very important to decide the content delivery platform i.e., computer, laptop, i-pad, mobile phone, etc. Unless there is clarity on these issues compatibility between the need and the outcome will not be achieved. Necessarily analysis should capture the requirements and set of expectations from material(s) to be developed. In the analysis phase, the instructional problem is clarified, the instructional goals and objectives are established and the learning environment and learner's existing knowledge and skills are identified.

11.4.1 Defining Learning Environment

The whole range of components and activities within which learning takes place is referred to as learning environment. The learning takes place within a web of social relationships as teachers and pupils interact both formally and informally. The basic question that arises is how can we organise the environment that supports and enhances teaching and learning? How can the diverse needs of learners be addressed while conceptualising any teaching and learning resources? For this, the physical and psychological dimensions of the environment are important and interrelated, and need to be taken care of.

11.4.2 Components of a Learning Environment

The learning environment refers to the diverse physical locations, contexts, and cultures in which students learn. As students learn in a wide variety of settings, such as indoor and outdoor environments, there is a need to link their varied experiences.

Learning environment encompasses the culture of teaching and learning, which may be a class room, online learning, as well as learning at a distance. This includes how individuals interact with and treat one another, as well as the ways in which teacher organizes an educational setting to facilitate learning. These may include task such as conducting classes in relevant setting, groupings, organizing the learning materials, or utilizing audio, visual, and digital technologies. The qualities and characteristics of a learning environment are determined by a wide variety of factors such as institutional policies, governance structures. Learning environments have both a direct and indirect influence on student learning, including their engagement in learning, their motivation to learn, and their sense of well being, belonging, and personal safety. How learners interact with the other learners and with their peers may also be considered as key aspects of a learning environment?

So, while designing any instruction for a target audience, the collection of data pertaining to learning environment should include the following components in the analysis phase: who are the beneficiaries? (individual/group), whether they are in formal/non-formal/ informal system?, whether supported with a facilitator or a peer learner?, what kind of technical facilities are available with the learners?, whether having access to infrastructural facilities including internet and required softwares/hardwares? If yes, what specifications and other socio-cultural aspects will help the instructional designer in finalisation of the design?

In other words, learning environment facilitates student centered learning, collaborative work, discovery and innovation, information exchange, active and inquiry based learning, critical thinking and performance assessed by teachers, members, peers and self.

The learning environment needs to be decided keeping in mind the characteristics of learners. Hence, information related to the learners, academic levels, and other attributes like skills, motivation, language competency, learning styles, and special needs should

be gathered and accommodated in the material design. The needs of differently-abled learners as well as learners from different backgrounds also should be considered while designing any instructional materials.

11.5 DESIGN PHASE: DESIGNING OF LEARNING

After the analysis phase, let us now come to the design phase.

The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, and lesson planning and media selection. The design phase is where the instructional strategies are designed and media choices are made. The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the project's goals. Specific means each element of the instructional design plan needs execution with attention to details.

In this phase, the activities are: formulating learning objectives, identifying appropriate content, selecting suitable methods of delivery and evaluating learning outcomes. In the case of a multimedia programme, the interactivity aspect is also decided in advance.

Some important considerations for the various sub processes in the design phase also are: content and strategies need to be contextually relevant, gender and racially sensitive, and should promote concerns related to environmental awareness, peace oriented values, inclusion, recognise constitutional values, national integration and develop scientific temper.

In the design phase, the prototype testing of the material is also included so that necessary changes can be made before development.

Now let us look at the various activities involved in the design phase.

11.5.1 Formulating Learning Objectives

An objective is a statement of the intended performance of a learner. The performance identified is usually executable, observable and measurable. Since the terminal performance refers to modified behavior of the learner, an objective is also termed as behavioural objective. Sometimes, it is termed as instructional objective, because it provides direction to the teacher for selection of content and learning experiences for designing instruction. The statement of an objective for a learner is akin to the destination for a traveller. The destination and the route must be specified before a travel plan is made. Route points are analogous to 'enabling objectives', which facilitate the achievement of terminal objectives. If one did not know where one is going to reach, the person is not likely to reach there at all. It is the objectives i.e. desired terminal abilities of the learners that decide that teaching-learning strategies and resources that should be employed to match the learning styles of the students. Actually in the entire teaching-learning evaluation cycle begins with objective and ends with evaluation. The most important parameters in a specific objective are action, process and output designed for the learner. Therefore, objectives need to be formulated carefully and should cover the cognitive (knowing), affective (feeling) and psychomotor (doing/skill) domains of learning. Action verbs like define, list, compare, calculate, sequence, classify, judge, locate, evaluate, design, etc., can be used while stating the objectives. While designing instructions, it is important to remember to specify objectives that are clearly defined, realistic, relevant, achievable and measurable (Refer Unit 13 of this block).

11.5.2 Identifying Appropriate Content

The identification and selection of appropriate content is an important step in any instructional design process. Content analysis needs to be carried out and content, which is difficult for learners needs to be identified. The sequencing of the content and its structuring needs to be done logically. There is a need to ensure that the content is relevant, appropriate and follows the pedagogic principles. Hence, content needs to be designed from simple to complex, known to unknown, concrete to abstract, general to specific. The following parameters need to be kept in mind while identifying and selecting the appropriate content:

- Appropriate topics and themes for relevant stages of a learner's development.
- Content to be actual and factually correct and objective-based.
- Language and the (linguistic) content needs to be appropriate for the target group.
- Continuity of content from theme to sub-theme, one level to the next level of the learner needs to be maintained.
- Inter-disciplinary and thematic linkages between topics listed for different themes/ subjects, which fall under distinct disciplinary areas.
- Linkages between knowledge imparted in formal settings in different subjects and also with the learner's everyday experiences.
- Infusion of environment related knowledge and concern in all subjects and at all levels.
- Sensitive to gender, religion, caste and class parity, and needs of all learners including those with disabilities.
- Integration of activities focusing on related attitudes and values in every content, subject and at all levels.
- Ensures aesthetic sensibility and values by integrating the arts and heritage of crafts in every aspect of the content selection.

It must be ensured that the content is pedagogically structured, and in consonance with the learner's profile (their age, level, interest, background, and learning styles).

11.5.3 Selecting Suitable Methods of Delivery

The next step is to select a suitable method of delivery of the content, after identifying the content. The content delivery mechanism may differ with nature and the level of learners. In the context of open and distance learning, the content is delivered through print, audio, video and multi-media. For example, an audio programme developed for learners of music course will be more appropriate where as in the case of social science course, the delivery can be through a lecture or panel discussion or through printed materials. The method of delivery should be suitable for learners as per their needs. Therefore, the learner profile needs to be kept in mind while selecting the suitable methods of delivery of content. Their age, attention span, interest, learning styles are very important to be considered, while designing instruction for different media, other methods of delivery like documentary, docu-drama, features, role play, case studies, etc. can be thought of for inclusion. For example, in case of designing a multimedia programme, suitable media, i.e., audio, graphics, animations, simulations, etc. need to be embedded within the presentation of content. A media mix of printed materials in combination with audio, video, graphics, animations, games, quizzes, puzzles, interactivity, etc. is appropriate and engaging for learners of various age groups. The constructivist methods like discovery, problem-solving, project method, observation, demonstration, and collaboration can also be adopted.

11.5.4 Evaluating Learning Outcomes

Instructional design is concerned with the preparation of appropriate learning design for a meaningful and effective learning environment. Evaluation should be a way of assessing whether the intended learning objective has been achieved at the end of learning process. This also provides credible feedback on the extent to which learning has taken place. Therefore, at the design phase itself, appropriate evaluation strategies need to be specified and inbuilt in the design itself. Such provisions in the form of practice, games and quizzes, pre-tests, post-tests, remedial measures, etc. infused with the content and methodology are needed. In other words, the goal at this stage is to evolve a learner evaluation scheme that includes a variety of assessment techniques that are consistent with the learning objectives (Refer Unit 13 of this block).

Finally, it is important to remember that the design phase also underscores steps for prototype testing. For example, if a series of 20 multimedia videos are to be produced on pollution, then a prototype programme on pollution needs to be designed for testing in terms of story line, language, presentation formats/methods used, content coverage, pacing, music, sound effects, overall treatments. If the prototypes are found to be effective and liked by the target group then mass production of such programme series can be planned. Therefore, the plan for field testing of the prototype with the target audience and experts need to be finalised at this stage.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Describe the ADDIE approach.

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2) List the steps followed at the design stage of ADDIE approach.

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11.6 DEVELOPMENT PHASE

Now after the analysis and design phase, it is time to actually develop the instructional materials. This is the phase where instructional designers and developers create and assemble the content assets that were decided in the design phase. In this phase, storyboards are created, content is written and graphics are designed. If e-learning is involved, programmers work to develop and/or integrate technologies. Testing performs debugging procedures. In this stage the script/lesson plan/story board is written,

multimedia is produced, process documentation is done, and formative assessment of the produced programme is carried out. The project is reviewed and revised according to the received feedback.

11.6.1 Instructional Design and Materials Development

The development phase is as varied as the selected media, the instructional strategies specified, and the content outlined. This is where we turn our design into printed self-learning material, audio, video programmes, interactive multimedia, workbooks, and training handbooks. The content is carved out based on the instructional strategies, and actually produced for the selected media.

There are three broad types of development processes, based on the type of delivery method that is selected: print, electronic, or face-to-face training. As an instructional designer, you may be involved in the development of materials of a course or a programme. Developing print media such as self-learning material and workbooks usually involves a team, which includes instructional designers, course writers, language editor, format editor, copy editors, graphic artists, photographers, page layout artists and proof readers. Depending on the size of the organization and the nature of the course, there may be additional specialists or some of these roles may be combined in a single individual.

Electronic delivery systems, such as video and multimedia, require a different development process to certain extent, though the system as a whole is analogous to the development of print media. Again, nearly all projects involve a team which may include instructional designers, producers, directors, story board artists, script writers, set designers, computer graphics designers and animation artists, videographers, sound technicians, lighting technicians, actors, video editors, computer programmers, program evaluators, and duplication and distribution people. Similarly, many of these roles may be combined and can be administrated by an individual for a small project, and many additional people may be involved in a large project. Here instructional designer can play roles ranging from writing lessons to supervising or managing an entire project.

11.6.2 Stages of Developing Instructional Materials and Writing a Storyboard

The process of material development (print or e-materials) is a crucial step in any instructional design process, which involves the following stages:

- Development of a storyboard;
- Preparation of concept map;
- Finalisation of detailed content analysis and content generation;
- Selection of instructional strategy;
- Selection of media and designing a media mix;
- Selection of appropriate mode of multimedia;
- Development of multimedia packages;
- Preparation of achievement test.

The process of finalization of detailed content analysis, preparation concept map and formulation of objectives along with development of material have been discussed earlier.

In this sub-section, let us focus on writing a storyboard for a multimedia programme. Let us see what is a storyboard and what are the components of a storyboard.

A storyboard is a document that contains a sequential and detailed description of the screens that will constitute the instructional design of a multimedia programme. A storyboard is referred to by the entire project development team to deliver successful learning experience through multimedia. The storyboard specifies the development responsibilities for each member in the team. Therefore, minute and precise detailing of every screen is critical and important in storyboarding. Writing and execution of the story board is team work, hence the development team is constituted by instructional designers, graphic artists, subject matter experts, programmers, managers, language experts and clients. Further, the multimedia storyboard needs to have a media mix and user interface design to facilitate navigation.

The components of a multimedia storyboard are given as below:

1) Text
2) Audio
3) Video
4) Graphics
5) Synchronization
6) Animation
7) Interactivity
8) User Interface Design

The multimedia storyboard needs to have identifiers such as subject, title, sub-title, topic/section name, screen number, document version for the convenience of the learners. The user interface design should have a colour scheme, screen layout, arrangement of title bars, navigation buttons, text, and graphics, etc. The on-screen text (screen titles, instructional text, content text, titles of labels, buttons, graphic) and text embedded in graphics/animation need to be integrated and synchronised with audio and video. Precautions may be taken to follow precise and crisp writing, consistency in terms of font type, size, alignment and having clear visibilities and readabilities. A multimedia needs to house a variety of resources, i.e., images, sketches, collage, illustrations, diagrams, flow charts, concept maps, screenshots, maps, text balloons/cut outs, animated characters, graphs, and mascot, etc. However, verification of alignment, size, colour combination, placement and overall impact needs to be monitored. Interactivity is a key to the success of any multimedia, therefore, it needs to be planned specifying the user actions and the relevant responses because it arouses interest among learners and provides scope for feedback. The storyboard is prepared based on the set objectives and defined instructional strategies.

Check Your Progress 2

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) What are the various stages for developing instructional materials?

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2) What is a storyboard? Describe the components of the storyboard.

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11.7 IMPLEMENTATION PHASE

There are a number of issues involved in implementation phase. In case of print-based instruction, these issues are duplication and distribution, the receiving audience, the reusability, the workability, the updating of the document, and making sure that all revisions are made in the final copy, and information used from various sources, each copyright free and ready for reuse, and acknowledgement of sources is properly done.

In case of electronic instruction most of the things are similar to that of print-based instruction. A few issues are additionally taken care of, like the workability/compatibility of the software on various platforms within the organisational framework. In case of incompatibility, the access of required hardware and software for the learners must be provided, so that they can use the available resources (audio/video) without any trouble, and in case of any difficulty proper assistance should be available.

While print-based and electronic instructions are designed as standalone materials, training of the implementers perhaps poses the greatest challenge in the implementation phase. Who will coordinate scheduling of facilities, trainers, and participants? Will training take place in a central facility or "out in the field"? How will the trainees and or participants commute from the venue to residence and back? How will the workshop materials reach to the site? Will the trainers need any specific equipment? Will they need technical support on site? Will they need logistics? The implementation phase is necessarily interwoven with evaluation. As learners receive the instruction, we need to know whether they like it, whether they are learning from it, whether they are using it, and whether the materials are making any difference in their levels of learning. If the program proves weak in any of these areas, the designer need to go back, perhaps all the way back to performance analysis in some cases, to revise the approach and continuing the cycle further till the goal is achieved.

This phase helps us in detailing an implementation strategy and putting the required structures and mechanisms in place. Taking a holistic view of presenting the multimedia as a solution to a learning problem, a quality assurance mechanism must provide guidelines and indicators for both these stages. A comprehensive strategy document, and instructional manual, a road map for execution, or an appropriate and realistic timeline for implementation will help in effective and efficient delivery of any instruction.

11.8 EVALUATION PHASE: EVALUATION OF LEARNING

Evaluation is an integral part of instructional process. It involves three basic steps. They are (1) identifying and defining the intended learning outcomes, (2) constructing or selecting tests and other evaluation instruments relevant to the specified outcomes, and (3) using the results to improve learning and instruction. Similarly, evaluation is

integral to every phase of the ADDIE approach. Placing evaluation at the end of a project is not advised, since by that time not much can be done about the inevitable weaknesses, which are uncovered.

In general, there are two types of evaluation: formative and summative. As their names imply, we conduct formative evaluation during the analysis, design, and development stages of the project and the summative evaluation during or after the product or program implemented. Formative evaluation varies depending on the type of instruction we have created. For instructional products either print or electronic the rapid prototyping method, coupled with usability and learning ability testing, can be applied. Prototypes are partial realizations of end products, they can take the form of outlines, storyboards, mock-ups, simulations, or simply preliminary versions of the product with partial implementation of either features, content, or both. Software developers often have quality control departments that specialize in usability testing, as well as software bug-testing (Refer Unit 15 of this block).

Formative evaluation for instructional program development is usually a little different. In the case of school classrooms and other ongoing training programs, new lessons or units can be piloted as parts of a larger programs. Plugging a new module into an existing curriculum for a while can give some idea of how well the new instruction will work. Entirely new workshops or courses may need to be piloted with small groups with intensive evaluation and revision before their wide distribution.

Summative evaluation is aimed more at demonstrating to sponsors how effective a finished instructional product or program is. The tools of summative evaluation include both quantitative and qualitative methods. Quantitative methods include standardized and custom made achievement tests, attitudinal surveys, and questionnaires, etc. Qualitative methods include case studies, peer or supervisory reviews, and many more.

If formative evaluation is well planned and executed and the results are used to adjust the design and development of the product or program, the results of the summative evaluation should be a foregone conclusion. Emphasis on formative evaluation at every stage of the ADDIE approach is a key to success.

Evaluation phase covers various aspects related to the instructional, visual, technical design, pedagogy, and costs, etc. A framework has to be developed for effective assessment while ensuring adequate budgetary provisions are made for the same, and one that allows both formative and summative evaluation. Prototype testing thus would form an important step right from the design stage itself.

Purpose of Learning Assessment

Assessment is done to determine the progress and is used as an activity to measure student learning and other aspects. We assess people in terms of their learning and achievements. Assessment of students' learning begins with the objectives of learning. Objectives can be what we want students to learn and as instructors how can we help students strive to achieve this learning. Assessment is most effective when it reflects an understanding of learning as integrated and revealed in the performance of the learners over time.

Through assessment, educators meet responsibilities to students and to the public. However, assessment should not be done just for the sake of justification of programme, but more importantly to make certain that they are giving the best opportunities to students (See Block 3, Unit 15, Section 15.3).

11.9 ADAPTATION TO THE ADDIE APPROACH (RAPID PROTOTYPING)

Prototyping is a method of production usually applied for automobiles, architecture animation and software development. Rapid prototyping is a production strategy that requires starting with a very sketchy idea that evolves through multiple prototype to arrive at a finished piece. Rapid prototyping is a different approach to the design and development of instruction. For example, a typical set of prototypes developed in the process of creating a working piece of instructional software can include rough pencil sketches, refined pencil sketches, computer general printouts (a paper mockup), a computer-based prototype with little or no interactive programming, a computer-based prototype programmed with appropriate interactions and navigation, the final product. (Brown & Green, 2016)

The idea of rapid prototyping as it applies to instructional design is to develop learning experiences in a cycle that is continuous throughout the life of a course/program. This cycle known as the spiral cycle or layered approach is considered to be iterative, meaning that courses or programs are continually improved as the cycle continues. This can be seen more clearly by comparing rapid prototyping with a classic design approach as shown below in Table 11.1.

Table 11.1: Comparison of Classic Design Approach with Rapid Prototyping Approach

Classic Design Approach	Rapid Prototyping Approach
1. Concept definition	1. Concept definition
2. Requirements definition	2. Implementation of a skeletal system
3. Preliminary design	3. User evaluation and concept refinement
4. Detailed design	4. Implementation of refined requirements
5. Code implementation	5. User evaluation and concept refinement
6. Test and acceptance	6. Implementation of refined requirements in a continuous cycle

Check Your Progress 3

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) How is rapid prototyping used in instructional design?

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2) Differentiate between classic design approach and rapid prototyping approach.

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11.10 LET US SUM UP

Instructional design is the systematic development of instructional specifications using learning and instructional theories to ensure the quality of instruction. This process leads to analysis of learning needs and goals in order to develop a system for accomplishing these needs. It includes development of instructional materials and activities; tryout and evaluation of all instructions and learner activities. There are a number of models and theories, which are followed for the development of instructional materials using ADDIE approach. However, ADDIE is the most popular and generic strategy among all and is most commonly used by instructional designers. The five phases — Analyze, Design, Develop, Implement, and Evaluate(ADDIE) — represent a dynamic, flexible guideline for designing effective instructional materials.

To sum up, it may be stated that the ADDIE approach is a systematic way that leads to the instructional design process. It provides instructional designers with a framework in order to make sure that their instructional products are effective and that their creative processes are as efficient as they can possibly be. ADDIE stands for the steps of the instructional design model. Each step has an outcome that leads to the subsequent step. Evaluation is essential after each step.

- **Analyze**: Define the needs and constraints.
- **Design**: Specify learning activities, assessment and choose methods and media.
- **Develop**: Begin production, formative evaluation, and revise.
- **Implement**: Put the plan into action.
- **Evaluate**: Evaluate the plan from all levels for next implementation.

11.11 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1) Please refer to section 11.3.

   The ADDIE approach is a framework that lists a generic process that instructional designers and training developers use. It is an effective training and performance support tool and has five phases i.e., analysis, design, development, implementation and evaluation. Instructional theories also play an important role in the design of instructional materials.

2) Please refer to section 11.5.

   The following activities are involved in the design phase:

   1) Formulating learning objectives.
   2) Identifying appropriate content.
   3) Selecting suitable methods of delivery.
   4) Evaluating learning outcomes.

   (Please explain these steps in your own words.)

Check Your Progress 2

1) Please refer to section 11.6.2.

2) A storyboard is a document that contains a detailed and sequential description of the different screens that will constitute the instructional design of a multimedia programme. The components include text, audio, video, text audio video graphics, synchronization, animation, interactivity, and user interface design etc.

Check Your Progress 3

1) Please refer to section 11.9.

   Rapid prototyping is used in instructional design to develop learning experiences in a cycle that is continuous throughout the programme.

2) The differences can be seen in Table 11.1. It is seen that in the rapid prototyping approach there is a spiral cycle where through user evaluation, there is continuous refinement of the concept at every stage.

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UNIT 12 LEARNERS' CHARACTERISTICS AND LEARNING STYLES

Structure

12.1 Introduction
12.2 Learning Outcomes
12.3 The Characteristics of Learners
12.4 Learner Centric Approach
12.5 Learning Styles: The Concept
12.6 Families of Learning Styles
12.7 Learning Styles in Distance Education
12.8 Let Us Sum Up
12.9 Check Your Progress: Possible Answers

12.1 INTRODUCTION

The distance education system strives to make learning need-based and learner-centred. An important stage of the instructional design process is to initiate the development on the basis of a learner analysis. Learner analysis helps instructional designers to design instructional activities and individualized material. A clear idea of the learner profile enables the designer to plan relevant environment for the target learner. We, therefore, need to understand what kind of information pertaining to the characteristics of adult learners and analysis of learners helps the designer in taking instructional decisions for the learner. In this unit, we focus on characteristics of learners and their learning styles essential for designing instruction in ODL.

12.2 LEARNING OUTCOMES

After going through this unit, you should be able to:

- analyze learner profile on the basis of common learner characteristics;
- identify learner needs so as to plan learning experiences for the specified target group;
- analyze learners on the basis of various learning styles defined by experts; and
- suggest different instructional strategies so as to cater to different learning styles.

12.3 THE CHARACTERISTICS OF LEARNERS

An important task for the instructional designer is to identify the characteristics of the students. The courses or programmes can be designed in such a way as to cater to individual needs of the students. For example, student entering university who comes straight from school, having gone through more or less identical courses and a student starting a degree under a distance education scheme will have widely different background, experience and aspiration. Therefore, while designing a course for distance learners, we can consider different characteristics.

Heinich, Molenda, Russell, and Smaldino (1999) have suggested three categories of learner characteristics. These are:

- General characteristics;
- Specific entry characteristics; and
- Learning styles.

Let us briefly examine each category

General characteristics refer gender, age, work experience, education and ethnicity. Specific entry competencies are prerequisite skills and attitudes that student possess, to benefit from the course or programme. Learning styles are traits that refer to how individuals approach learning tasks and process information. In addition to these three categories, other categories that include academic information, personal and social characteristics, culturally diverse students and disabilities (Morrison, Ross, Kalman, & Kemp, 2011)

Let us discuss how the above characteristics of students provide useful guidelines for designing instruction.

Distance learners are often strongly motivated. Usually, they have made a conscious decision to study, have paid for their course, made arrangements to find time for their studies, and in the process given up other activities. Such students have a different attitude to learning from young people, who are often simply following the general rule or obeying their parents' wishes by attending school or university.

Many people turn to distance study because they have missed out on educational opportunities earlier in life. Some have been prevented from continuing with formal education by economic or environmental factors perhaps when they were young they had to learn to support their family, or perhaps there was no university nearby. Others are school drop-outs with an incomplete education, people whose school-leaving marks were not high enough to allow them to go on to the next stage, or even first time failures.

Some learners approach their study tentatively and with little confidence, because of their inadequate educational background and previous lack of success. They need constant support and encouragement if they to persist their studies. Such learners may be in a minority but they deserve special attention because of their courage and determination to try again. We can be sure that if they drop out or fail a second time, they will not return, so we must design our materials and support system to try and prevent this.

Those who completed their formal education some years ago will have forgotten some of what they learnt at school, unless they have been studying part time regularly. They will need some guidance in revising certain elementary aspects of the subject they have chosen and they will also need help with study skills. Those who are out of practice find it difficult to organize note-taking, to plan and compose essays and to find and use reference material. Our courses for adults should, therefore, help with the process of study as well as provide the required content.

Learners bring experience and maturity to their studies. By relating new information to their experience, learners can often understand and learn more quickly. Affective learning which involves a shift in opinions is particularly difficult, as with increasing age, our attitudes become more fixed. In courses for distance learners with a substantial affective component, opportunities for discussion and debate are crucial.

This puts much of the responsibility for designing a course in distance education. The course writer should consider different learning styles, which provide *constructive* situation for the adult learners, as the learner is actively constructing both the knowledge acquired and the strategies to acquire it when constructing his or her own unique experience. It is this *constructivist approach* he/she then uses to deal with any new experiences in that field. (Source: Janet Jenkins, 1999)

12.3.1 Demography

From the above discussion you have learnt that different characteristics of open and distance learning students are: demographic factors, motivation, subject background or educational background, and learning factors.

In this sub-section, we will discuss the demographic factors that are considered while designing instructional materials. According to COL (1997), the demographic factors are: number of students, age group, gender, family background, geographic location, previous education, languages read and spoken, and job market shifts.

Our learners may have different demographic attributes. In order to make the study material relevant, the needs of these diverse learners must be addressed. This can be done by giving examples, illustrations, case studies that may reflect this diverse group. Each group in the population has its own set of characteristics, which differentiate that group from others. These attributes are referred to as 'demographical' attributes. Along with race, religion, geographical location, social class, age, and gender issues are also considered as demographic attributes that differentiate groups.

We need to consider these characteristics while developing instructional materials. Many a times, our target learners are widely spread over the country. We, as writers, may belong to one demographic group but need to include all demographic groups. This will enable us to meet the challange of addressing this widely spread learner group. This awareness is needed while giving examples, illustrations which are location-specific or culture-specific. We need to remember to make the content relevant to all.

12.3.2 Intellectual Skills and Competencies

The cognitive domain of the learner is very important in the learning process as cognition enables learning. Cognition is affected by intellectual skills and the knowledge level of the learners. The skill set with which learners start participating in the learning process plays a major role. the instructional design procedures for different learner characteristics are shown below in Table 12.1.

Table 12.1: Instructional design procedures for different learner characteristics

Learner Characteristics	*Design procedures for new learning*
Intellectual skills	Stimulate retrieval of: (1) prerequisite skills as components of new skill; (2) subordinate skills essential to cognitive strategies; and (3) basic skills involved in verbal information learning, attitude learning, and motor skill learning.
Cognitive strategies	Provide for retrieval when available.
Verbal information	Stimulate recall of proposition that may cue retrieval of newly learned intellectual skills. Provide retrieval of a meaningful context (schema) for new learning of verbal information.Stimulate retrieval of situational context for attitude learning.
Attitudes	Activate for learning motivation.
Motor skills	Recall essential part skills.
Schemas	Activate retrieval of schemas consisting of complex networks of propositions to aid new learning of intellectual skills, cognitive strategies, verbal information, attitudes, motor skills.
Abilities	Adapt instruction to differences in ability whenever possible. For example, use easily read printed text for learners low in verbal comprehension.
Traits	Adapt information to learner differences in traits when possible. For example, provide detailed learning guidance and frequent feedback for learners of high anxiety.

Source: Gagne, Briggs and Wager (1988).

Each learner enters with a different set of skills and different level of intelligence. Even the type of intelligence in which each person excels differs. One learner may be expert at expressing thoughts verbally, whereas the other may be able to express thoughts visually.

12.3.3 Attitudes

Even though a learner possesses capabilities and required skills for learning a new subject, the attitude affects his/her learning to a great extent. Further even the attitude of each learner towards the subject, and towards the environment differs. Some learners may possess very high attitude towards the subject or one may come across a learner with an extremely negative attitude towards the subject.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Describe the various characteristics of learners.

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2) Explain the instructional design procedures for different learner characteristics.

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12.4 LEARNER CENTRIC APPROACH

As a student of this programme, you may realize that the instructional strategies adopted in the open learning system follow a learner-centred approach. In an open learning system, a learner can be of any age or background, and can pursue his/her studies at time and place as per his/her convenience. In this approach, the learners' needs are most important to the designers.

Activity 12.1

Let's read about two friends, who are teachers of a B.Ed. Programme. Both are teaching in two different institutions. Though they cannot meet each other often, they often talk to each other and share their teaching experiences. Both needed to start their lesson by teaching the concept of "Education".

Teacher 1 had prepared an attractive slide presentation with several definitions of education given by various national as well as international experts. She presented each slide and explained each expert's definition. The elaboration was very effective and the teacher trainees were satisfied with the explanation. They were also given a handout of the presentation. They were happy that their teacher explained the concept so well.

cont. pp. 25

Activity 2 cont.

Teacher 2 also found several definitions of education and compiled them in the presentation. She also printed each definition on separate sheet of paper. She distributed copies of definitions in the groups of students. Each group discussed one definition among the group members and expressed their interpretation of the definition. Others reflected while the teacher presented definitions on the slides. They could identify similarities in the definitions and additional attributes found in each definition. Then the teacher told them to write their own definition of education.

Though both the teachers were experts and all learners were satisfied, which learning do you think was more meaningful? Learners who tried to interpret various definitions, discussed all aspects of these definitions had an opportunity to get involved in the learning process. Research has proved again and again that learners' active involvement in the learning process makes learning meaningful. Once we accept that the distance learning material needs to be learner-centred, the responsibility of making the material learner-specific also lies with the course designers. If the learning material succeeds in giving a feeling that it is developed considering learner's own needs, the level of learner satisfaction is very high. Giving this satisfaction to all learners from the same material is a challenge. A thorough analysis of learners can help to meet this challenge.

12.4.1 Analyzing Learners' Needs

Though each individual is a different personality, learner analysis may help the course designer identify characteristics of the entire learner population. This kind of analysis helps in making learning individualized. Apart from the learner characteristics, learners' academic and affective needs are also important while preparing ourselves for material development.

You may now refer back to the list of questions you had derived in Activity 12.1. Are there any questions specifically about the learners' needs? Apart from what we wish to impart to them and how we perceive them, what learners desire from us is also very important. Distance learners have specific needs, which make them join a particular course. If a person joins a distance teacher-training programme, she or he is interested in becoming an effective teacher. Mere theoretical knowledge of the education field will not attract the trainee, but she or he would expect relevant inputs directly helping her/him to develop the teaching skills.

Learner need strives at reducing gap between where the learner is and where the learner desires to reach. Need analysis helps to define the steps to bridge the knowledge gap of learners. It helps us to define the objectives so as to plan the learning experiences. This ultimately results in making the learning experience need-based and therefore, learner-centred.

12.5 LEARNING STYLES: THE CONCEPT

Learning styles are characteristic strengths and preferences of the learners for responding to the stimuli in the environment and processing the information. It is a behavioural pattern developed for any new learning. Though each psychologist defines the term 'learning style' in a different way, 'learning styles' are mainly focused on the following characteristics:

1) A learning style is a set of behavioural patterns. These are characteristic cognitive, affective and physiological behaviours. The overt behaviour of a person reveals his/her learning style. The behaviour is in terms of response to the learning environment. (David Kolb & David Wolfe, 1984)

2) Learning style is a 'way' or an 'approach' of learning. It describes 'how' a student learns.

3) It is a preferred and consistent set of behaviours, developed over a period of time. These are persistent qualities in the behaviour. The behavioural pattern is influenced by the way the person thinks, experiences in the past, the demands of the environment and the current task.

In brief, learning styles reflect the underlying causes of learning behaviour. They help in determining the educational conditions under which the learner is most likely to learn. These are the 'clues', which reveal how the learner's mind relates and responds to the world.

12.6 FAMILIES OF LEARNING STYLES

The learning styles, i.e., the behavioural patterns are labeled and classified in a number of ways. These ways of classification emerged as learning style theories. In order to group and provide a framework for different learning style theories, various families of learning styles are considered. The main families of learning styles can be labeled as:

- Constitutionally based
- Cognitive structure
- Personality types
- Learning preference

12.6.1 Constitutionally Based

Learning styles in this family mainly focus on genetically influenced personality traits. The factors considered at this level are mainly environmental factors, which are least stable and can be easily influenced. We are going to discuss learning styles defined in the Dunn and Dunn model as well as delineators presented by Gregorc.

12.6.1.1 Dunn and Dunn Model

Learning style theory considering instructional preferences and environmental factors was proposed by Dunn, R. et al. (1979). After investigating the research within and outside the field of education and being concerned with how youngsters and adults learn, Kenneth Dunn and Rita Dunn found that 18 different elements from four basic stimuli affect a person's ability to learn and retain. The four stimuli are:

a) the immediate environment;

b) their own emotionality;

c) their sociological needs; and

d) their physical requirements.

The fifth dimension is of cognitive style, i.e., psychological.

The learning process of a person is often affected by sound, light, temperature, and furniture design in the environment. Some learners prefer bright light whereas others prefer dim light. We all like to read and study in particular sitting arrangements. You may have greater preference either for table-chair sitting or else you like to lie and relax on a bed while reading a book.

Dunn and Dunn's emotional factors include how to treat motivated and unmotivated students, how a persistence quotient of a student affects learning, how responsible

students learn and how tasks can be arranged for those who are not responsible and how structure affects the learning process.

Dunn and Dunn (1979) focused on the source of motivation as coming from internal desires, authority figures or peers. Persistence involves a preference for keeping with a task until it is complete versus taking frequent breaks and having many activities started before finishing one. You may prefer to sit and complete tasks at a stretch or else you may prefer to take breaks while studying. An individual's need for specific, well-defined task structure versus a preference for broad explanations with the freedom to add one's own structure is also felt to be important. Some prefer well designed content by teachers, whereas some prefer to rewrite and make their own notes.

The physical elements of learning style include perceptual strengths like different preferences for auditory, visual, tactual, kinesthetic senses or a combination of senses. Intake habits, time preferences and mobility are also considered important elements of physical need. She or he cannot remember the things till they walk while reading the book! Some are inclined to listening to music while studying, whereas some may not be able to concentrate if music is on. Some prefer to eat properly before an examination, whereas some cannot eat anything before the test. Some like to study at night, whereas some prefer early morning timings.

Dunns' sociological approaches to learning style include preferences for working alone or with colleagues, with one or more peers in a team, with an adult or authority figure or in a variety of social groupings. As a distance learner, either you may be feeling relaxed reading this material all alone without anybody's disturbance or else you might be missing peers to discuss these interesting facts!

12.6.1.2 Gregorc's Style Delineator

Anthony Gregorc created a bi-dimensional model by sorting people along two dimensions: abstract-concrete and sequential-random. According to him, people can find their relative strengths in four mind channels as concrete sequential, abstract sequential, abstract random and concrete random.

Concrete-sequential learners prefer linear and sequential learning. They are hardworking, accurate, dependable and prefer conventional, consistent, factual, organized learning conditions. They prefer step-by-step directions when confronted with a learning situation. These learners get fascinated by knowledge of how things work. They prefer to indulge in mechanical and technological knowledge. They perform better in objective tests that are right-answer oriented. They are good with exact, structured work.

The **abstract-sequential** learning preference is characterized by excellent decoding abilities with written, verbal and image symbols. Abstract-sequential prefers abstract and analytical learning and the person thrives, in a mentally challenging but ordered learning environment. They are more knowledgeable, thorough and believe in structured, logical and deliberate experiences. They consider themselves as experts and also expect others, including teachers to respect them for their knowledge. They learn well from authorities and like vicarious experiences. These learners may not prefer multimedia-based activities. They prefer direct lectures of teachers.

Abstract-random learners are emotional, imaginative, sentimental, spontaneous, and idealistic. They are distinguishable by their attention to human behaviour and a capacity to sense and interpret "vibrations". They prefer an active, interesting, flexible, and informal learning environment. They prefer freedom from rules and guidelines.

They like to have a friendly relationship with the teacher. They may withdraw from and dislike teachers who do not respond to them. They are also easily hurt by sarcastic remarks of teachers or peers. Their past experiences easily affect their new perceptions. Teachers may use fantasy, make-believe, and imagination as a ready resource for these learners. Knowledge in the form of stories, metaphors and personal experiences appeals to them the most. They generally appreciate poetry, art, music, and literature.

Concrete-random learners are quick, intuitive, curious, creative, instinctive and adventurous. They thrive on problem-solving. They possess an experimental attitude and accompanying behaviour. They seem to process knowledge and seek answers by insight and intuition rather than systematic deductive thought processes. They jump to conclusions, often correctly. These learners use trial-and error approaches to learning. They learn well through discovery methods, games, simulations, and role-play.

According to Gregorc (1985), individuals can adjust to varying circumstances through their non-dominant channels so long as the dominant style is permitted an opportunity to develop and clear cut mind style dispositions are linked with preferences for certain instructional media and teaching strategies.

Activity 12.2

Match Column A and B.	
A: Learning style strategy	**B: Recommended**
1. Concrete-sequential	1. Simulations
2. Abstract-sequential	2. Reading of research papers
3. Abstract-random	3. Scenario-based learning
4. Concrete-random	4. Science experiments

12.6.2 Cognitive Structure

This family examines cognitive personality style, addressing an individual's approach to adapting and assimilating information. This level is considered to be an underlying and relatively permanent personality dimension. Riding and Rayner's Cognitive Style Analysis (CSA) falls in this category.

12.6.2.1 Riding and Rayner's Cognitive Style Analysis (CSA)

Richard Riding and Stephen Rayner (1998) by their research on style differences developed the Cognitive Styles Analysis (CSA) consisting of over 30 styles. They believe that style is divided into two dimensions. One of them is wholist-analytic, i.e., the way in which an individual would organise information in parts or as a whole. The other dimension is verbal-imagery, i.e., the way in which an individual would represent knowledge in mental pictures or words.

Riding developed a software package of the CSA allowing the user to quickly and easily measure the cognitive style on both dimensions. The test consists of three parts. The first part of true-false type items assesses verbal-visual dimension. The verbal-imager dimension is indicative of whether the individual tends to represent information, while thinking, verbally or in mental pictures. The second and third parts are aimed at assessing the wholist-analytic approach of an individual. The wholist-analytic style dimension describes whether an individual is inclined to organize information into whole or parts. An individual's position on the wholist-analytic dimension is determined by the relative speed of processing, matching figure tasks and embedded figure tasks.

The test involves judgments about the similarity of two figures and a relatively fast response to this indicates a wholist tendency. The embedded figures task contains items comprising a simple shape and a more complex geometrical figure. For this part of the test, the task of the respondent is to indicate whether or not, the simple figure is contained within the complex one. (Davies & Graff, 2006; Parkinson & Redmond, 2002)

12.6.3 Personality Types

The next category of learning styles aims at identifying the personality traits of learners. This category provides a structure for understanding human behaviour and experience by outlining the dynamic interplay between 'reversing' motivational styles. A few of these are discussed in the following paragraphs.

12.6.3.1 Apter's Motivational Style Profile

Apter's (2001) reversal theory talks about the motivational styles of an individual. The Apter Motivational Style Profile (AMSP) is a comprehensive personality profiling instrument. It focuses on the role of a person's motivational factor in his/her life. Individual's strength is the motivational factor's changeability, which leads him/her towards the success, individual or organizational.

Reversal theory is a distinctive theory of personality, motivation and emotion that focuses on the way people change during the course of everyday life.

According to this theory, people are driven by eight core motivational states — organised into four pairs of opposite states — and are constantly moving through a dynamic pattern of reversals within each pair. Psychological health and effectiveness is maximised when people are able to experience all eight states, and match their state to the demands of the situation.

At the heart of the Apter Motivational Styles Profile (AMSP) is the idea that our experience is shaped by a set of alternative ways of seeing the world, each based on a fundamental value or motive. Specifically, four pairs of such opposite states have been identified. We switch or 'reverse' fairly frequently between these opposite or motivational states or 'styles' in the course of everyday life and under a variety of circumstances. These motivational styles are:

- Achievement (Serious)
- Fitting in (Conforming)
- Control and power (Mastery)
- Individualism (Self)
- Enjoyment (Playful)
- Freedom (Rebellious)
- Caring and affection (Sympathy)
- Collectivism (Other)

The AMSP provides a framework for individuals to understand and realise their motivational potential.

This is a radically different personality profile that embraces human diversity and change potential. It will not tell you who a person is and will be forever. It will, however, help an individual to understand how they are experiencing the world and present them with

opportunities for the changes they want to make. It is a 40-item on-line questionnaire with expert report and support materials. It is widely applicable across industries, management levels and cultures.

12.6.3.2 Jackson's Learning Style Profiler

Charles J. Jackson and Lawty-Jones, M. (1996) developed the Learning Style Profiler (LSP), which is a hybrid model of learning based on personality, self-efficacy, goal orientation, emotional intelligence, and conscientiousness. It is designed to measure functional learning associated with high performance and dysfunctional learning.

The five learning styles reflect different parts of the process of learning.

High Sensation Seeker: The high sensation seekers prefer to get involved in new and challenging activities. Their conscious mechanisms work for making these challenging goals achievable. Low sensation persons, on the other hand, are cautious enough to accept new and challenging learning activities.

Goal Oriented Achiever: A goal oriented achiever is a person who sets learning goals which are generally both hard and specific and who has the self confidence to be able to achieve these goals. She/he possesses ability to control her/his goals and direction to achieve the same. Those who score low in this are more careful in setting new goals, possess less confidence and set low goals so as to avoid failures.

Emotionally Intelligent Achiever: The emotionally intelligent achievers learn from their mistakes. They possess a scientific, detached and autonomous learning style that processes information in an emotionally intelligent manner. Low emotionally intelligent achievers tend to avoid activities where they may commit mistakes, thus escaping from mistakes. They generally believe in luck rather than efforts and do not act on logical emotions.

Conscientious Achiever: The conscientious achievers are responsible and rational learners. They use complex higher-level learning and goals to comprehend the information, which is difficult to interpret otherwise. A high scoring conscientious achiever provides a re-expression of an instinctive urge to explore the world so that positive goals and outcomes can be achieved. A low scoring conscientious achiever finds it hard to learn complex and fuzzy information.

Deep Learning Achiever: The deep learning achievers have a very positive inclination and liking for learning. They are open to new ideas and possess willingness to learn about it thoroughly. They are knowledge seekers. A low deep learning achiever score indicates a practical person who has a single minded and expedient focus on learning just the appropriate knowledge. Whilst there is also a lack of broader knowledge of the complexities, this focus provides a practical and applied approach to problem solving.

12.6.3.3 Myers-Briggs Type Indicator

Myers-Briggs Type Indicator (MBTI) is a widely used instrument for assessing student learning styles. The MBTI provides data on four sets of preferences, which result in 16 types. A type is the combination of the four preferences. The MBTI consists of 126 items used to measure the learner's preferences. Each of the four types has a primary orientation towards the world, one which affects their ability to learn and to work. The four dimensions are as follows:

1) **Extraversion *versus* Introversion:** It indicates whether a person prefers to direct attention towards the external world of people and things or towards the inner world of concepts and ideas. Extraversion leads to conversational risk

taking. Extraverts depend on outside stimulation and interaction for engaging in learning. The introverts being drawn to solitary activities and limited interpersonal interactions, tend to develop frameworks that integrate or connect the information. Introversion provides them with concentration and self-sufficiency. For introverts, knowledge is the interconnection of the material.

2) **Sensing *versus* Intuition:** Sensing is characterized by information gathering through one's five senses and dealing with the world in practical or factual terms. They prefer organized, linear, and systematic work. They pay attention to details and observe phenomena closely. Intuitive people seek out patterns and relationships among the facts that they have gathered. They gather inferences and guesses from context, structure, their own training, then conceptualize, and build models from which to work. The intuitors may seek excessive complexity in discourse, but may miss important details.

3) **Thinking *versus* Feeling:** Thinking is characterized by judging based on impersonal, objective criteria. They choose to decide things impersonally based on analysis, self-discipline, logic, principle, and instrumental motivation. They prefer clear course and topic goals, outcomes, and precise, action-oriented objectives. A thinker may be overly anxious as his/her self-esteem is connected to achievement. Feeling is characterized by judgements based on personality and sociality. The feeling learners take into account how they feel and how others may feel. They focus on human values and tend to be good at persuasion and facilitating differences among group members. They need appreciation and enjoy the exercises in small, and harmonious groups.

4) **Judging *versus* Perceiving:** Judging learners are decisive, self-starters and self-regimented. They are more apt to lead a planned, organized and well-controlled lifestyle. They focus on completing the task, they are only concerned with knowing the essentials, and take actions quickly. They have intolerance for ambiguity. Perceptive learners are curious, adaptable, and spontaneous. They enjoy autonomy, openness and flexibility. They start many tasks, want to know everything about each task, and often find it difficult to complete a task. A lack of persistence or consistency may hamper their performance. (Knowlton, 1998; Brightman, 1998; CTL, 1997; Schroeder, 1993)

12.6.4 Learning Preference

This category of learning styles aims at identifying the learning preferences of the learners.

12.6.4.1 Allinson and Hayes Cognitive Styles Index (CSI)

Cognitive style was assessed using the Cognitive Style Index (CSI). Allinson & Hayes (1996) designed an inventory of 38 items scored on a 3-point scale of true-uncertain-false to measure the intuitive-analytic dimension of cognitive style. A score of 2, 1, or 0 is assigned to each response, the direction of scoring depending upon the polarity of the item 17 are reversed to control for acquiescence response bias. CSI items are derived from 18 different conceptions of cognitive style identified in the literature (Hayes & Allinson, 1994; Hayes & Allinson, 1998). A score towards the maximum of 76 indicates a relatively analytic style, and a score towards the minimum of zero indicates a relatively intuitive style.

12.6.4.2 Honey and Mumford's Learning Styles

Honey and Mumford (1992) developed the learning styles idea by producing a set of inventories based on Kolb's work. They suggested that there are four styles: activists, theorists, pragmatists and reflectors.

The activists are active processors who tend to make sense of an experience by immediately engaging with it, using it and doing it. The theorists are abstract perceivers. They take in information by a process of analysis, observation and thinking. Pragmatists are concrete perceivers who absorb information by direct experience, through sensing, doing, acting and feeling. The reflectors are reflective processors who make sense of experiences by reflecting on them, and thinking through as many possibilities as possible. (Wheeler, 2001)

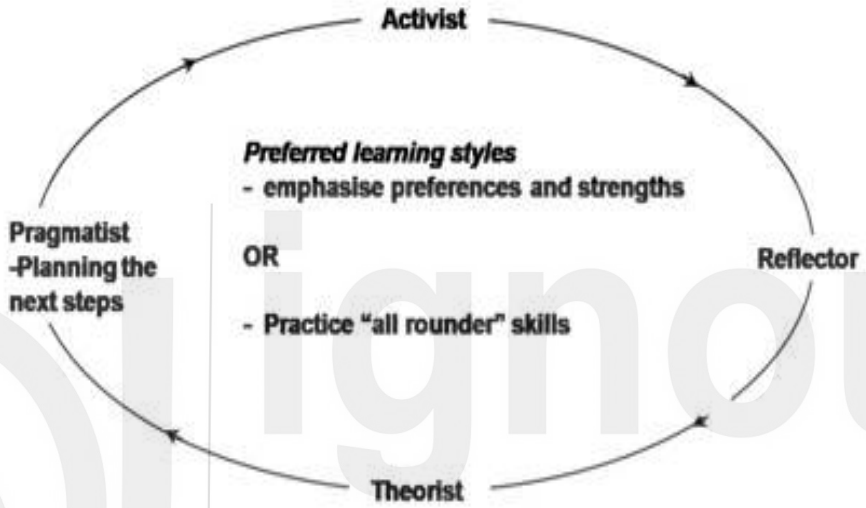

Fig. 12.1: The Honey and Mumford model of learning style

Source: Honey and Mumford (1992)

Check Your Progress 2

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Explain the different learning styles suggested by Myers-Briggs Type Indicator (MBTI).

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2) Describe Honey and Mumford's Learning Styles.

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12.6.4.3 Kolb's Learning Style Orientation

David Kolb's (1984) experiential learning theory provides a model of learning and adaptation processes consistent with the structure of human cognition and the stages of human growth and development. He conceived learning as a four-stage cycle, which depicts generic adaptive abilities: concrete experience (CE) abilities, reflective observation (RO) abilities, abstract conceptualization (AC) abilities, and active experimentation (AE) abilities. The learner must be able to involve herself/himself fully, openly and without bias in new experiences (NE); the learner must be able to observe and reflect on these experiences from many perspectives (RO); she or he must be able to create concepts that integrate observations into logically sound theories (AC) and must be able to use these theories to make decisions and solve problems (AE) (Kolb, 1984). Fig. 12.2 presents the experiential learning model.

The four stages of learning model reflect two primary dimensions of the learning process. The first dimension represents the concrete experiencing of events at one end and abstract conceptualisation at the other. The other dimension has active experimentation at one extreme and reflective observation at the other. (Kolb, D., op. cit.)

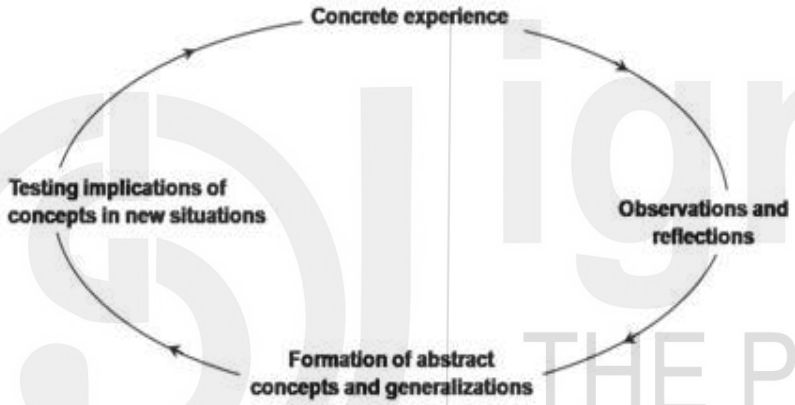

Fig. 12.2: The Experiential Learning Model

Source: Kolb, D. (1984)

By combining the two opposite dimensions, we get four quadrants of learning behaviour. These four learning styles identified by Kolb (1984) are the converger, the diverger, the assimilator, and the accommodator. Fig. 12.3 presents Learning Style Inventory (LSI) and the four learning styles as the combination of four dimensions of the learning process.

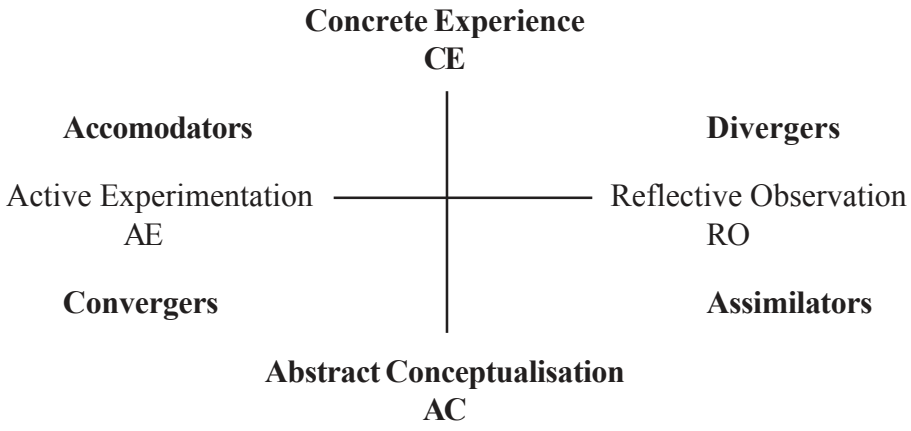

Fig. 12.3: Kolb's Learning Style Inventory (LSI) and four Learning Styles

Source: Kolb, D (1984)

The characteristics of each of these learning styles are described below.

1) **Converger:** The converger's dominant learning abilities are abstract conceptualization (AC) and active experimentation (AE). They like solving problems and finding practical solutions. Their strength lies in the practical application of ideas. They are precise and logical, abstract and systematic. They are good at decision making. The convergers are relatively unemotional, preferring to deal with things rather than people. They tend to shy away from social and interpersonal issues and prefer technical tasks.

2) **Diverger:** The divergers show the learning strengths opposite to those of the convergers. They are best at concrete experience (CE) and reflective observation (RO). Their greatest strength is their imaginative ability. They are good at generating ideas and can view a situation from different angles. The divergers tend to be interested in people and emotional elements. They possess very sensitive feelings while learning. They have broad cultural interests and tend to specialize in the arts. The divergers tend to become counsellors, organizational development specialists, and personnel managers. They excel in the ability to view concrete situations from many perspectives.

3) **Assimilator:** The assimilator's dominant learning abilities are abstract conceptualization (AC) and reflective observation (RO). The assimilator's greatest strength lies in her/his ability to create theoretical models. They possess characteristics such as sound, logic, precision, and inductive reasoning. They are analytic, abstract, and good at organizing information and designing experiments. The assimilators are less interested in people and more concerned about abstract concepts. This learning style is more characteristic of the basic sciences and mathematics rather than applied sciences.

4) **Accomodator:** The accomodator has the strengths opposite to those of the assimilator. The accomodators are best at concrete experience (CE) and active experimentation (AE). Their strengths lie in doing things and involving themselves in new experiences. They enjoy and seek new experiences and adapt to new situations well. They are intuitive, risk-takers, and open-minded. The accomodators generally rely on others for information due to lack of analytical ability. The accomodators are generally found in technical or practical fields such as business.

Activity 12.3

Read characteristics of each learning style carefully. Suggest appropriate career fields for these learning styles.

1.	Convergers	i.	ii.	iii.
2.	Divergers	i.	ii.	iii.
3.	Assimilators	i.	ii.	iii.
4.	Accomodators	i.	ii.	iii.

Check your answers with a few suggested at the end of the unit.

12.7 LEARNING STYLES IN DISTANCE EDUCATION

We have so far discussed various learning styles and their characteristics. These characteristics clearly imply that different kinds of learning experiences are essential so as to cater to all the learners. Interacting with these learners and communicating with each one of them at different levels is possible in instructor-led systems, but imagine a distance learning system where you are assuming a certain set of characteristics, demographic background, intellectual skills, knowledge about the subject, and attitude. Don't you think it is a challenging task to address unknown, unfamiliar, unseen group of learners with such varied characteristics?

A classroom teacher in a conventional institution can plan and arrange for different learning experiences for different learners so as to cater to their learning styles, but how will one cater to different learning styles of distance learners? Do you have any suggestions? Jot down the points.

Activity 12.4

Suggest a few ways to plan distance learning strategies so that the distance teacher can take care of differences in the learning styles of the distance learners.

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Let us consider writing ODL materials based on different learning styles of learners.

12.7.1 Writing ODL Material

We write open and distance learning material for the distance learners. You all are well versed with this style of writing used in the distance learning material by now. While interacting with learners through this material, can we visualise all types of learners? If yes, can the distance teacher plan interactions with all types of learners? Though it may be difficult to write different kinds of material for individual learners, how can distance learning material try to meet the learning needs for different learners. Let us read about some. We need to plan a variety of exercises and activities for different types of learners. We may also include problem solving activities and quizzes.

1. Content Presentation

We know that there are visual as well as verbal learners. We normally have to elaborate and explain for the verbal learners, but also represent our content through visuals for the visual learners . Diagrams, concept maps, pictures, charts and graphs may be extremely useful for the visual learners.

2. Illustrations and Scenarios

Our illustrations may cater to those who like to think, reflect, judge, and so on. We may also write some scenarios for those who learn by involving their feelings in it.

3. Assignments

We plan for assignments and practicals for distance learners. The nature of these assignments may vary to cater to the different learners, e.g., some are individual learners, and some are social by nature. There can be a few group assignments for which they need to find peer learners in their geographical area and try to work in teams.

4. Media in Distance Education

Along with text based modules, we also use other media to facilitate distance learning. Other media helps us in catering to all types of learners. Audio may prove useful for auditory learners. Multimedia may integrate all possible strategies for all types of learners. We may also plan problem solving approaches as well as simulations. We may also summarise theoretical information for the abstract learners.

5. Student Counseling

Do you think a teacher in distance education system needs to consider learner characteristics? Student counselling is a crucial part of the distance education systems. Teachers also need to be aware of the different learner characteristics as it will help them to guide the learners about various self-learning approaches.

6. Distance Learners as Adult Learners

While answering these questions for yourself, you might have realized that we all need to remember that the distance learners are mainly adults and hence possess different characteristics than teenagers. They prefer participatory approach and like to be trusted with the responsibility of learning. They learn better if they find learning relevant to their life and work. They are self-reliant learners and prefer to work at their own pace. One first needs to understand these characteristics while planning for the distance learners.

Check Your Progress 3

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Describe variety of exercises in open and distance learning materials keeping in view different types of learners?

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2) Explain the learning strengths of the accommodators type of learners.

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12.8 LET US SUM UP

We hope this unit has given you some insights into the various learner characteristics. Whether it is a face-to-face situation or whether it is the distance system, considering learner characteristics, learning styles, cultural and educational background always help us to plan for and design meaningful and effective learning experiences. Wherever possible, we need to first assess various aspects of the learners and plan learning accordingly. Wherever a target profile is heterogeneous, we may plan a variety of strategies so as to cater to the needs of the heterogeneous group.

12.9 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1) Refer to section 12.3.

   The different characteristics of learners includes demography, intellectual skills and competencies and attitudes.

2) The design procedures for different learner characteristics are: intellectual skills, cognitive strategies, motor skills and attitudes, abilities, schemas and verbal information.

Check Your Progress 2

1) Please refer to sub-section 12.6.3 and explain the four dimensions of :

   i) Extraversion *versus* Introversion.

   ii) Sensing *versus* Intuition.

   iii) Thinking *versus* Feeling.

   iv) Judging *versus* Perceiving.

2) Please refer to section 12.6.4.2.

   Please describe the four learning styles i.e. activist, theorist, pragmatist and reflector.

Check Your Progress 3

1) The variety of exercises on ODL materials are problem solving activities, quzzes, writing scenarios, assignments, simulations. (ref. sub-section 12.7.1).

2) Please refer to section 12.6.

   Accommodators are those who seek new experiences, they are risk takers and are good at active experimentation and concrete experience.

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UNIT 13 DESIGNING LEARNING

Structure

13.1 Introduction

13.2 Learning Outcomes

13.3 Need for Designing Learning

13.4 Instructional Objectives and Designing Learning

- 13.4.1 Formulating Learning Objectives
- 13.4.2 Taxonomies of Learning Objectives
- 13.4.3 Structure of Observed Learning Outcomes (SOLO) Taxonomy
- 13.4.4 Revised Bloom's Taxonomy

13.5 Designing a Blue-Print

13.6 Evaluating Learning Objectives

13.7 Let Us Sum Up

13.8 Check Your Progress: Possible Answers

13.1 INTRODUCTION

In unit 11, Section 11.5 of this Block, we have discussed the steps involved in designing learning. You have learnt that while designing learning for a unit of instruction or multimedia package different activities are carried out. These are formulation of learning objectives, identifying appropriate content, selecting methods and media for organizing content and evaluating learning outcomes. (Ref. Unit 11 : ADDIE approach, Section 11.5 for a brief description pertaining to different phases of designing learning in sub-sections 11.5.1 to 11.5.4).

As you may recall, an objective is a statement of intended terminal ability of a student. This ability is executable, observable, and measurable. Sometimes, it is also called an instructional objective. This indicates that an objective is intended to be achieved through the process of instruction. The objectives are formulated covering the cognitive (knowing), affective (feeling), and psychomotor (doing/skill) domains of students. Therefore, while designing learning of a unit of instruction, it is important to ensure that objectives are carefully formulated, clearly defined and relevant to the content.

In the previous Unit 12, we have discussed that there are different design procedures for learning based on characteristics of students. These are intellectual skills, cognitive strategies, verbal information, attitudes, motor skills, schemas, abilities and traits. (Gagne, Briggs and Wager, 1988).

So, before you start working on this unit, you may revisit and assimilate what you have studied in units 11 and 12 pertaining to formulation of learning objectives and design procedures for learning based on diverse group of students.

The purpose of this unit is to acquaint you with the concept of formulation of learning objectives based on the cognitive, affective and psychomotor domains along with their implications in designing learning and procedures for evaluating learning objectives.

13.2 LEARNING OUTCOMES

After going through this unit; you should be able to:

- explain the need for designing learning;
- differentiate between the taxonomies of learning;
- prepare a blue-print using the content and objectives;
- analyse the evaluation procedures pertaining to objectives.

13.3 NEED FOR DESIGNING LEARNING

This section focuses on the need for designing learning in ODL. It draws particular attention to those features of an instructional unit that help sustain student's attention, motivation and interest and reinforce learning. For example, when a teacher plans a lecture, he/she has to make choices about how to approach the topic and what learning activities to include. A teacher of Law in USA, for example will use illustrations related to American law while a teacher in India will emphasize Indian law. This shows that a teacher takes relevance as one of the criterion for selecting content or subject matter for designing instruction.

Another criterion for need for designing learning is related to effective learning. The subject matter expert has to select the content which stimulates thinking or which sets a problem to be solved. For example, a science course, concerned with the topic 'energy' might be designed around the theme of a 'world energy' crisis with individual units relating to scientific knowledge, principles and concepts related to specific energy uses and needs in his or her own country. Here the teacher starts by providing definitions presenting principles, listing main points and then goes on to provide examples, illustrations and visuals/graphics etc. The teacher has to adapt learning centric methods, where students must be encouraged to think and learn actively by building up a thorough understanding of the content. A teacher who adopts the above criteria may have to consider also the mode of presentation of content while designing learning. The strategies for presentation of content are moving from specific to general, known to unknown, simple to complex, specific to general, easy to difficult and basic to advance. Instructional material should be arranged in a logical order, taking the student step-by-step through a topic. A concentric or round about or systematic stepwise approach to a subject can be stimulating and effective with the help of flow diagrams.

We can consider a number of activities, which may stimulate or maintain interest. For example, learning could be stimulated by an activity in a Food and Nutrition course, where the students are asked to conduct a small survey of nutritional habits in their community and can compare the results in the other community after reading the study material. Such activities set students on the path to understanding. In ODL, we design the learning materials for diverse group of students after considering their learning styles, needs and preferences. This has implications for designing learning materials to facilitate learning. Students in ODL system come with a wide range of needs and expectations and understanding of the ODL system in which they are to study, so there is a need to customize the learning activities to meet different learning preferences of students.

There is also a need to design materials in different formats incorporating different media (print, audio, video, web, etc) to help students to study at different times and in different places at their own pace.

Let us now discuss what might be the characteristics of learning materials used for a diverse group of students (heterogeneous) with different learning styles, preferences and needs studying at different places. These are:

- Inform the students what they need to do before going through the unit of study. Therefore, there is a need to design study guide components in a unit.
- Explain clearly what the students should be able to do on the completion of the units of a study material (i.e., in terms of objectives).
- Guide the students how to carry out the activities (i.e., how to read the sections and subsection, how to complete the SAQs/exercise, how to plan for an assignment, etc.)
- Incorporating instructions for self-study or to do the activities in the learning materials while designing learning.
- Explain the subject matter to help the students to relate it with their previous experience i.e. to draw attention and motivate the students.
- Engage the students in activities and exercises that make them work with the content/subject - matter.
- Help the student to review or sum up their learning.
- Provide the students feedback on exercises/SAQ/CYPs enabling them to judge or self-evaluate whether they have learnt successfully.

The course developers and instructional designers should consider the educational background, characteristic of learning and their occupation etc. At this stage, the importance of analyzing the entry behaviour of the learners, i.e what the students already know, and what they can do at the start, during and end of a course. A detailed statement of the entry behaviour of the students helps designing learning and to give instruction to the teachers and course developers. Therefore, designing learning is needed to assess what the students are supposed to learn and be able to do or do better after going through the units/course/programme.

Designing learning helps the subject matter experts (SMEs) and instructional designers to select appropriate methods and media based on the course aims and unit objectives.

The course writers or subject matter experts while discussing the issue of designing learning with the instructional designers have to consider the levels of learning. The design of learning materials for any level begin with an analysis of learning needs and statement of objectives. Objectives lead to designing a unit/course that determine what students need to know or feel or able to do for a particular subject area.

After analysis of the educational needs of a course, we arrive at the broader aims. These aims provide a general framework for writing instructional objectives. But for detailed design of learning activities, we need greater precision and we can acquire this by defining objectives. A statement of unit objectives describes what students should be able to do after going through a unit or at the end of working on a unit. According to Morrison, Ross, Kalman and Kemp (2011) "Objectives perform two important functions for instructional designers and teachers. First, they offer a means for the teacher to design appropriate instruction, select and organize instructional activities and resources that facilitate effective learning. Second, objectives provide a framework for designing assessment strategies for evaluating student learning". So, objectives serve as a development as well as an assessment tool. In the next section, we have discussed the concept of instructional objectives and formulating objectives using taxonomies of learning.

13.4 INSTRUCTIONAL OBJECTIVES AND DESIGNING LEARNING

In the above section, you have studied the need for designing learning. Designing learning helps the subject matter experts to select appropriate methods and media based on the course aim and unit objectives. Objectives lead to designing the unit of a course that determines what student need to know and feel or able to do for particular subject.

In this section we will present you how to formulate objectives, difference between goal/aim , objectives and outcomes.

Let us discuss how to formulate learning objectives.

13.4.1 Formulating Learning Objectives

Instructional objective have an important role to play in the designing of learning, as they act as navigators for negotiating the path towards effective learning. However, when we discuss instructional objective, they have to be discussed in the context of goals, outcomes as well as learning experiences. A learning programme has to be designed based upon the overall goal of the programme. This goal is derived from a policy or a vision, which forms the basis for the programme. According to Gronlund(1981) an educational goal acts as a general aim or purpose and is therefore, stated as a broad, long-range outcome. For example, the goal of a civic programme may be to develop good citizen and promote national harmony. The goal of a programme of science may be to develop scientific temper amongst the pupil. Therefore, the goal is used to guide the programme planning towards achievement of this larger goal. Instructional objectives are derived from the goal. According to Gronlund (1981), a general instructional objective is "an intended outcome of instruction that has been stated in general enough terms to encompass a *set of specific learning outcome.*" Learning outcomes on the other hand are related to the learning that takes place by a learner as a result of the instructional objective planned by the teacher. According to Gronlund (1981) the specific learning outcome is that "intended outcome of instructions that has been stated in terms of specific and observable pupil performance." Thus learning outcomes demonstrate the performance that learners are able to demonstrate after they have achieved the instructional objective.

> Pupil performance is defined as "any measurable or observable, pupil response in the cognitive, affective, or psycho motor area that is a result of learning." Gronlund (1981)

Difference between learning objectives and learning outcomes

Now let us look at the difference between learning objectives and learning outcomes. *Learning Objectives* tend to describe specific, discrete units of knowledge and skill. They can be accomplished within a short time frame. Learning objectives are statements of intent. On the other hand, learning outcome describe broad aspects of behaviour which incorporates a wide range of knowledge and skills. They are accomplished over time after several learning experiences. Learning outcomes are related to demonstrations of performance. Therefore, *Objectives* are **intended** results or consequences of instruction, curricula, programs, or activities while *Outcomes* are **achieved** results or consequences of what was learned; i.e., evidence that learning took place.

Let us now learn how to formulate instructional objectives.

A list of objectives for a unit of instruction or a course convey the intent of the instruction and serve as an effective overall guide in planning content, designing learning and

assessment strategies. According to Gronlund (1981) instructional objectives can be stated in two steps:

1) Stating the general objectives of instruction as intended learning outcomes;
2) Listing under each objective a sample of specific types of performance that students are to demonstrate when they have achieved the objectives.

For example, the procedure for statements of general objectives and specific learning outcomes is as like the following:

1. Understand Scientific principles.
   - 1.1 Describe the principles in his/her own words
   - 1.2 Identifies examples of the principle
   - 1.3 States tentative hypotheses based on the scientific principle
   - 1.4 Distinguish between two given principles
   - 1.5 Explains the relationship between two given principles.

From the above example, you may note that the expected outcome is concerned with **understanding** and that the general objective starts with the verb **understands**. The specific learning outcomes listed below the general objective also start with a verb. These are : describes, identifies, states, distinguishes between and explains. (Source: Gronlund, Norman E. 1981)

You can remember this acronym (***SMART***) that can help you to formulate objectives:

- **S**pecific
- **M**easurable
- **A**ction
- **R**easonable
- **T**imely

You can also formulate ***SMARTER*** objective:

- **S**pecific
- **M**easurable
- **A**ction oriented
- **R**easonable
- **T**imely
- **E**valuate consistently
- **R**ecognize mastery

(**Source:** Piskurich, George M., 2006)

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1. Describe the difference between instructional objectives and learning outcomes.

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2. Explain SMART objectives.

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13.4.2 Taxonomies of Learning Objectives

We have discussed the steps involved in formulation of objectives in the above subsection. These objectives will cover cognitive, affective and psychomotor learning as needed per designing a unit/course. For example, courses for a management programme may normally have a number of affective objectives, arising from the need for managers to interact and while dealing with managing human resources, develop skills in managing personnel, as well as cognitive objectives concerned with learning about different theories and practices of management.

Let us now discuss cognitive, affective and psychomotor objectives stated by B.S. Bloom et al. (1956), Krathwohl et al., (1964), and Harrow (1972).

Teachers can use taxonomies in writing objectives while designing a course or a programme. These taxonomies serve as a type of design engine that can provide the subject matter experts (SMEs) and instructional designers with a level of clarity that can then be passed on to the students.

These taxonomies are frameworks to outline cognitive, affective and psychomotor learning processes of students to develop knowledge, attitudes and skills.

The desirable outcome of learning experiences – the way individuals are to act, think or feel as a result of participating in some instructional activities – can be classified into three domains, viz. *Cognitive, Affective and Psychomotor.* Bloom and his associates classified educational behaviour from the simple to the complex, based on the level of learning and developed taxonomy of learning objectives. We shall describe briefly all the three domains which include different types of learning outcomes. Each domain consists of a list of general objectives stated for a programme or a course. Each general objective has a pool of specific *objectives.* These specific learning objectives are stated in a unit in behavioural terms. These objectives clearly convey what a distance learner will be able to do after going through a unit. They are also known as instructional objectives. Each objective begins with an action verb that indicates definite observable and measurable response (e.g., identifies, defines, recalls etc.). In the following discussion, you may note that with each general objective we have specific objectives. For example, general objective knowledge has specific objectives such as names, identifies, defines, states etc. In a course of Food and Nutrition, the general objectives is to know the basic components of Diet, but the specific instructional objective should be to be able to identify at least five principle components of a balanced diet or define the term 'balanced diet'. (**Source:** ES-312 : Factors in the design of print materials (Block-1). Revised edition, 2000)

Cognitive Domain

The taxonomy or hierarchy for cognitive domain was developed by B.S. Bloom and a team of researchers in the year 1956. It is referred here as Bloom's taxonomy.

This domain includes learning objectives which deal with the 'recall' or 'recognition' of knowledge and the development of intellectual abilities and skills. This is known as the knowledge component of educational objectives.

Six stages of Cognitive learning are presented below:

i) **Knowledge:** Knowledge is defined as the remembering of previously learnt study material. This may involve the recall of a wide range of learning material, from specific facts to complete theories. Knowledge represents the lowest level of learning outcomes in the cognitive domain. It is indicated by the repetition of responses that have been practiced through learning experiences. The specific learning outcomes are : names, defines, labels, states and selects.

ii) **Understanding**: It is defined as the ability to grasp the meaning of study materials. It is the behaviour which represents new responses in relation to and in addition to those previously practiced and learnt. The specific learning outcomes are : interpretations, translations, summaries, analyses, detection of similarities and differences and comparisons etc.

iii) **Application**: It refers to the ability to use previously learnt concepts or principles in new and concrete situations. It is an act of putting theories, rules, methods, concepts, principles or laws to practical uses or new situations. The specific learning outcomes are : discovers, produces, relates, solves, uses and predicts.

iv) **Analysis**: It refers to the ability to break down a complex concept material into its component parts so that its organizational structure may be understood. This may include the identification of the parts, finding out relationships between parts, and explaining the organizational principles involved. The specific learning outcomes are : identifies, illustrates, sub-divides and differentiates.

v) **Synthesis**: Synthesis refers to the ability to put parts together to form a new whole. This may involve the production of a unique communication, a plan of operations (research proposal) etc. The specific learning outcomes are : categorises, combines, designs, rearranges, summarises, writes, and reconstructs.

vi) **Evaluation**: It is concerned with the value judgement of any statement or achievement of the students. The judgements are to be based on definite criteria. Learning outcome in this area are the highest in the cognitive hierarchy because they contain elements of all of the other categories, plus value judgements based on clearly defined criteria. The specific learning outcomes are: appraises, compares, justifies, summarises and supports. (**Source:** ES-312, Block-1)

Affective domain

The affective domain taxonomy was developed by Krathwohl and his team in the year 1964.

This is related to the attitudinal domain of educational objectives. Learning in the affective domain pertains to changes in interest, attitudes, values, and to the development of appreciation and adequate adjustment needed for effective learning. This is a higher level of learning, and it has a close relationship with cognitive and behavioural changes. This relationship is operative at the instructional as well as the evaluative level. Each form/instance of affective behaviour has a corresponding one of cognitive behaviour. In certain cases, promoting attitudinal changes may demand an element of face-to-face teaching in distance education. Therefore, in certain cases audio-visual media and face-to-face contact sessions are adopted to achieve these objectives.

Stages of affective learning

i) **Reception:** It refers to the learner's willingness to attend to particular phenomena or stimuli (textbook, activities, etc). At this stage, the learner becomes sensitive to the existence of certain phenomena and stimuli. For example, he or she becomes willing to receive instruction in English. Such willingness is the first requisite for the successful learning of a foreign language. The specific learning outcomes are : chooses, describes, identifies, selects, replies and uses.

ii) **Responding**: It refers to the active participation on the part of the distance learner. The learner is sufficiently motivated to actively respond to the stimuli, for example, he or she becomes eager to participate in the cultural activities organized by an institution. Learning outcomes in this area may emphasise ready to agree in responding (a student completes assignments, participates in teleconference and shows interest in the subject). The specific learning outcomes are discusses, performs, answers, presents and writes.

iii) **Valuing**: The behaviour of a learner shows that a situation/an object/phenomenon, has value or worth for him/her. For example, a belief in the importance of civic responsibility in society. However, you may not fulfil such responsibilities in each and every situation when it comes to actual social practices but you internalize the set of specified values, and express simple acceptance or a commitment. The specific learning outcomes are : reports, completes, explains, justifies and studies.

iv) **Organisation**: This is essentially an advancement/ extension of valuing stage. In this context, we can infer that organization is concerned with bringing together different values, resolving conflicts between them, and building an internally consistent value system. For example, preparing a vocational plan that satisfies the human need for both economic security and social service. The specific learning outcomes are: arranges, combines, modifies and prepares etc.

v) **Characterisation by a value or value complex**: At this level, the values which have a place in the individual value hierarchy, are organized into some kind of internally consistent system. This system controls the behaviour of an individual. Thus, a set of valued or the pattern of behaviour as a result of learning or repeated experience in society becomes a way of life or the character of an individual. Having reached this stage, the individual unlike the one we suggested in item (iii) above will fulfil the social responsibilities at all costs. The specific learning outcomes are: displays, listens, revises, solves, uses and verifies.

Psychomotor domain

The taxonomy of psychomotor domain was developed by A. J. Harrow (1972). This domain is concerned with physical activity or psychomotor skills of educational competency. Face-to-face teaching within the overall framework of distance teaching can ensure learning of this kind. For example, driving can be learnt more effectively under the direct supervision of an instructor, after the learner has attended to a television lesson on 'how to drive a car'.

Psychomotor learning has three characteristics. These are:

i) **Response chains**: Learning of skills involves a chain of motor responses, i.e. the muscular movements in swimming or driving or writing.

ii) **Movement coordination**: Coordination of perception and motor skills is necessary here. For example, a child starts riding a bicycle by acquiring this coordination.

iii) **Response patterns**: Organisation of stimulus-response chains into large response patterns. For example, a child can ride a bicycle or motorcycle without making an error after he/she masters the skill in question.

Seven Stages of Psychomotor domain

There are seven stages of psychomotor-learning. They are : perception, set, guided response, mechanism, complex overt response, adaptation and origination.

1. **Perception** is the process of becoming aware of objects, qualities or relations by way of sense organs. This level is concerned with the use of the sense organs to obtain cues that guide motor activity. The specific learning outcomes are: chooses, identifies, selects and relates etc.

2. **Set** is a preparatory adjustment of readiness for a particular kind of action. It refers to readiness to take a particular type of action. The specific learning outcomes are: begins, moves, reacts and volunteers etc.

3. **Guided response** is an early step in the development of skills. It is the overt behavioural act of a learner under the guidance of a teacher or tutor. Readiness is a prerequisite for this kind of responses. It includes imitation, and trial and error. The specific learning outcomes are : assembles, builds, sketches, manipulates and constructs etc.

4. **Mechanism** means that the learnt response has become habitual. At this level, the learner has achieved a certain level of confidence and proficiency. The specific learning outcomes are : displays, measures, organizes and builds etc.

5. **Complex overt response** is the skillful performance of motor activities that involve complex movement patterns. Proficiency is indicated by a quick and accurate performance requiring a minimum energy. The specific learning outcomes are : assembles, constructs, fixes, organizes and manipulates etc.

6. **Adaptation** is concerned with skills that are so well developed that the learner can modify movement patterns to fit special requirements or to meet a problem situation. The specific learning outcomes are: adapts, rearranges, reorganizes and revises etc.

7. **Origination** refers to the creating of new movement patterns to fit a particular situation or specific problem. The specific learning outcomes are : arranges, combines, designs and originates. (**Source:** ES-312, Block-1)

Check Your Progress 2

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

Select a topic from your subject and design a unit of instruction with the help of specific learning outcomes suggested in cognitive, affective and psychomotor domain.

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13.4.3 Structure of Observed Learning Outcomes (SOLO) Taxonomy

Let us discuss the Taxonomy of Structure of Observed Learning Outcomes (SOLO). According to J. Biggs and K. Collis (1982) SOLO provides a systematic way to describe how student's performance grows in complexity while mastering academic tasks. Biggs and Collis (1982) designed the framework of SOLO taxonomy, which is based on the outcomes of students learning that display increasing structural complexity at quantitative as well as qualitative levels, which are integrated into a structural pattern.

It presents a hierarchy of learning outcomes. These are:

Prestructural : Students are simply acquiring bits of unconnected information, which have no organization and make no sense. Specific learning outcomes are find out missing points, and acquiring bits of unconnected or unorganized in formation.

Unistructural: Simple and obvious connections are made and focusing on one conceptual issue, but their significance is not grasped. Specific learning outcomes are : Simple meaning, naming, terminology.

Multistuctural: A number of connections may be made, but the meta-connections between them are missed, as is their significance for the whole. Learning outcomes are enumerate., describe, list, combine etc.

Relational level: The student is now able to appreciate the significance of the parts in relation to the whole. Relevant aspects are integrated into an overall coherent structure. Specific learning outcomes are: compare, contrast, analyze, relate and apply.

Extended abstract: The student makes connections not only within the given subject are, but also beyond it, able to generalize and transfer the principles and ideas underlying the specific instance. Specific learning outcomes are theorize, generalize, hypothesize and reflect.

According to Louise Starkey (2012), The development of a poster, skit, essay, webpage or podcast could require students to apply their understanding of a concept or a skill to a different context, demonstrating an extended abstract learning outcome of SOLO taxonomy.

Biggs (1999) suggests four steps in writing learning outcomes in the SOLO taxonomy framework. These steps are:

1. Decide what kind of knowledge is to be involved (factual, conceptual, procedural or metacognitive);
2. Select the topics to teach;
3. Decide the purpose of teaching the topic and hence the level of knowledge desirable for students to acquire; and
4. Relate the learning outcomes to assessment tasks so that the results can be reported.

Let us discuss an example explained by Louis Starkey (2012) for learning the concept of 'Sustainability' using SOLO taxonomy.

A student may start learning the individual parts of a concept (prestructural stage of SOLO taxonomy). For example, if students are learning the concept of sustainability they may start by learning about mining and oil extraction through an interactive educational programme with embedded video footage. From there the teacher can teach about the limitations of the use of these resources through an interactive time scale programme, thus the students will be reaching the unistructural stage of the SOLO taxonomy where simple and obvious connections

are made, but their significance may not be grasped. The students may then consider their household consumption over a week, what is brought into the household and what leaves. This could be recorded by scanning each product entering the house and mashing with the online energy consumption figures for the household. Analysis can be provided through a sustainability website. This takes the students to a multistructural understanding where a number of connections may be made, but the meta-connections between them are missed, as is their significance for the whole. The origins of each student's household inputs are considered as to whether these are mined, grown or manufactured of the parts in relation to the whole and are working at the relational level. The students then consider the inputs and outputs of the school, tracking the origin and destination of inputs and outputs. The students are now reaching an extended abstract position where they are making connections not only within the given subject area, but also beyond it, able to generalize and transfer the principles and ideas underlying the specific instance.

(Reprinted with permission by Louise Starkey, 2012 [pp. 100]).

13.4.4 Revised Bloom's Taxonomy (Anderson and Krathwohl, 2000)

The original Bloom's taxonomy was unidimensional with both noun and verb together. For example, in the statement the student should be able to identify three components of an instructional objective. Here 'identify' is the verb and three components of an instructional objective is the noun represented in a unidimensional framework.

In the revised taxonomy Anderson and Krathwohl, (2000) both noun and verb form two separate dimension – the noun forming the knowledge dimension and the verb forming the cognitive process dimension.

Knowledge is the lowest level of the objectives in the cognitive domain in the original taxonomy of B.S. Bloom with other levels such as Comprehension, Analysis, Synthesis, application and Evaluation. But in the revised taxonomy by Anderson and Krathwohl, the six categories of the original taxonomy are retained with changes to lable those in their verb form. The knowledge category is now renamed as remember, while comprehension is now understand. Application analysis, and evaluation become apply, analyse and evaluate, and synthesis has changed place with evaluation with a new name create. Therefore, the hierarchical structure of the revised Bloom's taxonomy is : remember, understanding, apply, analyse, evaluate and create. However, both versions serve to assist teachers in creating objectives for lessons, units, courses and programmes (Mishra, 2004).

Let us discuss each dimension with its specific learning outcomes.

1. **Remember**: Retrieving relevant knowledge from long term memory. Specific learning outcomes are: Recognising and recalling etc.
2. **Understand**: Determining the meaning of instructional message including verbal, written and graphic communication. Specific Learning Outcomes are: classifying, summarizing, interpreting, explaining, comparing.
3. **Apply**: Here the students are able to use a procedure in a new or given situation. Specific outcome are executing and implementing.
4. **Analyse**: Refers to breaking material into its constituent parts and detecting how to parts relate to one another and to an overall purpose. Specific learning outcomes are organize and differentiate.
5. **Evaluate**: is making judgements based on criteria and statements. Specific learning outcomes are examining, valuing, checking etc.

6. **Create**: refers to putting together to form a novel, coherent whole or make an original product. Learning outcomes are: generating, planning and producing.

From the above discussion of different types of taxonomies of objectives, if you like, you may compare these taxonomies and can adopt the framework as suggested above to formulate education objectives for designing effective learning experience learning activities. According to Starkey (2012) a teacher will design learning activities to guide or instruct students through the process of developing their knowledge while retaining a focus on the learning of concepts and skills. The pedagogical approaches may draw on any one or all leaves of the taxonomies of learning i.e., Bloom's taxonomy, Krathwohl's affective domain, Harrow's psychomotor domain, SOLO taxonomy or revised Bloom's taxonomy.

13.5 DESIGNING A BLUE PRINT

At the designing stage, decisions have to be taken with regard to the objectives, choice of content area, choice of methods, media and assessment strategies. So, many questions come to our mind before we prepare a test or a question paper. What content is to be covered by the test? What type of items are to be asked and what are the objectives that are going to be tested? Are the objectives that are going to be achieved are stated clearly covering all the learning domains of human behaviour? For example, we want to prepare a test in a subject like Life Science for graduates. It is desirable that all the content areas must be duly represented in the test. Moreover, due weightage is to be provided to different content areas must be decided. Suppose the content areas decided are – Nervous System, Respiratory System, Digestive System and Skeletal System of the subject Life Science.

After the expert opinion, we decide the weight to be given to the different content areas viz. Nervous System, Respiratory System, Digestive System and Skeletal System are 20%, 30%, 20% and 30% respectively and the weight given to the objectives of knowledge, understanding, applications and skill are 40%, 30%, 20% and 10% respectively. After the weight of content areas and different objectives are decided, a blue-print can be prepared. We have provided an example of a blue-print in figure.

A blue-print for the proposed test on a subject of Life Science is presented below:

A Blue-print (Two dimensional chart)

Objectives →	**Knowledge**	**Understanding**	**Application**	**Skill**	**Total**
Content Areas ↓					
Nervous System	8	6	4	2	**20**
Respiratory System	12	9	6	3	**30**
Digestive System	8	6	4	2	**20**
Skeletal System	12	9	6	3	**30**
Total	**40**	**30**	**20**	**10**	**100**

This Blue Print shown above is a content-behavioural objective chart. Here, we have shown the weight to be given in two dimensions, viz., content and objectives. So, it is a two dimensional chart. The blue print is a plan of the test to be prepared. If you decide to include only objective type of questions the two-dimensional chart will serve the purpose. If you plan to include three types of questions, i.e. essay type, short-answer type or objective type questions (another dimension i.e. form or type of questions). You have to prepare a blue print of three dimensional chart.

13.6 EVALUATING LEARNING OBJECTIVES

Evaluation is carried out to make informed judgments about the effectiveness of the process and the outcomes. The design activities are evaluated at multiple stages during the process. Formative evaluation processes can start with the identification of the needs of the students to ensure that the needs have been analysed and identified properly. Once you have designed the instructional strategies and created a draft or prototype of the instruction, you can review and revise it.

Evaluation of learning outcomes (ELO)

As you are aware that evaluation is the systematic process of determining the extent to which the specified learning objectives have been achieved by the students. These learning objectives help to design the content and evaluation strategies in a course. Evaluation of learning objectives help you for obtaining information pertaining to a student's learning progress and achievement. Evaluation also helps in assigning a value (marks or grades) to the performance of a student. Therefore, student performance vis-a-vis the course outcomes can be reported with the help of grades and numerical marks. For more detail you may read grading criteria based on Biggs (1999) SOLO taxonomy. (Ref. MDE-413, Block 4, Unit 1, Section 1.3,example 2)

The procedures/steps involved in ELO are:

i) establishing objectives
ii) placing objectives in broad classification
iii) defining objectives in behavioural tems
iv) establishing situations in which attainment of objectives can be demonstrated
v) choosing or developing appropriate evaluation tools/techniques
vi) collecting data from learner's performance
vii) comparing data with objectives
viii) making a decision about the learner's performance
ix) providing a feedback

Here, evaluation of learning outcomes (ELO) is concerned with the systematic process of determining the extent to which the instructional objectives are achieved and it provides feedback to the learners as well.

Evaluation, as we have maintained is the systematic process of collecting and analyzing data in order to make decisions. Evaluation is the process of obtaining and providing descriptive and judgemental information about the worth and merit of a programme's, goal, design, implementation and impact in order to make informed decisions. This is otherwise known as decision-oriented evaluation.

Let us now work out the exercise given below.

Check Your Progress 3

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

Describe the procedures/steps involved in evaluation of learning outcomes.

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In Units 11 and 15 of this Block, you have studied the formative and summative methods of assessment involved in designing materials. Let us revisit formative and summative tests involved in designing learning. A teacher evaluates the performance of students while they continue with the instruction, as also at the end of instruction. You have seen that self-assessment questions (SAQs)/check your progress questions (CYPs) are provided within the study materials to monitor the learning progress of students. This test helps a student to get feedback to his/her own progress. This feedback is to be seen in terms of cognitive, effective and psychomotor domains included in his/her learning. In open and distance learning formatve evaluation is done through SAQs/ CYPs and assignments. This type of testing procedure is called formative evaluation and the tests used for this are called formative tests. (Ref. Units 11 and 15)

With a background of student's learning needs and the course outline the teacher will be able to design learning experience based on the objectives of instruction. The next step in the process is to evaluate the extent to which a set of objectives has been achieved. For evaluating these objectives diverse methods are used. For example, for cognitive type objectives, oral or paper and pencil tests of objectives type or essay type are used, while for skills oriented objectives – both intellectual and psychomotor skills the performance type test or situational tests are used. For effective type objectives, the methods used are observation, checklists, inventories, rating scales, interviews and attitudinal scales. We can combine two methods of measuring the objectives formulated based on cognitive, affective and psychomotor domains. For example, projects, assignments and practical activities can be developed for measuring these objectives. This type of assessment is also known as student evaluation.

This type of formative assessment also provide feedback to the instructional designers as to identify which part of the unit or course needs improvement or revision, and which objectives are not clearly achieved. So, formative assessment serves two major functions i.e. feedback to students in monitoring the progress of learning and to the instructional designers on the efficacy of design components.

Summative tests are provided at the end of a unit or a course of instruction. The purpose here is to assess the overall performance of the students at the end of a unit or course. The summative assessment determines the extent to which the instructional objectives have been achieved. Summative assessment also helps to assign grades in a course or certify students mastery of the intended learning outcomes. The techniques and tests used in summative evaluation are determined by instructional objectives. They are teacher-made achievement tests, rating on various types of performance and evaluation of the unit/course. The two purposes of summative evaluation is grading or certification of student achievement, and for judging the appropriateness of the unit objectives or course objectives.

Check Your Progress 4

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

Select a topic of your choice and design different types of tests and techniques used for evaluating objectives of cognitive, affective and psychomotor domains of learning.

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13.7 LET US SUM UP

In this unit, we have discussed the concept of goals and objectives. The objectives describe an action carried out by a student at the end of instructional event that can be observed and measured. Goal is a general statement about the ultimate intention of instruction. Objectives are more specific about how and what degree of instruction will affect the teaching-learning process. Objectives are formulated logically arranged to create instruction or design learning tasks in a unit/course. In this unit, we have described Bloom's taxonomy, SOLO taxonomy, revised Bloom's taxonomy that define the types and levels of instructional objectives. You can use different types of questions or tests as well as formative and summative assessment procedures for evaluation of learning outcomes.

13.8 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1. Please refer to section 13.4.1. Learning Objectives tend to describe specific, discrete units of knowledge and skill. They can be accomplished within a short time frame. Learning objectives are statements of intent. On the other hand, learning outcome describe broad aspects of behaviour which incorporates a wide range of knowledge and skills. They are accomplished over time after several learning experiences. Learning outcomes are related to demonstrations of performance.
2. Please refer to 13.4.1 the acronym SMART stands for **S**pecific, **M**easurable, **A**ction, **R**easonable, **T**imely.

Check Your Progress 2

Please refer to section 13.4 taxonomies of learning and design a set of learning tasks in your own subject.

Check Your Progress 3

i) establishing objectives

ii) placing objectives in broad classification

iii) defining objectives in behavioural terms

iv) establishing situations in which attainment of objectives can be demonstrated

v) choosing or developing appropriate evaluation tools/techniques

vi) collecting data from learner's performance

vii) comparing data with objectives

viii) making a decision about the learner's performance

ix) providing a feedback

Check Your Progress 4

Please refer to sections 13.5 and 13.6. For evaluating the objectives and goals the procedures are multiple choice test items, checklist, portfolios etc. based on the content and objectives.

UNIT 14 DEVELOPMENT OF LEARNING RESOURCES

Structure

14.1 Introduction

14.2 Learning Outcomes

14.3 Designing Learning Resources

14.3.1 Concept of Learning Resources

14.3.2 Significance and Need of Learning Resources in ODL

14.4 Characteristics of Learning Resources

14.4.1 Universal Design

14.4.2 Features of Learning Resources

14.5 Types of Learning Resources

14.6 Guidelines for Designing Learning Resources

14.7 Let Us Sum Up

14.8 Check Your Progress: Possible Answers

14.1 INTRODUCTION

As you are aware, distance education is a system where there is a distance between the learner and the teacher. The distance learner is considered an autonomous learning who studies in a self-learning environment. The role of the teacher is that of a facilitator who guides the learner to adhere the learner. In such a system, the learner is supported by many different learning resources to enhance his/her learning. These learning resources are designed keeping in mind the characteristics of distance learners. The learning resources help in the delivery of distance learning.

In this unit, you will learn about learning resources and their features. You will observe how effective learning can take place at a distance through well-planned and well designed learning resources.

14.2 LEARNING OUTCOMES

After going through this unit, you should be able to:

- explain the meaning and role of learning resources in distance education;
- describe the characteristic features of learning resources especially with respect to universal design;
- identify the different type of learning resources; and
- explain the guidelines for designing learning resources.

14.3 DESIGNING LEARNING RESOURCES

Before we go on to designing learning resources, it is important to understand the concept of the term 'learning resources'.

14.3.1 Concept of Learning Resources

Learning resources are those resources which help the learners to navigate through their learning and help them to achieve their learning goal. These resources may help in

learning and teaching. They can be used by the teacher to support institution. In the case of distance learners, the learning resources have immense significance as the learner is a self-learner and such resources help the learner to not only acquire knowledge and skills but also to organize their learning and process it. Learning resources are educational aids that facilitate the learning journey of the learner. These resources can be in the form of printed self learning materials, audio materials, videos, models, online materials. Thus learning resources help in teacher-directed and learner- directed activities as well as in individual and group learning practices.

14.3.2 Significance and Need of Learning Resources

Let us try to understand why learning resources are significant. In Unit 12, Block 3, you have read about the importance of learners' analysis and recognized that learners of a distance educational programmes are diverse i.e. they belong to different age groups, geographical regions, educational backgrounds, economic status. All learners have different characteristics and their intellectual skills and competences may differ. Further their attitude as well as abilities will also differ. As a result, the learning styles will be different. While some learners may find it easy to read a text and learn better with pictures, charts, another group of learners may learn better when they hear an audio version of the text. Yet another group of learners may prefer to touch to demonstrate their skills.

This implies that learners learn in different ways. This is why learning resources have to be designed in different ways so that the learning styles of learners are addressed. (Please also Revisit: Unit 12 of Block 3 for a detailed discussion about different learning styles.)

Activity 14.1

You have learnt about the major learning styles by which learners learn. These are:

VARK
V– Visual (seeing)
A – Aural
R – Read/Write
K – Kinesthetic (touch).

As a learner, please think about your own learning style – What is your learning style? Make a note of the way in which you learn.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1. Describe the significance and need of learning resources in ODL.

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2. List out the major learning styles of different learners.

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14.4 CHARACTERISTICS OF LEARNING RESOURCES

Learning resources may differ in their nature and usage. However there are certain common characteristics of good learning resources. These are based on the principle of universal design. Let us now read about universal design.

14.4.1 Universal Design

The term 'universal design' was first defined by Molly Follette Story, James L Mueller, Ronald L. Mace as "the design of products and environments to be usable to the greatest extent possible by people of all ages and abilities." (Story, Mueller, Mace, 1998). The underlying philosophy of the universal design is that the design must be such that the maximum persons of all abilities and irrespective of their age, sex, region, disability, learners' style are able to benefit from the product. Thus 'universal design' goes a step forward from the earlier term 'accessible design', which was used in the context of person with disabilities.

The 'universal design' has been extended to education also. Thus the Universal Design in Education (UDE) forms the basis for designing all structure, processes and services. In the case of distance education, the UDE is applicable while designing learning resources as well as selecting these resources and ensuring their usage through learner support services.

According to Burgstahler (2009), the seven principles of universal design developed by Story, Mueller, Mace (1998) at the Centre for Universal Design, North Carolina State University are as follows:

1. **Equitable use:** The design ensures that people of all abilities are able to use it. It implies that the design can be used by all persons irrespective of their abilities. Therefore, the design is accessible to a larger body of persons.
2. **Flexibility in use:** The design must be such that individual learning styles can be included and thus it is not rigid. Thus such a design which is flexible has greater potential for being able to cater to individual preferences of more persons.
3. **Simple and intuitive use:** This implies that the design is easy to use and can be used by all persons irrespective of their background and knowledge.
4. **Perceptible information:** Here the design can be used by all persons irrespective of their sensory abilities.
5. **Tolerance for error:** In this case, the design is such that it minimizes the error quotient and therefore is more likely to be correct and easily useable.
6. **Low physical effort:** In this case, the design is such that it can be used without much physical effort and therefore can be used by more people.
7. **Size and space for approach and use:** Here the design is such that the physical size and space makes it usable for all persons with different physical characters.

Thus we see that the universal design is aimed at ensuring that the design is able to be used by more and more persons and is thus more accessible to all.

The concept of inclusion in learning and instruction has to reflect in all the resources developed. Universal Design for Learning (UDL) was defined by Rose & Meyer, 2002, (Preface) as "a research-based set of principles that together form a practical

framework for using technology to maximize learning opportunities for every student." The UDL curriculum is based on three principles:

1. **Multiple means of representation –** This implies that they must be many different ways by which learners can be provided information, knowledge, skills and other aspects of the curriculum.

2. **Multiple means of action and expression-** This implies that learners are given different alternatives to demonstrate what they have learnt.

3. **Multiple means of action and engagement-** This implies that learners have opportunities to express their interest and engage in the learning process.

The importance of Universal Design lies in that it can be used for all components of learning i.e. development of learning resources, assessment tools, audio video materials, academic counseling. In the case of distance learning, it has direct impact as learners of ODL institutions belong to a heterogeneous group, having diverse characteristics and therefore a Universal Design ensures that all learners are able to access the materials.

14.4.2 Features of Learning Resources

Learning Resources have certain characteristics features which allow them to be useful and meet the diverse needs of distance learners. These are as follows:

1. **Inclusive:** An instructional designer has to develop the learning resources in such a manner that they are usable by learners having different characteristics and abilities. In order to be inclusive, effort has to be made to ensure that the content is free from any kind of restrictive and closed approach. This implies that the sensitivity of different groups must be kept in mind while developing the resources. These include gender sensitivity, region, and religion neutrality as well as ensuring that the resources are not biased towards any particular group, or persons of certain economic status or educational background. This natural approach must be reflected in the content, presentations, examples, photographs and cartoons placed in the materials as well as the assessment pattern.

2. **Accessible resources:** In the previous section, you have read about universal design, which aims at ensuring that the design of all products, including learning resources is such that it is accessible to all. Therefore, UD goes beyond debilities and applicable for person with different abilities. However, in the case of distance education, an important group of learners are those with disabilities. Therefore, it is important that such learners with disabilities are provided resources that are suitable to their disabilities and allow them to perform at the same level as students without disabilities. The learning resources must be prepared in a range of formats using appropriate designs so that all learners are equally benefited. This includes using assistive software to support learners with different abilities.

3. **Affordability:** The learning resources developed for supporting distance learners need to be affordable for all income groups of learners. This implies that the learning resources need to be prepared in such a way that they do not become out of reach due to exorbitant costs and hurt th financial status of the learners. These resources need to cater to the average learner.

4. **Handy and Efficient:** Learning Resources need to be handy so that they can be used easily by the learners. This implies that the size of the resources should be such that it can be easily handled. In case these are E-resources, then the technology must be assistive and affordable for its easy use. The resources have to be efficient

in terms of the content, presentation, consistency as well as the time taken by learners to use them. The instructions given to use the resources need to be clear and unambiguous. The language should be simple and appropriate to the level of the learners.

5. **Environment friendly and reusable:** The resources have to be environment friendly. In order to ensure that they can be recycled, the material used for preparing such resources should be environment friendly and reusable. The resources should also keep in mind the local needs and therefore be prepared appropriately. This would be in keeping with the global policy to prepare indigenous material that are aligned to the needs of local persons. In the case of learning resources that are to be used internationally, a uniform pattern and policy should be made.

6. **Discipline appropriate:** The specific disciplines also have specific requirements. Therefore, the learning resources need to be appropriate to the philosophy and structure in the discipline. For instance, learning resources for any language discipline must be able to address the competency of reading, writing, listening, and speaking. On the other hand, in the case of a discipline of science, there would be need to prepare learning resources that are able to achieve the requirement for practical work.

7. **Aligned to the achievement of learning outcomes:** The learning resources serve as a mean to supplement the learning and achieve the learning objectives. Therefore, it is necessary that the development of learning resources should be such that it is able to meet the learning objectives. This may be by adding supplementary knowledge, skills to enhance learning of a particular topic. Learning resources can also build upon existing knowledge and consolidate the knowledge of the learners. Bloom's Taxonomy lists out different behavioral objectives (Ref. Unit-13, Block-3). These objectives can be aligned to the learning resources so as to strengthen learning. According to Butcher, Davies and Highton (2006), a mapping of learning resources to Bloom's taxonomy would mean that the learning outcome of a essay writing could be supported by the learning resources of annotated bibliography. Similarly, laboratory work could be achieved through a video briefing on laboratory work as well as demonstration of the practical. Thus, case study, examples, visual material, models can be used as learning resources to achieve different learning outcomes. Thus, by doing this the additional learning resources fill up the gaps in the learning make the learning more holistic and well balanced.

8. **Interactive:** In a distance learning system, the role of learning resources is also to create a bond between the teachers and learner through interactivity. Therefore, there is a need to build interactivity while designing the resource. Such interaction would help to reduce the distance as well as open communication channel between the teachers and learners as well as helping peer learning. Such resources also must have a feedback mechanism so that learning can be monitored and guided.

9. **Assistive Resources:** Learning resources are also available for persons with disability in the form of assistive software. Such software is able to support learners with disability as well as those learners who have different learning styles. The Table 14.1 shows how different assistive technology can be used to support different disabilities.

Table 14.1: Assistive Technologies to support different disabilities

Disabilities	*Assistive technologies*
Visual Impairment	Screen readers, Screen enlargers, Speech recognition systems, Speech synthesizers, Refreshable Braille, display, Braille embossers
Hearing Impairment	These people can make use of computer well. It is also said that deaf people can be good programmers.
Physical Impairment	Adaptive keyboard, Speech recognition systems, Speech synthesizers, Touch screen
Cognitive Impairment	Speech synthesizers, Speech recognition systems, Reading tools, and Learning disability programme.

Source: Mishra, S. (2008)

Check Your Progress 2

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1. Explain the meaning of 'universal design'. What are the principles upon which an UDL curriculum is based?

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2. Describe the characteristic features of learning resources.

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14.5 TYPES OF LEARNING RESOURCES

There are many different types of learning resources. These resources can be classified as core resources and additional resources. The instructional designer while mapping the learning resources takes a decision as to which resources would be core resources and others that would be additional resources. The core resources are those resources that are intrinsic to the programme and contain the key concepts of the curriculum. The additional resources are supporting resources which provide additional information and help the learner to better understand the content. For instance, an annotated bibliography given in a handout to the learner would form an additional resource which would support the assignment to the developed by the learner. Learning resources may be in the form of printed SLM, videos, handouts, e-resources or physical models. An example of showing some learning resources is given in Fig 14.1.

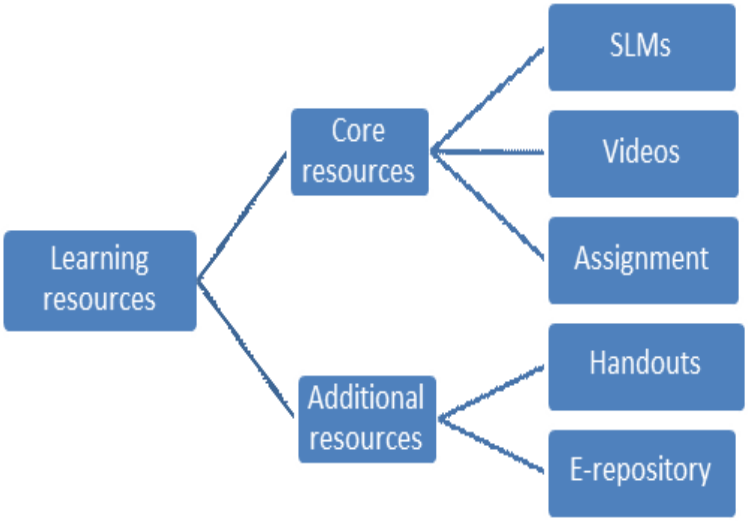

Fig. 14.1: Types of learning resources – Some examples

Let us now learn more about the learning resources.

1. **Print based:** Print based resources continue to be valuable learning resource especially in context of low internet connectivity locations. Printed resources can be in the form of self learning material, text material, handbook, handouts, brochures, journals, reference books.

a) **Self-learning materials (SLM)**: The most important learning resources are the self-learning materials (SLM), which are designed and developed especially for distance learners. The development such SLM is based upon the philosophy of distance learning and therefore such material is able to accommodate and achieve the learning objective more effectively. You will read about the self-learning material in Unit18, Block-4

b) **Handouts**: Handouts are considered an important learning resource which can be specially designed by the teacher to aid the learner. These handouts may be in the form of notes related to a particular topic or information for doing a particular topic or for preparing an assessment. They could also be in the form of annotative bibliography or references provided by the teacher for additional reading by the learners. The handouts could also be in the form of printed notes or power point presentation made by the teachers which can be given to the learners. Depending upon the nature of the discipline, handouts can be used by teachers to provide important definition, formulae, glossary, flow charts and other such support material for the learners. However, it should be ensured that handouts are not bulky and do not overwhelm the learners. Handouts can also be prepared by the learners themselves as ready notes for revision purposes.

According Butcher, Davies and Highton (2006), the designing of the handouts is a major influence on the student's perception of the learning. Therefore, when designing the handouts, the purpose of that particular handout must be clearly stated. This should include information about how the handout is linked to other sections of the course. The designing of the handouts must be attractive so that the learners find it easy to read. Doyly and Robson (2002) have provided guidelines for designing handouts, which give details of the size and style of the font, the line spacing and justification as well as the colour of the paper of the handout and a placement of images and text. Thus, we see that designing a handout requires planning and careful thought related both to the content as well as the presentation of the material.

c) **Assignment:** In an ODL system, assignments are a part of learning as preparing the assignment helps the learning to study and on the topic. The assignments are also part of the formative assessment and act as tools by which remedial learning can take place. Therefore, designing the assignment has to take into account the different learning outcomes and help learners to acquire the competencies and skills upon completion of a programme.

2. **Multi-media/audio-video resources:** They are many learners who learn well using aural-verbal materials. Therefore, such learners can be supported through multi-media resources. These resources may already exist and the learner may have to be guided towards identifying the most appropriate resource. In case the resources have to be developed then requisite planning for its designing has to be done. This would include whether the resource is a stand alone one, which topic of the curriculum is it supplementing, what is the ratio between the audio and video elements, what sort of time frame is it to be developed in. The UGC has formulated the four quadrant approach for supporting higher education programmes being developed under the SWAYAM platform. The four quadrant approach includes 1. Text, 2. Video, 3. Discussion forum, 4. Assessment Questions. Here, each video is to be approximately 20-30 minutes and is linked to the credit value of the programme. Thus a course of one credit would be supported by 10 videos while that of four credits would have 40 videos to support.

3. **Visual resources:** In the above, you have studied about the developing resources pertaining to print, audio and video programmes. You have learnt that print resources can present complex information and it requires literacy, analytical and mnemonic skills. Visual resources refer to those resources, which support learning through the eyes i.e. learners can see/read the resource and learn from it. They could be one-dimensional resources or could be multi-dimensional. Some examples of visual resources are photographs, pictures, posters. charts, which can be easily read and understood. You may have seen posters put up in classrooms, library that serve as learning resources. Visual resources include books, magazines, prints, drawings, and other such materials that are aesthetically pleasing to the eye.

   With the growth of technology, visual resources are being used as online resources. Let us refer to a web page which also presents information through text and images. This visual resource support interactivity, for example, user-centered information navigation and low cost of development. The other types of visual resources are digital photos, maps, and schematic drawings, flow charts and power point presentations. These resources require computer and internet connections. They are cost effective for duplication and publishing. For example, simulation includes animation that presents specific content for example ecosystem, life cycle of butterfly and Earth's movement through space that offer the student the opportunity to observe the result and serve as engaging and motivating for the students.

   To ensure the quality of the visual resources, it is necessary to consider four important issues which are i) pedagogical issues ii) subject matter iii) language and format iv) surface features i.e. interface design.

4. **Web based resources/Online Resources:** Web based resources are very important in today's context. With the growth in use of technology, and the availability of internet facility, there has been a shift from non-digital to digital resources, which are available on the click of the mouse. There are many different types of learning resources that can be created in a digital environment. These resources include data bases, catalogue, e-journals, reference books, learning

portals, e-books, repositories which can be easily accessible to the learner. The growth of open educational resources, open source and open content initiatives has made web based resources more accessible as well as borderless and thus resources from different parts of the world are available to learners. Besides resources that are freely available on the web, there are some resources that may be especially designed by teachers and institutions to meet the specific learning needs of their learners. For instance, a university may design a learning portal for its learners so that teachers can guide the learners online. This may be a personalized means for supporting the learners by creating and monitoring their individual learning pathways. In other instances, institutions may also design a repository where other learning resources can be placed for easy access by the learners. However, the designing of these resources has to be done in such a way that there is not an overdose of information, therefore prior planning has to be done, which may be through a concept map. The planning has to ensure that the learner can locate relevant information at a fast pace. Therefore, indentifying the appropriate key words, planning the layout keeping the objectives in mind is important.

5. **Library:** In the case of most distance education institutions, the library is accessible to learners and the services can be used by learners regularly. The library is an important source for identifying both printed and e-resources. In most libraries, there is also provision for not just for borrowing their own books but also for inter library loans for the students. Thus the library is a valuable learning resource.

6. **Web Portals, E-repositories**: Web portals are powerful learning resources as are also E-repositories. These resources make it possible for many resources to be placed under a single window.

Activity 14.2

Look at Fig 14.1. Prepare a similar diagram showing the core and and additional learning resources that you would like to deveop for a subject /topic of your choice.

You have read about Handouts being a useful learning resource. Design a handout which contains annotated bibiliography for understanding ADDIE approach.

Check Your Progress 3

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1. What are the various types of learning resources?

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2. What is the four quadrant approach for designing of learning resources under SWAYAM?

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14.6 GUIDELINES FOR DESIGNING LEARNING RESOURCES

Learning resources are developed by adoption of ICTs in institutions, universities, and schools. Text materials, instructional audio and video programmes and web-based content are also designed and developed by subject matter and pedagogical experts. Let us discuss a few guidelines:

The learning resources may be developed to provide support for learning and teaching, inclusion of technology, a cognitive science and assessment. The instructional context refers to different characteristics of students, learning objectives. Expectations, interests, needs of the students. So, development of learning resources is linked with processes of teaching and learning and focus is on the students (student-centered).

Planning and context for development of learning resources: The planning for content has to be done systematically with an appropriate presentation of the concept. The learning resources need to be designed keeping in mind learning theories and universal design. The context has to include understanding the cognitive factors, instructional objectives, delivery mechanism and evaluation pattern.

Target Group: Here there should be sufficient prior analysis done regarding the learners, their educational level, demographic profile, preferred language and usage levels, learning style so that their resources can be designed accordingly.

Objectives: The purpose for which the learning resource is being designed must be clear to the designer. It should be established whether the resources is a core resource or an additional one, whether it is teacher directed or for self learning by learners. The resource has to support attainment of the learning objective.

Content: The content should be appropripiate to the level and to the learning objectives of the discipline. For instance, learning resources for history may include reading materials as well as videos and historical films. A language teacher may develop integrated learning resources that would allow reading or listening to a literacy text as well as speaking out its central ideas and then writing an essay on the main ideas in the text. The resources for teaching of mathematics may include multi-resource packages, including games. Resources for developing competencies of problem solving would be developed accordingly.

Selection of Media: While developing the learning resources, special effort must be made to select the most appropriate media i.e. whether it is to be in print or digital format. The selection has to be done after analysis of the learners, their educational background as well as their comfort level with a particular media. For example, the decision to select digital materials has to be depending upon the availability of internet and level of connectivity before developing the digital materials.

Language: The language of the learning resources should be clear and unambiguous. Efforts should be made to ensure that language is appropriate to the level of the learners. The language should be learner-friendly and conversational. It should be sensitive to various groups and should be as inclusive as possible.

Presentation: The presentation has to be attractive and of a high quality. The font size, line spacing, the use of pictures, graphics, level and quality of information, language, interactivity, ease of use should be well taken care of. The presentation should motivate the learner and also increase his/her curiosity to proceed ahead to learn more about the topic.

Technical aspects: The technical aspect has to ensure that the material is sound and balanced. The features of universally design should be followed and the sensitivities of diverse groups should be kept in mind. It needs to be ascertained if the learning resources needs to be developed in a particular format or using particular LMS/portal, which is easily navigable. Bulky content should be avoided.

Feedback and Updating: The learning resources should have an updating schedule so that they can be revised and updated on a regular basis. Further a feedback mechanism may be added or should be taken at regular intervals so that any problems with content, its usage and other issues can be addressed. This would ensure that there is weeding out of old and irrelevant information / content.

Cost: The cost for designing and developing the learning resources has to be estimated and budgets allocated for developing, and implementing it. The additional cost of continuous updating also has to be catered for right from the planning stage.

Plagiarism and copyright Issues: This is a very important aspect of designing any learning materials. The material should be free from any kind of plagiarism and violations of copyright. While there is a lot of information, research work and innovative materials available on the internet, however if any material is to be used, then citation must be given so that the original author receives due credit. There are many softwares available for checking that the learning resources are plagiarism free.

Activity 14.3

The National Digital Library of India is a virtual learning resource that contains various learning materials from primary to post graduate level. This vast resources connects institutional resources from across libraries of the country through one single window. The portal is easily accessible and the resources are available in many Indian languages.

Please try to access learning resources from IGNOU's eGyanKosh at http://www.egyankosh.ac.in

Check Your Progress 4

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

Enumerate the components guidelines involved in developing learning resources.

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14.7 LET US SUM UP

Learning resources are resources which help learners to navigate through their learning and help them to achieve their learning goal. These resources help the learner to organize their learning in a systematic manner. In distance education, learners belong to a diverse group, therefore the learning resources have to be designed such that theyare universally accessible to all learners. The main features of universal access as developed by Story, Mueller, Mace (1998) are:

1. Equitable use
2. Flexibility in use
3. Simple and intuitive use
4. Perceptible information
5. Tolerance for error
6. Low physical effort
7. Size and space for approach and use

In addition to universal access, it is also necessary that good learning resources are Inclusive, Accessible resources and Affordability. Learning resources should also be Handy, Efficient and Environment friendly and reusable. Every discipline would need to find the most appropriate resources so that they are properly aligned to the achievement of learning outcome and are Interactive and Assistive Resources.

There are different types of learning resources such as Print, Audio-Video, Visual, Kinesthetic, Web-based/e-resources. A good designer follows guidelines for developing learning resources which include the appropriate principles, content, language format etc.

14.8 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1. Learning resources are those resources which help the learners to navigate through their learning and help them to achieve their learning goal. These resources can be in the form of printed self learning materials audio materials, videos, models, online materials. Please see section 14.3.

2. The major learning styles are Visual (seeing), Aural, Read/Write, Kinesthetic

Check Your Progress 2

1. The different types of learning resources are: Print based, Self-learning materials (SLM) , Handouts, Visual Aids, Web based resources/Online Resources, Multi-media/audio-video:, Library, Web Portals, E-repositories.(please refer to section 14.5)

2. Please read about the nine features given at section 14.4.2 Other Characteristic Features of Learning Resources

Check Your Progress 3

1. Please See Section 14.5 on types of Learning Resources

2. The four quadrant approach for developing resources under SWAYAM includes 1) Text, 2) Video, 3) Discussion forum, 4) Assessment Questions. Please see section 14.5.

Check Your Progress 4

1. Please see section 14.6
2. The guidelines for designing learning resources are:
   - Planning and context
   - Target group
   - Objectives
   - Content
   - Selection of media
   - Language
   - Presentation
   - Technical aspect
   - Feed back and updating
   - Cost
   - Plagiarism and copyright issues.

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UNIT 15 EVALUATION OF LEARNING

Structure

15.1 Introduction

15.2 Learning Outcomes

15.3 Purpose of Assessing Learning

15.4 Evaluation Measures

15.4.1 Norm-Referenced Test

15.4.2 Criterion-Referenced Test

15.5 Types of Evaluation

15.6 Kirkpatrick Model of Assessment

15.6.1 Level 1 Reaction/Satisfaction Level

15.6.2 Level 2 Learning Level

15.6.3 Level 3 Behaviour Level

15.6.4 Level 4 Impact Level

15.6.5 Level 5 Returns on Investment

15.7 Let Us Sum Up

15.8 Check Your Progress : Possible Answers

15.1 INTRODUCTION

In unit 11 of this block, you have studied about the learning environment and different phases of designing instruction. In unit13, you have read the goals and objectives of the instruction. Once you have organized the learning environment and set the objectives of instruction, you will need to decide how to measure the learner's achievement and evaluate the success of instructional design. Therefore, conducting evaluation activities helps the instructional designer revise and improve the instructional process.

In this unit, we have focused on the purpose of assessing learning, evaluation measures, and types of evaluation and Kirkpatrick model of evaluation. Before going to discuss the purpose of assessing learning in section 15.2, you should have a clear idea about the difference between assessment, evaluation and tests.

In the field of open and distance education, we have to be continuously engaged in the decision-making process informed by relevant data, which is collected through various measuring devices. There are certain terms like assessment, measurement, evaluation and tests, which are generally used interchangeably, however, these terms have different connotations. The process of collecting, synthesizing, and interpreting information to facilitate the decision-making process is called *assessment,* while *measurement* is the process of quantifying or assigning a number to performance. For instance, a student may get 18 out of 20 in a mathematics test. Here, a numerical score is used to represent the individual's performance. *Evaluation* involves making judgments about the quality of the learner's performance. In the process of evaluation, the quality of a learner's performance is judged and compared with other group members. A *test* in contrast, is a formal, systematic and usually paper-pencil procedure used to gather information about the learner's behaviour. Test*s* are only one of the many types of information gathering device related to assessment. Other evidence gathering strategies may be an interview, observation, assignments, personal contact programmes, and project reports. Educational assessment is, therefore, an omnibus term, which includes all the processes

and activities reflecting and describing the nature and extent of human learning, its degree of correspondence with the aims and objectives of instructional design and activities, and pedagogical approaches designed to attain those objectives.

However, the goal of assessment does not end with providing feedback about the effectiveness of any instructional strategy, but is to help in the *decision-making process*. Assessment plays an important role in learning as the mechanism to take stock of the instructional interventions and efforts periodically and to assess the accomplishments and failures of instructional programme is inbuilt in the system of education whether face-to-face or distant. Assessment is a systematic, ongoing process of collecting, describing, and analysing information about, the students' progress or the instructional programme in relation to curricular expectations and instructional objectives. In other words educational assessment is the process of reporting the knowledge, attitude, beliefs and skills of students in measurable terms. Assessment can focus on an individual learner, the learning community (students, or other organised groups of learners), the institution or the educational system as a whole. In this unit, we shall discuss in detail the purpose of assessing learning, criterion and norm-referenced procedures of assessment and Kirkpatrick's model of evaluation.

15.2 LEARNING OUTCOMES

After going through this unit, you should be able to:

- reflect on the purpose of assessment of learning;
- differentiate between criterion-referenced and norm-referenced assessment;
- discuss various types of evaluation; and
- describe various levels of Kirkpatrick's model of evaluation.

15.3 PURPOSE OF ASSESSING LEARNING

As indicated in the previous section, assessment is the application of a systematic process of obtaining the results of the performance of an individual. The information regarding the performance of an individual is collected through a variety of sources and procedures like observation, verbal or written tests, interviews, focus group discussions, questionnaires, portfolios, etc. One point of caution here – don't confuse the term assessment with measurement because the measurement is the process of quantifying or assigning a number to an individual's performance. Generally, a numeral score is used to represent an individual's performance, and as clarified in the very beginning of this unit, there is a difference between assessment and evaluation also, as evaluation involves making a judgment about the quality of student's performance, or a possible cause of action, an assessment helps in making such judgments.

Assessment is an integral part of the teaching-learning process. In face-to-face as well as in distance learning situations, the assessment provides feedback to the teachers/ instructors about the progress of learners and helps them to adjust their instructional strategies according to the needs and levels of learners. Assessment is carried out for the following purpose:

- To diagnose learners' strengths and weaknesses;
- To monitor learners' progress;
- To assign grades to learners; and
- To determine instructional effectiveness.

The purpose of the assessment of learning is to provide feedback to both the teacher and the learner regarding the learner's progress towards achieving the learning objectives. This feedback helps to revise or modify the instructional strategies according to the needs and levels of learners. The assessment has a diagnostic purpose also, as it helps to identify the underachievers, and their learning difficulties as well as the overachievers, creative and highly intelligent learners. This type of information is very useful for placement and decision-making process and ensures the quality of instruction. Research evidence indicates that effective assessment inbuilt in the teaching-learning process with the active involvement of learners is a powerful means of improving learning and raising standards. The objectives of learning and assessment are closely associated, and the learning objectives determine the type of assessment procedure to be used. For example, if the objective is to demonstrate critical thinking skills, the assessment technique will be problem analysis. Similarly, if the objective is to test the vocabulary knowledge, the assessment technique will be a multiple choice test, and if the objective is to assess writing skills you may ask the learners to write a composition. In brief, there are three purposes of assessment of learning – *diagnostic, formative and summative*. The *diagnostic assessment* provides the teachers/instructors with the *understanding of the existing knowledge, skills, attitudes, interests, range of individual differences of learners as well as the strengths* and specific needs of an individual or the group. This type of assessment is helpful in planning the instructional strategies accordingly and is often referred to as pre-assessment because it is an assessment that takes place prior to the initiation of instruction.

Another type of assessment is a *formative assessment,* which is an ongoing assessment that provides feedback to both learners and teachers about the *progress* being made. It determines what the learners know and are able to apply, and points to the next steps for teaching and learning. It indicates whether learners are moving satisfactorily towards the instructional outcome the teacher is seeking to promote. This assessment keeps the teachers and learners focused on the purpose of learning and progress being made, that ensures effectiveness of instruction, which could be changed or modified depending on the progress of learners.

Summative assessment occurs at the end of a period of learning and provides an opportunity for the learners to demonstrate their achievement of the important objective of the programme addressed during a particular period. It is used in combination with data from formative assessment to evaluate a learner's growth relative to the purpose of the programme.

Besides the diagnostic, formative and summative purposes of assessment, which are focused on the learners' development, we are often interested to know the effectiveness of a particular instructional strategy compared to other instructional strategies. Therefore, one of the crucial purposes of assessment is to determine the effectiveness of the instructional strategy. In such types of assessment, the pre-test and post-test design is most popularly used to ascertain the effectiveness of the instructional strategy.

Therefore, the role of assessment in designing instruction are:

- Promote learning.
- Description of the existing competence and/or attitudes of students.
- Provide feedback about individual differences of learners on their level of attainment
- Indicate to learners, their conceptual difficulties and assist with improvement.
- Provide feedback to tutors/teachers on areas in which learners are experiencing difficulties and diagnose the need for change in instructional strategies.
- Judge the performance of learners using appropriate criterion-referenced or norm-referenced measures.

- Award marks and grades about the learning level of students.
- Determine whether a learner is sufficiently prepared in a subject area to proceed to the next level of instruction.
- Predict the future performance of students.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1. What is the difference between assessment, measurement and evaluation?

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2. Discuss role of assessment in designing instruction.

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3. Describe three main purposes of assessment in the context of open and distance education.

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15.4 Evaluation Measures

There are two distinctive and widely used strategies for assessment: ***norm-referenced and criterion-referenced***. The major difference between these two categories of tests lies in their intended purpose, content selection and scoring procedures, which guide the interpretation of test results.

15.4.1 Norm-referenced Tests (NRT)

A test is norm-referenced *"when the translated score tells where the person stands in some population of persons who have taken the test" (*Cronbach 1970). Most of the times we want to classify the learners as high or low achievers on the basis of their achievement scores. We, therefore, use norm-referenced tests to highlight the achievement differences between and among students. This type of test compares the performance of an individual to the performance of a group called the norm group. For instance, if an individual scores 75 marks in mathematics, how would you interpret his/her performance? 75 marks tell us nothing until you have some idea about the norm group. Again, 75 may be the highest or the lowest score of the norm group. Therefore, it is essential to have the scores of the norm group in the norm-referenced tests. You might have observed that in many institutions, grades are reported and these are often accompanied by labels or short verbal descriptions of the student's performance in relation to the group to which he/she belongs. Typically, a grade 'A' might be described as outstanding and 'C' as 'average', etc. Thus, the norm is the group and the assessment refers to it.

15.4.2 Criterion-referenced Tests (CRT)

In contrast, a **criterion-referenced interpretation** is absolute interpretation because it depends on the extent to which the criterion assessment domain represented by the test is actually possessed by the student. Criterion-referenced assessment tries to overcome the limitations of norm-referenced tests. There are individual differences in the rate and pace of learning. Some researchers who have developed an individualised system of learning emphasise that education which is truly oriented towards individual differences is one in which a majority of learners are able to master all the basic objectives, if provided time to do so. Norm-referenced assessment provides little information to the teacher/tutor about the time needed by different learners to master a given objective and it tells only the relative position of learner's performance, while the criterion-referenced test determines "..what test takers can do and what they know, not how they compare to others", (Anastasi,1997). CRT tells how well the learner is performing relative to a predetermined performance level on a specified set of educational goals. CRT helps to determine whether the learner has learned the material taught in a specific subject or course. Therefore, an English CRT would include questions based on what was supposed to be taught in English course only.

The table given below compares norm-referenced and criterion-referenced assessment procedure which will give you a very clear picture of these two assessment procedures.

	Norm-referenced (NR) Assessment	**Criterion-referenced (CR) Assessment**
Purpose	To make comparisons between learners and to relate these to the larger group.	To evaluate performance of a learner with an established criterion of performance.
Role	In selection, grading, competition and career guidance, comparison of institutions and relative performance of learners.	Evaluation of the absolute success of instruction, decision- making, individualised instruction and assessment of readiness.
Interpretation	If standardized, the score indicates the position of a learner in a large normally distributed group of scores.	Indicates the level of learner's mastery of a given objective.
Diagnostic Value	Helps in identification of relative performance of learners.	Helps in identification of actual strength and weaknesses in performance.
Reliability	Generally estimated using test retest, parallel form or homogeneity-methods.	Estimated by consistency with which the set of items of an objective classifies learners as masters or non-masters.
Validity	Estimated by reference to external criterion.	Estimated by comparing the items with the objectives of the test.
Types of items	Large number of different items designed to sample a range of skills and concepts.	Each objective has a number of very similar items designed to test a narrowly defined skill or concept.

Check Your Progress 2

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

Differentiate between norm-referenced and criterion-referenced tests with examples.

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15.5 TYPES OF EVALUATION

In the first section, you have learnt that evaluation involves making judgements about the quality of student's performance.

Evaluation is a process for judging the performance of an individual, product or process. There are three types of evaluation that can be considered while designing instruction. They are:

1) Student evaluation
2) Formative evaluation
3) Summative evaluation

Student evaluation is carried out to determine the success level of a student that he or she has achieved by participating in instruction. The success level is based on the extent to which a student is able to meet the instructional objectives. The results of student evaluation can be compared against a set of standards *(criterion-referenced)* as discussed in the previous section or to other learners *(norm-referenced)* (Ref. section 15.3).

Therefore, before we discuss the procedure of assessment of learning and performance of learners, it is important to note the following points:

- Assessment of learning should be a part of effective planning of instructional design, i.e., at the initial planning stage itself, you should decide how and in what procedure you are going to ascertain the achievement of various learning objectives. This planning should also include strategies to ensure that learners understand the objectives they are pursuing, and the criteria that will be applied in assessing their work as well as how learners will receive feedback, how they will participate in their assessment and how they will be helped to make further progress.
- Assessment of learning should focus on how learners learn.
- Assessment of learning should be recognized as central to the instructional design. The tasks and questions, therefore, should be so designed to prompt the learners to demonstrate their knowledge and skills, and help them to improve further.
- Assessment of learning should be sensitive and constructive.
- It should take into account the learner's motivation. Assessment that encourages learning, fosters learners' motivation by emphasizing progress and achievement rather than failure. This motivation can be sustained and enhanced by assessment methods that ensure and protect learner autonomy, provide some choice and constructive feedback, and create an opportunity for self-direction.
- Assessment of learning should promote commitment to learning goals and a shared understanding of criteria by which they are assessed. This can be ensured by engaging learners in peer and self-assessment.

- Provide constructive feedback to learners pinpointing their strengths and weaknesses and providing suggestions for improvement.
- Develop the ability among learners for critical self-appraisal and self-reflection for bringing quality improvement in the system.

Assessment of Students' Performance

By now you have become acquainted with the need and importance of assessment, and the measures of evaluation, it is time to focus on what and how to assess students' performance in distance learning. Generally, the performance of students in a traditional classroom setting is assessed through various teacher-made tests, while in distance learning the continuous assessment is an inbuilt and essential component of the teaching-learning system. In a traditional classroom setting, the teacher evaluates the performance informally in the classroom, and formally through periodic tests and home assignments, and the feedback is immediately provided to the students as they are continuously in contact with each other. But in a distance learning situation, teacher-assessment is no longer pre-eminent, there is no immediate feedback and reinforcement. The self-assessment of learners instead acquires the central stage, which is done through the self-check exercises in the text. Self-assessment questions are, therefore, one of the essential and crucial elements of distance instructional materials. Other forms of assessment techniques employed in distance learning are teacher/tutor assessment, computer assessment, and of course the terminal assessments as in the case of a traditional learning situation. Let us discuss these techniques further in detail.

Self-assessment: Self-assessment is a procedure of the assessment of a student's learning that is frequently utilized in the instructional materials of distance learning system with three major objectives: to ensure the understanding of learner of important issues being discussed; to reinforce understanding; and to stimulate, motivate and sustain learners' interest in the material. These questions are either short answer or objective types, and frequently occur in the body of self-learning study materials.

Teacher/Tutor Assessment: It is the most crucial form of the assessment of learning, which is carried through the evaluation of learners' assignment. The learners are required to write assignments periodically as part of the overall instructional procedure and submit to the tutor for assessment. These assignments may use essay types questions or short answer questions, and even may include some objective type questions. These questions test the understanding and application of learners. This type of assessment is a continuous and formative assessment of learning that helps not only in providing feedback to the learners about their understanding, but also helps in initiating dialogue and communication between learners and tutor, who are otherwise isolated from each other. Tutor assessment is also carried out in the study centers during personal contact programmes of various courses.

Computer-marked Assessment: It supplements and compliments tutor-assessment, however, it generally measures the knowledge and understanding of the learners. Various distance learning systems around the world are utilizing this assessment procedure more and more frequently to be continuously in touch with the learners and to monitor their performance.

Terminal Assessment: Examination plays a vital role not only in assessing the performance of learners in conventional system, but also in a distance learning. Terminal assessment basically measures the cognitive and application domain of the learner. This is the summative assessment that evaluates a learner's achievements and takes into account his/her performance in the assignments.

These are used prior to instruction, during instruction, and after instruction. The data collected during these phases provide information about the students. Prior to instruction, data are collected to determine what a student should know about the instructional objectives. Data collected during instruction, help to determine how a student is progressing. Data collected after instruction helps to determine what a student has achieved.

Formative Evaluation is carried out during instruction and provides data that indicate how a student is progressing. Student evaluation focuses on the student, formative and summative evaluation tend to focus on the instructional design process. (Brown & Green, 2016).

Formative evaluation is used throughout the instructional design process to collect data that can be used to provide feedback on how the process is going. The feedback allows to make improvement to the instruction before it is completely developed. Formative evaluation is used during designing instruction to ensure that the intervention being developed is tested and revised to meet the needs of the client. Therefore, formative evaluation is used as the intervention is forming (Green & Brown, 2016).

Summative evaluation is conducted at the end of the instructional design process to determine how successful the designing activity was carried out to meet the major goals. Therefore, summative evaluation is used to provide the whole picture of the design process. Summative evaluation takes place after an instructional intervention has been implemented.

15.6 KIRKPATRICK MODEL OF EVALUATION

Summative evaluation helps to ascertain the effectiveness of the instruction/training programme. One of the popularly used evaluation models has been proposed by Kirkpatrick in 1994 in his book *Evaluating Training Programmes,* wherein he outlined a four-level model of assessment of e-learning, e-training or blended instruction. These levels include the ones given below:

Level 1: **Reaction** of students about what they thought and felt about the training programme.

Level 2: **Learning,** i.e., the resulting increase in knowledge or capabilities.

Level 3: **Behaviour**, i.e., the extent of improvement in the behaviour, capability and implementation.

Level 4: **Impact,** i.e., the effect on the business or environment resulting from the trainee's performance.

Level 5: **Return on Investment,** i.e., the effect of training in improving quality and production.

Let us discuss each level in detail.

15.6.1 Level 1 Reaction/Satisfaction Level

The goals of any training programme can be achieved only if it comes to the expectations of learners and they feel satisfied by the services and inputs provided to them. Therefore, in this first level or step, the learners are asked to evaluate the training after completion of the programme. This type of assessment has the potential to provide very useful data pertaining to the satisfaction of learners on not only the overall effectiveness of the programme but also about various components like the instructors, the topics, presentation styles, time schedule, adequacy of content coverage, use of audio-visuals, etc. Each of these components may further be broken into various sub-components, such as, you may ask the learners to evaluate specific characteristics of presentations,

etc. This level, therefore, relies on the measurement of attitudes of learners towards various components of the training programme and is usually measured with the help of a questionnaire. You may include questions related to the following.

- Relevance of the objectives.
- Ability of the course to sustain the interest of learners.
- The amount and appropriateness of interventions and interactive exercises.
- The ease of navigation.
- Perceived value and transferability in the workplace.
- Important strengths and weaknesses of the programme.

With technology-based training, the questionnaire can be delivered and completed online or e-mailed to the learners and is the most popularly used device of assessment.

Level 1 assessment tells us about the satisfaction and attitude of learners and is very important for other levels to occur. Learning (level 2) and transfer of learning (Level 3) cannot take place unless the learner has a positive attitude and feels satisfied with the services provided to him/her. It also helps the course planners to modify/change or remove unpopular programmes and tells about the strength and weaknesses of various components, which can be rectified accordingly. However, you can get more accurate and true responses if the learners are not asked to reveal their identity through their names. This will not only ensure anonymity, but they will also be more honest in their answers. You can use a rating scale or open-ended questions depending upon the nature of information you are trying to seek. Level 1 has the following advantages:

- You can have an idea about the learners' perception of the training programme.
- It may indicate that some important content areas are not covered in the training programme.
- It may tell you about the level of involvement and engagement of learners in the training events.
- It can provide information about the feedback and evaluation of the specific components of the training programme as well as the overall satisfaction level of learners with the programme. This may help in the improvement and removing the deadwoods from future training programmes.

15.6.2 Level 2 Learning Level

The intention of this level is to ascertain whether learning objectives have been achieved. This level tests whether learners have actually learned the knowledge, skills, and attitudes they were supposed to acquire through the programme. The level two evaluation should, therefore, be done immediately after the training event. You may use pre-test and post-test design to ascertain the effect of training on the knowledge, skills and attitude of learners. Knowledge is typically measured by an already available test or a teacher made achievement test, which may be either criterion-referenced or norm-referenced. Skills are measured with the help of performance tests and attitudes are measured with the help of questionnaires. The advantage of this level is that it provides feedback and formative evaluation information to the course designer about the programme that can be used to improve it further.

15.6.3 Level 3 Behaviour Level

Learners generally score well on post-test as the test is given immediately after the instruction or training. But the programme can be considered effective only if the change brought in the learner's knowledge, skills and attitude is sustainable and they are able to use it in their day to day practice. The level three evaluation, therefore, involves measuring the transfer of knowledge, skills and attitudes from the training context to the workplace. However, it does not mean that level one and two are less

important. The learners should have a positive attitude towards the programme (Level 1), and they need to learn the material (Level 2 outcome). But for maximum transfer of learning, the learners should get a conducive climate also, besides the effectiveness of training. Therefore, the workplace factor plays an important role in the effectiveness of training as the training factors. So, how can we design a level three evaluation? Kirkpatrick suggests the following:

- Use a control group as far as possible.
- Allow time for a change in behaviour to take place.
- Evaluate pre and post programme and use the strongest design that is feasible.
- Try to get responses from all the learners.
- Collect relevant information from various sources.
- Keep cost-benefit in mind.

The Level 3 evaluation measures actual behaviour on the job instead of just measuring the reaction of learners. Level 3 outcomes are essential for Level 4 outcomes, i.e., they are intervening variables that lead to Level 4 outcomes. But it is intrinsically useful also. In some situations the outcomes of the first three levels are sufficient indicators of the success of the instructional programme.

15.6.4 Level 4 Impact Level

The fourth step of the Kirkpatrick model is to evaluate the impact of the instructional programme, i.e., it attempts to assess training in terms of business results. This level measures the success of the programme in terms of increased production, improved quality, decreased costs, increased sales, and higher profits or return on investment. In other words, this level measures the bottom-line result of enterprise learning and tries to ascertain whether the learning has a positive effect on the institution (Kirkpatrick, 1994). Kirkpatrick recommended the use of experimental design for this level of evaluation, as well as allowing sufficient time for the results to be achieved. Pre-test and post-test design has been suggested by Kirkpatrick. A cost-benefit analysis should also be done as in the previous level of evaluation.

The table given below presents the model in a grid form.

Level	*Evaluation Type*	*Evaluation Description & Characteristic*	*Evaluation Method/ Tool*	*Relevance and Practicability*
1	**Reaction**	Perception of learners about the programme	Happy sheet, feedback forms, verbal reactions, post training survey/ questionnaire	Inexpensive to gather data, easy to obtain information.
2	**Learning**	Measurement of increase in knowledge base	Tests, questionnaires, interview, observation	Easy to design, score and in quantify, highly relevant.
3	**Behaviour**	Measurement of transfer of learning, sustainability of change	Observation, interview	Measurement of change in behaviour requires cooperation of various functionaries of the organisation.
4	**Impact**	Measurement of the effect of instruction on the environment.	Pre-test and post-test experimental designs, & cost benefit analysis	Provides feedback of the overall effectiveness of the instructional programme. Process must contribute clear accountability.

It is clear from the above mentioned description that the Kirkpatrick's model of evaluation provides both formative and summative feedback, which may help in improving the quality of instructional strategies and methodologies.

15.6.5 Level 5 Returns on Investment

Jack Phillips, and later on Kirkpatrick himself, referred to a fifth model of evaluation, i.e., Return of Investment level. This level reflects the concern of failure of training programmes to deliver the desired results and the concern for accountability. The Kirkpatrick model did not focus directly on the ROI issues. Kirkpatrick's four levels are associated with the results of training in the form of increased motivation, reduced absenteeism, increased production, quality improvement, and even cost reduction, etc. The fifth level tells us the cost of the programme in terms of its capacity to represent the return on investment in training programme. In order to obtain a true ROI evaluation, the monetary benefits of the programme are compared to the cost of implementation or the value of investment. This level of evaluation is developed by collecting level 4 data, converting it to monetary data and then comparing it to the cost of programme to represent the return on training investment. Some institutions at the international level are utilizing this step to calculate the cost of new courses. The ROI formula is developed for this purpose and evaluation is conducted in all five levels. The formula is given below:

$$\text{ROI } \% = \frac{\text{Benefits} - \text{Cost}}{\text{Costs}} \times 100$$

Check Your Progress 3

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Discuss various types of assessment of learning in distance education.

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2) Discuss various levels of Kirkpatrick's model of evaluation.

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15.7 LET US SUM UP

Educational assessment is an omnibus term, which includes all the processes and activities reflecting and describing the nature and extent of human learning, its degree of correspondence with the aims and objectives of instructional design, and activities and pedagogical approaches designed to attain those objectives. There are certain terms like assessment, measurement, evaluation and tests, which are generally used interchangeably. However, these terms have different connotations. The process of

collecting, synthesizing, and interpreting information to facilitate the decision-making process is called *assessment.* While *measurement* is the process of quantifying or assigning a number to performance. *Evaluation* involves making judgments about the quality of learner's performance. In the process of evaluation, the quality of a learner's performance is judged and compared with other group members. A *test* in contrast, is a formal, systematic and usually paper-pencil procedure used to gather information about the learner's behaviour.

Assessment is an integral part of the teaching-learning process. In face-to-face as well as in distance learning situations, the assessment provides feedback to the teachers/ instructors about the progress of learners and helps them to adjust their instructional strategies according to the needs and levels of learners. Assessment is carried out for the following purpose:

- To diagnose learners' strengths and weaknesses;
- To monitor learners' progress;
- To assign grades to learners; and
- To determine instructional effectiveness.

There are two distinctive and widely used strategies for assessment: ***norm-referenced and criterion-referenced***. The major difference between these two categories of tests lies in their intended purpose, content selection and scoring procedures, which guide the interpretation of test results. In this unit we have also focused on various techniques of evaluation of learning as well as the evaluation of the learner's performance.

Towards the end of this unit, we have explained the Kirkpatrick's evaluation model and its different levels.

15.8 ANSWERS TO CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1) Measurement is the process of quantifying or assigning of a number to performance of a student. Evaluation involves making judgements about the quality of the students' performance.

   The process of collecting and interpreting information to facilitate decision-making is called assessment.

2) Please refer to section 15.2.

3) Please refer to section 15.2.

Check Your Progress 2

Please refer to section 15.3.

A test is Norm-referenced *"when the translated score tells where the person stands in some population of persons who have taken the test". (Cronbach, 1970)*

A criterion-referenced interpretation is absolute interpretation because it depends on the extent to which the criterion assessment domain represented by the test is actually possessed by the student.

Check Your Progress 3

Please refer to sections 15.4 and 15.5.

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