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# MES 134 : DESIGN, DEVELOPMENT AND DELIVERY OF COURSEWARE

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**Course: Design, Development and Delivery of Courseware**

## **Course Objectives:**

After studying this course, you will be able to:

- understand the basics of courseware development;
- develop courseware for delivery through various media;
- evaluate the quality of courseware; and
- manage production of courseware.

## **COURSE INTRODUCTION**

Before getting an overview of the content of this course, let us examine its structure. IGNOU's programmes comprise courses. A course comprises blocks. A block has units and a unit has sections and sub sections. Thus an area of study is analyzed into its constituent themes and subthemes.

The three blocks comprising this course are about design, development and delivery of courseware. What is courseware? During face to face teaching in a classroom a teacher often delivers content orally. However when teachers use a medium/media for teaching, the content is designed, developed and then delivered in the form of a courseware. Courseware is thus a generic term that includes various types of educational resources that are delivered for teaching and learning using various technologies.

This course has three focal areas each of which is covered by a block. The blocks are the following:

**Basics of Designing Courseware:** This block about designing courseware has two units. The first unit is about instructional designing, and the second is about the basics of courseware designing. This block is thus about planning courseware development, and the concretization of the plan into a design that guides courseware development.

**Development of courseware:** This block describes the process of courseware development for various media. Unlike the first block, which has a more generic approach this block contextualizes the description of courseware development to the specificities pertaining to different media. The first unit is about courseware development for the print medium but it also focuses on the development of text based instructions for the web. The second and third units are about development of courseware for audio and video media respectively. The fourth unit is about reusable learning objects (RLO). Since RLOs may include multimedia content, hence, the process of development of multimedia courseware has been described.

**Courseware Delivery and Management:** This block describes delivery of courseware, and management of courseware development and delivery. Its first unit is about various modes and approaches adopted for delivering courseware. The next unit is about management of courseware production and storage.

Before you start reading the course content you may note the following points:

1. **Survey:** Go through the entire course content. Before reading a unit, read its structure and objectives. Browsing the content will give you an idea about what you are going to learn.
2. **Question:** On the basis of the title and objectives of a unit ask yourself what you are going to study. You may ask questions like ‘what is this unit about? How will it benefit me?’
3. **Read:** Read the content at least twice and make notes that summarise your understanding of the content. This will help you to interact with the content. Try to answer the questions included in the content.
4. **Reflect:** Reflect on the content and try to link it to practice by practicing the processes taught. You may also try to relate the content to your experiences. For every example given for explaining the content think of at least 2 more.
5. **Review:** Check whether you are capable of fulfilling the objectives listed at the beginning of the unit.
6. **Write:** You must practice writing. You may begin with the answers to check your progress and unit end exercises. Developing writing skills is essential for developing text based courseware, and also for writing the script of audio and video programmes.

**We wish you all the best. You are free to contact us (011-29572942/40) for discussing the course content or problems related to it.**

**Note :** Websites included in the content may not be permanent.

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# UNIT 1 INSTRUCTIONAL DESIGN

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## Structure

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Process of learning: How do we learn?
  - 1.3.1 Factors determining learning
  - 1.3.2 Self learning
- 1.4 Instructional Design
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  - 1.4.2 Genesis
  - 1.4.3 How to design instructions?
    - 1.4.3.1 Learning approaches and Instructional Designs
  - 1.4.4 What are the benefits of designing instructions?
- 1.5 Models of instructional designing
- 1.6 Learning Design: What is it?
- 1.7 Summary
- 1.8 Unit End Activities
- 1.9 References and Suggested Reading
- 1.10 Answers to Check Your Progress

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## 1.1 INTRODUCTION

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Think about some of the major activities you have carried out. How did you begin these processes? Did you begin by planning? Why? Is it because planning keeps an activity on track and enhances the likelihood of its purpose (goals) being fulfilled? Courseware (see introduction to this course) development also needs to be planned. Since the planning is carried out in view of the purposes of the courseware, we say that courseware is 'designed'. As courseware imparts instructions, we use the term 'instructional designing'. This unit is about instructional designing. We shall however, first discuss the concept of learning and, the factors that support learning. This is because courseware is designed for supporting learning. After that we shall discuss the concept of instructional design, the steps taken for designing instructions, and a few models of instructional design.

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## 1.2 OBJECTIVES

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This unit will help you to:

- Explain the concept of Instructional Design (ID);
- Describe the importance of ID;
- Describe models of ID; and
- Discuss the concept of learning design.

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## 1.3 PROCESS OF LEARNING: HOW DO WE LEARN?

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What is 'learning'? How do we learn? What facilitates learning? Can we learn on our own? This section will help you to answer these questions, and prepare you for designing instructions for helping learners to learn. The scope of this unit however allows only a brief discussion on these aspects but you can read about learning, using other resources.

What is learning? Learning has been explained in different ways. There are however four major approaches to learning- behaviourism, cognitivism, constructivism and connectionism (Bates, 2015). We shall discuss the first three well known approaches.

### Behaviourism

According to the behaviourist theories, learning results in perceptible and long lasting change in 'behaviour'. Following learning the learner can respond (communicate &/ act) in a new way and this is considered as a 'new behaviour'. For example we exhibit new behaviours when we learn to –tell our name, state the reasons for migration of birds, write alphabets, explain the laws of thermodynamics, wave our hand while saying goodbye, ride a bicycle, sing a song, develop/repair/operate a machine and so on. The change involves the development of the capacity to respond (R) to a stimulus (S). S is something that has the power to elicit R, and the two are paired correctly following learning. For example heat (S) makes us switch on fan (R). Or we say 'it is hot today', which is also a response to heat. In these cases we have 'learnt' what to do/say, i.e. respond when it is hot. Learning thus involves association of S and R leading to a new behaviour. Learning in this way can be a simple act of associating R (like saying 'good morning') to S (meeting someone in the morning). It can also involve complex activities involving a chain of S-R associations like driving as per traffic rules that involves stopping (R) when the traffic light is red (S), starting (R) when the light turns green (S), not taking U turn (R) when the traffic signal (S) restricts it, and, so on.

How do we learn to make the correct response? As per behaviourists like Thorndike learning involves trial and error and we select the response that succeeds by chance. For example for opening a lock (S) we may try out (R) many keys from a bunch of keys and by chance a key opens it. We select it as the right one. Practice (using the key to open the lock a few times) strengthens the S-R connection and helps to 'learn' to identify the right key. Goals thus drive learning and rewards motivate learners to learn. In this case 'opening the lock' was the goal and 'getting in', the reward.

According to behaviourists like Pavlov learning involves connection between S and R but there is conditioning. For example, a learner when 'instructed to stop' at 'red traffic signal' stops (R) but after practice involving the pairing of the instructions to stop and the light turning red, even without the instruction whenever the traffic light turns red, s/he stops. This is because the traffic light substitutes the instruction to stop and the learner is conditioned to respond to the light. Pairing of the 'instruction to stop' and the 'red signal' is however important and conditioning is successful when these are **contiguous** (having minimum time gap) during the practice sessions. Hence, the light turning red and the instruction to stop should be simultaneous events with minimum time gap. Now you know why an image and the text describing it should be placed on the same page without gap between them.

According to Skinner a right response is learnt when it is reinforced. For example if a new driver is appreciated (reinforced) for stopping at red traffic light, s/he develops the habit of responding in this way to red signal. A child appreciated for punctuality,

develops the habit of punctuality. Reinforcement involves appreciation, high scores, good grades, awards, and so on. This idea of selecting 'correct' response and reinforcing it by the teacher/trainer led to the concept of programmed instructions. Programmed instruction involves objectives of teaching, teaching small chunks of information (frames) for attaining the objectives, assessment of learning to check whether the objectives are attained, and feedback for reinforcement of learning. Is the unit you are now reading based on this approach?

Behaviourism thus considers human behaviour to be predictable and controllable (Bates, 2015) through rewards and reinforcements. This approach emerged in 1920s and although other more recent approaches challenge it, yet the practice of *setting goals* of teaching, giving *inputs*, seeking '*correct*' responses (responses that show the attainment of goals) and providing feedback in the form of grades and marks continues. As correct responses are predetermined by teachers &/evaluators and their reproduction is rewarded, learners tend to learn and 'reproduce' these fixed 'correct answers' during assessment. Do you read teachers' notes/books and write the content read during tests? Behaviorism also says that exercise facilitates learning, and we know that learning to add, read, use computer and even fly an airplane improves with practice. Further, behaviourists say that satisfying learning experiences and motivation are important for learning. Do you agree with this? Many of us found it difficult to learn things that did not interest us. They also say that one has to be 'ready' to learn, and interest, previous learning, and maturity determine readiness. Therefore, a primary school child cannot learn at secondary school level unless she has learnt well the subjects taught at the primary level. Behaviourists also consider learning as a goal based activity. This is true as we learn the things we intend to learn. Further, behaviourism cautions that learners may generalize stimuli and respond to related ones in a similar way. For instance fear for a teacher can generate fear for the subject s/he teaches and even for school.

Behaviourism led to teacher centered methods of teaching, and the teacher is active, delivering lectures while learners learn passively by receiving the information teachers provide. How are you learning now? Who is providing the information?

### **Cognitivism**

Cognitivists say that human beings have the capacity for cognition (thinking). Hence learning is not just a mechanical association of stimulus and response which happens by chance or by conditioning, and gets strengthened through practice and reinforcement. Learning is therefore not merely a 'behavioural' change but it is a mental process involving information processing. Something learnt is therefore, something which is meaningful to us. For example, instead of trial and error we compare the size of keys in the bunch and decide which key has a size that matches the size of the lock. Such comparisons and decision making are acts of cognition (thinking) and involve information processing. Cognition can be at lower levels for knowing or understanding something, as well as at higher levels for analysis, synthesis and evaluation (see Bloom's taxonomy, unit 2).

As cognition involves information processing cognitivists focus on how information is received, organized, stored, and retrieved. How do we process information? Our Sensory Register receives input from sense organs. For instance a telephone number we read/hear lasts for a short while in our sensory register and is lost unless we pay attention to it. On paying attention the information is transferred to our Short-Term Memory (STM) (also called working memory), which has a limited capacity in terms of the number of items that it can store. STM loses the information, for instance after we have used the telephone number and no longer pay attention to it. Or else

the information enters the long-term memory (LTM), is stored and retrieved when required, like our own telephone number.

Gagne, Briggs & Wager (1992) say that information is stored in LTM according to its meaning. This happens as new learning gets linked to earlier similar ones. For example our pre-existing concept (schema) of birds accommodates new information we get about birds. Schema is thus a cognitive structure that accommodates new information and its structure is altered while accommodating new information. For example the existing schema pertaining to the concept of birds is altered while accommodating the new information that some birds do not fly. We thus store information in an organized manner. Therefore knowledge construction is difficult when there is no past learning. Hence one who has no concept of birds will find it difficult to learn that some do not fly. Therefore a child who cannot add finds it difficult to multiply. One who passed elementary level of schooling without learning fails at the secondary level.

Like behaviourism, cognitivism also underlines the need for practice but not as a mechanical activity (drill), rather as a mental activity. Moreover as per cognitivists we construct knowledge '**actively**' instead of '**receiving**' it from others. For example- children may receive the information from teachers/books that cactus is an example of desert plant, learn it by rote and forget it after the test. However when children understand the concepts of desert, and the features of cactus, they have suitable learning experiences into which they can place the information (new learning experience) that cactus grows in deserts. Similarly for a child  $12 \times 12$  is 144 not because the teacher/book says so but because s/he understands that 12 times 12 are 144. This type of learning by meaning making is retained unlike rote learning. Meaningful learning happens when new learning experiences can be rooted into past ones, while behaviorism requires that inputs transmitted by teacher/expert is received, practiced and reproduced by learners. However behaviourism cannot be completely avoided. For instance, how did you learn your name, your address, symbols of elements (Chemistry), capitals of states, who built which monument, and many other such things? You learnt because your correct responses were reinforced. As a child you probably did not learn your name by 'thinking' about it.

**Activity**

How do you learn? Do you learn by rote? Do you try to learn by understanding the meaning of the content? Which type of learning are you likely to retain?

**Constructivism**

Constructivists say that knowledge is constructed by learners. Like cognitivists constructivists consider knowledge construction as an active process that uses earlier learning experience for constructing new knowledge. Constructivists also underline the need for cognitive processes like thinking and reflecting on new information (Bates, 2015). However, as per constructivism meaning making is a subjective process. This means that a learner forms meaning in his/her own way depending on the context, past experiences, beliefs, and values. Even though aspects like  $12 \times 12 = 144$  and cactus grow in deserts are facts (truth) for every learner but there are aspects that can be interpreted differently. For example, a particular food is a source of protein for some while for some it is not right to eat it; some vouch for nuclear technology, while some vouch for its elimination. Therefore, there can be **multiple realities** instead of one and hence multiple 'correct' responses instead of a fixed one. Further, by allowing learners to construct knowledge, the focus is on learning rather than teaching. Therefore there are broader goals but neither fixed objectives nor fixed answers. For example, the goal may be to teach about healthy food habits



but we do not set the objective that 'learners should be able to list a particular set of food items. Hence there can be multiple correct responses. Social Sciences can accommodate multiple interpretations and realities but allowing learners to construct knowledge by thinking, discussing and carrying out activities is important for both Science and Social Science.

While learning as per behaviourists is an individualised process, social constructivists say that social processes like discussions (with teachers and peers) facilitate learning. **Learning is thus considered to be a social process** requiring interactions, especially with those who are more knowledgeable but peers can also help us learn. We also learn by observation. For instance we may have learnt to use apps on our phone while observing our friends download and install apps. Therefore situations with experts 'applying knowledge' to a process support learning. For example a tailoring shop with expert tailors is a better place to learn tailoring instead of classrooms with lectures on tailoring clothes. Learning thus happens first within social settings and is internalised later. Moreover learners are active and hence teaching methods are learner centered.

### Activity 1

1. Read an article in the newspaper as well as the following groups of letters:  
bhgffffy; awaokokddy. Try to recall what you read in the newspaper and these letters. Which one could you recall? Why?
2. Is thinking essential for all types of learning? You may still remember some songs and rhymes of your childhood which you used to sing/recite without understanding their meaning? How do you explain this?
3. You must have learnt many things from your family and friends and have retained the learning. Does this indicate that learning is a social process?

### CHECK YOUR PROGRESS 1

Examine the following images. Which type of learning (behaviourism/cognitivism/social constructivism) is likely in each case?

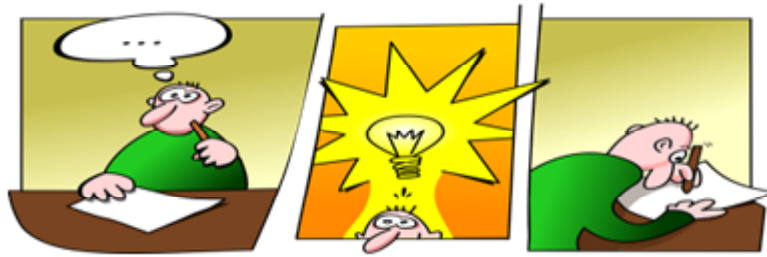
1.



2.



3.



4.



Source of images 1-4: Pixabay

### 1.3.1 Factors determining learning

Some of the factors that impact learning are the following:

**Gaining attention:** We learn only those things to which we pay attention. Hence, before teaching the content, techniques like asking questions, narrating an event that presents a problem, showing images related to the topic are used for drawing learners' attention to the content. To keep learners attentive we use techniques that break the monotony of continued explanations. For example we include in the text additional information in boxes, cases, activities and the like.

**Interest:** We pay attention to stimuli that interest us. Therefore examples involving balloons, toys, toffees and the like would be useful for adults or for children?

**Linking new and old learning:** Unless the content taught is related to prior learning experiences learning is not meaningful. Therefore the introduction to the units of this course mentions the linkage between the past learning experiences and the new one.

**Readiness:** Readiness for learning is essential. Will you invite to an advanced level training those who lack the mastery of the basics?

**Contiguity:** Stimulus and the desired response should be close to each other. If you mention the colour purple and show a purple coloured object after a few pages, will it be helpful? Why should illustrations and captions be placed together?

**Goal:** Learning is purposeful. Hence determining what learners want to learn should guide course development.

**Learner engagement:** Learners need to be active while learning. Activities make us think and do. Why does this unit include activities?

**Interaction:** Discussions with teachers, peers and others support learning. Inclusion of discussion forums in online courses, collaborative projects and assignments are hence, helpful.

**Support:** Explanations, examples, glossary, illustrations, summary and the like scaffold (support) learning.

**Practice:** Practice strengthens and retains learning, and leads to perfection. Practice helps to retain even rote learning. You may still remember a song you had learnt in your childhood without understanding the meaning but used to ‘rehearse frequently’.

**Feedback:** Feedback confirming that the response is correct *reinforces* learning. Feedback can be in the form of correct answers with which learners match their responses; a sign like thumbs up, a smiley or comments like ‘read section ... and try again’, and so on.

**Satisfaction:** Relevant and interesting content that fulfils learning needs leads to satisfying learning experiences.

**Clarity of content:** Clarity of content facilitates information processing and hence, meaning making. The content is learnable when it is well organized, and the learner does not have to struggle to understand it.

There are other factors like aptitude that influence learning but we shall not discuss these in this unit.

### Activity 3

Think about something that you have ‘learnt’. Describe the factors that helped you to learn. Were there any barriers to learning? What were they?

### 1.3.2 Self learning

When a learner learns on his/her own there is self learning. During self learning the learner is ‘self directed’ and sets his/her goals for learning and monitors learning on his/her own. Therefore we need to develop the courseware in such a way that self learning is possible. The factors that determine learning also impact self learning. In a classroom a teacher takes care of these factors. S/he sets objectives to clarify the purpose for learning, provides information, gives examples, explains, questions, sets learning tasks, assesses learning, provides feedback on progress, provides other resources (e.g., textbooks), and so on (Commonwealth of Learning, 2005). Therefore, the courseware we develop should perform these functions to facilitate self learning. Creating content that substitute teachers in this way is not easy, nevertheless practice can help.

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## 1.4 INSTRUCTIONAL DESIGN

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Now that you understand ‘learning’ you can design instructions for learning. This section will help you to understand the meaning of instructional design, and the process of designing instructions, thereby enabling you to appreciate the need for designing instructions.

### 1.4.1 What is an instructional design?

What is the difference between teaching and instructions? Teaching and instruction are often used interchangeably but according to Romiszowski (1981) instruction is a goal directed teaching process, which is to a great extent pre-planned. For example you may learn about a country from your friends who have been there, or you may learn by watching a video that **aims** to describe the geography, weather, culture, tourist spots and other aspects of that country to **those** who want to learn these. The video may also include a quiz to **assess** learning and score your responses. The video is therefore developed with the **goal** of teaching a certain category of people (**target group/audience**) having particular **learning needs** (need for information about certain aspects of the country). Therefore it provided **well planned learning**

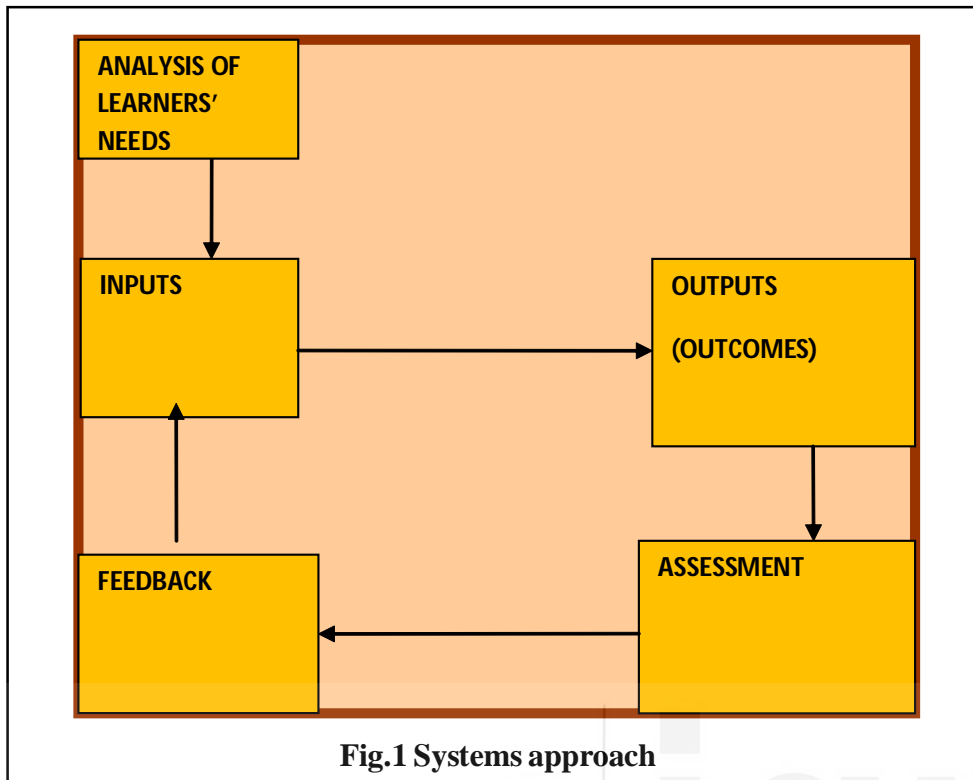
**experiences.** The instructions were thus **designed** for attaining the instructional goals. Your friend's descriptions (inputs) were perhaps not **designed** in this way as they had not **planned** why, and how they would help you to learn about that country.

### 1.4.2 Genesis

What led to the concept of ID? According to some authors the concept of ID has its roots in military training. During the Second World War the USA had to train large number of military personnel. The Division of Visual Aids for War Training of the U.S. Office of Education produced hundreds of films and training handbooks for military training programmes (Schott & Seel, 2015). Visual teaching aids like motion pictures, silent movies, talkies, manuals and the like were carefully selected for imparting training. Thus teaching became a planned activity and inputs were provided as per the plan for attaining predetermined goals. However as per authors like Seel, et al. (2017) the concept of ID is older than this and can be traced back to the beginning of the 20th century. In 1920s Tyler's idea of setting 'objective' of learning is one such development. In 1926 Sidney Pressey developed a teaching machine that imparted individualized instruction, assessed learning through multiple choice questions and provided feedback. During the 1930s there were attempts to establish a systematic planning of instruction, while in 1940s there was rapid development of instructional media for military training programs (Schott & Seel, 2015). Schott & Seel also say that in this phase instruction became a special field of research and development, and it was imparted mainly with two general objectives: (1) Training as many learners as possible within a short period of time; (2) using the most efficient available instructional means (such as written instructions, demonstration films, as well as practical exercises). These objectives of imparting instruction are relevant even today and instructions imparted through print, web based media, video and audio are still used for teaching many learners within a short time. In late 1940s the principles of cybernetics such as setting a goal, taking controlled action to achieve it, and getting feedback was also a step towards planning instructions. In 1949 Ralph Tyler outlined four steps of curriculum development, which are- determination of objectives, identification of education experiences, organization of educational experiences, and evaluation of experiences. In the next decade B. F. Skinner, an American psychologist developed a teaching machine and in 1958 he introduced the concept of programmed instruction (see earlier section). Systems approach (Box1) became popular during 1950s and 1960s and this approach also underlined the need for setting objectives, and planning instructions accordingly

#### **Box1- Systems approach**

The concept of instructional design (ID) is based on the concept of systems approach (Gagne, Briggs & Wager, 1992; Sink, 2014). A system is an assembly of interrelated parts or elements, and change in one or more parts/elements impacts the whole system. A system has goals that are attained through appropriate inputs. The outputs of the system are assessed on the basis of these goals, and inputs are altered if goals have not been attained. A teaching learning process is an example of a system as course planners *assess students' needs; set goals for instructions; rationalise what should be taught (inputs)* to attain the goals; *assess outputs* (students' performance) vis a vis the goals; and alter inputs if outputs do not match goals (See Fig.1).



In 1962 Robert Glaser described an instructional system, comprising instructional goals, input, instructional procedures, performance assessment and evaluation. Research on Computer-Assisted Instruction (CAI) in the 1960s also adopted a similar approach for designing instructions. The concept of criterion-referenced assessment developed by Glaser in 1963 was in keeping with such developments as it assesses whether learners can perform specific learning tasks.

These developments have in common, the attempt to **systematize** teaching-learning process by predetermining goals of learning, providing suitable learning experiences as inputs, checking whether learners' performance matches the goal, and giving feedback. It is clear that behaviourism, which was the predominant approach to learning in this period guided these developments. In 1962 Glaser introduced the term "instructional design" (Schott & Seel, 2015). The concept of ID subsequently gained importance, and because of extensive research in this field it has emerged as a discipline.

You have read that instructional designing involves systematising instructions by structuring it into inputs; assessment of outputs to check whether these are as per the goals of instructions; and giving feedback. These steps comprise the behaviourist approach. IDs were thus initially behaviouristic but later other approaches to learning influenced IDs. In 1965 Robert Gagne published 'The Conditions of Learning', which originally had a behavioristic orientation and later a cognitive orientation (Schott & Seel, 2015) for instructional designing. Later IDs with constructive approach have also been developed.

### 1.4.3 How to design instructions?

You have read that goals/ objectives are determined and instructions (courseware) are subsequently designed to attain the goals. How do we set goals/objectives? Let us see how it is done but you will read the details in the next unit.

Learning has three domains- cognitive (learning involves thinking like thinking about the key that can open the lock, or why cactus grows in desert); affective (learning involves feelings and we learn to respect our environment, wild life; empathize with the underprivileged; appreciate honesty); and psychomotor (learning involves co-

ordination of thought and physical movement like carpentry, handling lab equipments, administering an injection, and so on). You need to teach for making learners think/develop right attitude / perform tasks involving thought and movements. While designing instructions we need to consider for which domain(s) of learning we are going to develop courseware. Further, for the three domains of learning Gagne described five capabilities that learning should develop. These are: Intellectual Skills (like that used for solving problems, understanding concepts, etc.), Cognitive Strategy (ability to monitor own learning, and track one's progress), Verbal Information (such as being able to describe something); Attitude (like respect for wildlife), Motor Skills (like dancing, skating, administering injection, etc.). Gagne however says that instructions should not aim to develop any one/few of these but must have multiple aims and learners need to attain several varieties of learned capabilities. For example the video (see 1.4.1) developed understanding (cognitive domain) as well as appreciation (affective domain) for the country. This unit helps you to understand ID and appreciate its need and expects the development of first four out of the five capabilities.

After setting instructional goals (Box 2) the next step is to design instructions for attaining the goals. Gagne described nine events for designing ID. These instructional events and the corresponding learning processes provide a general framework (structure) along which you can design instructions in the following way:

1. Gain attention: you can use techniques like asking questions to arouse curiosity, describing an event that creates interest in the topic, and so on for drawing your learners' attention.
2. Inform learners the *objectives* (purpose) to make them *interested* in the topic.
3. Stimulate recall of *prior learning experiences* for attaching new ones to it.
4. Present the content in a *meaningful* way, and provide necessary explanations and examples so that learning is meaningful.
5. Provide *learning guidance* in the form of examples, glossary, cases, summary, and the like.
6. *Elicit performance* by including activities that provide scope for practice.
7. Provide *feedback* on learners' performances.
8. *Assess performance* by checking learning outcomes against instructional objectives through assignments, tests, and the like.
9. Enhance retention and transfer of learning (transfer involves applying the learning gained in one situation, to another situation like, learning from internship at a medical college is applied while working at a hospital) by providing cues and strategies of retrieval of learning. For example, in the next few units we shall provide clues to help you to recall learning pertaining to ID.

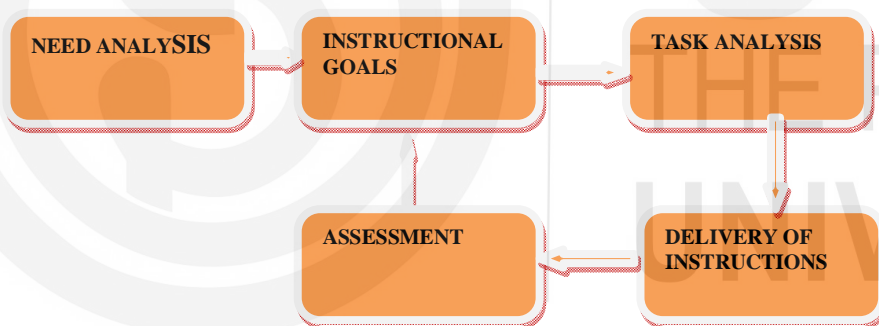
### **Box 2- Educational/ instructional goals and objectives**

Goals are statements of the outcomes of education, and pertain to activities that result from deliberately planned instruction (Gagne, Briggs & Wager, 1992). A goal is broad and more general, while objectives derived from it are more specific. For example enabling learners to develop courseware is an instructional goal. One of the objectives through which this goal will be accomplished is enabling learners to design instructions. Similarly if the goal is to enable learners to design instructions, developing an understanding of the concept of ID is an objective.

ID is thus basically a plan for teaching and Gagne's nine events are used as a structural framework for designing courseware. The Commonwealth of Learning (2005) suggests steps that provide further details of instructional planning. These are:

1. Need analysis, also called need survey to determine learners' characteristics , especially learning needs;
2. Setting instructional goals that state learning outcomes clearly;
3. Deciding how learning will be assessed at the end of the course &/ during the course;
4. Task analysis to:
  - decide the types of activity learners must carry out for achieving the desired learning outcomes;
  - identify the graphics needed;
  - plan self-assessment exercises;
5. Develop the units/content;
6. Test and evaluate the materials; and
7. Take account of the evaluation results and revise the plan.

These steps (summarized in Figure 2) are iterative (repeatedly occur in a cyclical way) as learning outcomes lead to re-examination and re-planning of goals and inputs. You will read in details about these steps in unit 2.



**Fig.2 : Steps for developing an ID**

**Box 3 -ID for IGNOU's Educational Technology courses**

ID can be done at a micro level, on an **immediate basis**, while teaching a topic or on a macro level for a **long term basis** for an entire course comprising several themes and sub-themes and involving complex and long term planning (Gagne, Briggs & Wager,1992). Macro level planning was necessary for developing the Educational Technology courses, which you are studying now. Instructional goals and objectives were set. Task analysis was carried out and content that could help to attain the objectives was developed.

On examining the units of this course you will find that these are designed for imparting instructions along the nine events described by Gagne. Therefore, the introduction includes the 1<sup>st</sup> and 3<sup>rd</sup> events; objectives include the 2<sup>nd</sup> event; 4<sup>th</sup> &5<sup>th</sup> events are in the middle part of the units; 6<sup>th</sup> is in the activities. Check your progress questions cover the 7<sup>th</sup> event while answers to check your progress questions cover the 8<sup>th</sup> event. Cases and events from the real world and cross reference to units pertain to the 9<sup>th</sup> event.



### 1.4.3.1 Learning approach and Instructional Designs

IDs began with a behaviouristic approach. Ertmer & Newby (2013) say that the behavioristic approach require a teacher/designer to (1) determine which cues (within content) can elicit the desired responses; (2) pair prompts (instructions like –stop) with target stimulus (like red signal) to elicit the responses (stopping) in the “natural” (performance) setting; (3) arrange conditions so that students get reinforcement for correct response. Feedback is important for both behaviourists as well as cognitivists. A behaviorist uses feedback (reinforcement) to modify behavior while cognitivists use feedback (knowledge of results) to guide and support mental connections between stimulus and response (Thompson, Simonson, & Hargrave, 1992, as cited in Ertmer & Newby, 2013) The feedback that the Units of this course provide (Answer to check your progress) has a cognitivist approach. When the cognitive approach guides an ID the content is structured, organised and sequenced for facilitating the recall of old learning and attachment of new learning to it. Further the content is made meaningful through examples, cases, and other such elements that make information processing easy (Ertmer & Newby, 2013). Advance organizers that help learners see the structure of the content, and the relation among the themes and sub themes (like the structure of the units of this course), chunking information into meaningful parts, organization of instructional materials from simple to complex and relating new to old experiences are important in such IDs (Commonwealth of Learning, 2005; Ertmer & Newby, 2013). Further, like behaviourism, cognitivism too, requires that learning is assessed against pre-determined objectives that specify what learners should be able to do after learning.

More recently the constructivist approach, which emphasizes learner’s own activities as the mechanism for learning (Elen & Clarebout, 2001, as cited in Commonwealth of Learning, 2005) have been guiding IDs. Cases, scope for reflection, group work, discussion forums where learners can share their thoughts are suitable for ID with social constructivist approach. However, creating IDs with this approach is challenging as there can be multiple correct answers instead of one fixed answer. For example learners may have different views on effectiveness of a particular model of ID. Hence including assessment questions with predetermined correct answers and readily available feedback and scoring mechanisms is difficult. However like cognitivism, constructivism also requires learners to be active while learning. Therefore learning experiences need to include scope for engagement in discussion forums, activities requiring application of learning, and critical thinking.

It is not necessary that IDs should be based on one particular approach to learning. IDs can have an eclectic approach and include elements of all learning approaches. For example the units you are reading have been developed as programmed instructions, and hence they have a behaviouristic approach. Nevertheless it relates new and old learning, presents information supported by examples and cases, and includes activities that encourage reflection, and application of learning. It is meant for individualised learning but you can discuss the content with your peers and teachers at study centers. Therefore in spite of adopting programmed instruction approach based on behaviourism, the units you are reading have cognitivist as well as constructivist approaches.

As per Commonwealth of Learning (2005) for learning that requires association of stimulus and response -like elements and their symbols; historical events and the year in which these happened; capitals of states, behaviouristic approach can be adopted. For enabling comparisons, classification, learning new concepts, cognitivism is appropriate. When learners are supposed to reflect on events and interpret these,



constructivism is appropriate and for learning from 'others' through discussions and observations, social constructivism is appropriate.

Commonwealth of Learning (2005) classifies ID into the following three types:

- a. Tell and test : Explanations are followed by a test for assessing understanding . This has a behaviouristic approach as learners are expected to respond in a fixed way and are taught to respond accordingly.
- b. Tutorial: Instructional inputs are followed by an activity that does not just test but furthers understanding (like this unit). The tutorial supports cognition and hence has a cognitivist approach.
- c. Reflective action guides: Instructions have an essentially constructivist approach and the instructional material aims to support learning by encouraging the use of one's own experiences. For example a teacher may be asked to recall her experience of managing her classrooms, reflect on it and discuss it with peers. Such materials will have goals but will not state objectives that specify learning outcomes, which are likely to be different. Further, it includes collaborative projects, tasks requiring discussions among learners and with instructors, writing reflective journals and the like.

Problem-based learning is a variation of the reflective action guide method. Problem-based learning is triggered by a problem, a question or a scenario, within which a number of themes or dimensions of learning are present. Learners are introduced to a practical problem, faced in real life like school children spending too much time with technological devices; air pollution and so on. The course then lists suitable resources like reading materials, videos, and the like that learners will use for working on the problem. Assignments along with monitoring and feedback keep learning on track. Hence the instructions do not begin with explanation of concepts and solutions for problems but learners arrive at solutions in a self directed way, while teachers facilitate it.

#### 1.4.4 What are the benefits of designing instructions?

Now that you understand the concept of ID you will be in a position to list its benefits. Examine the benefits we have included and you may add some more on your own.

You have read that in the 20<sup>th</sup> century it was felt that teaching needs to be a planned activity so that it is effective and this led to the idea of ID. Gagne, Briggs & Wager (1992) say that ID aims to facilitating learning, and benefits learners. This is because with instructional designing, teaching becomes a planned and goal oriented process that remains focused and keeps learning focused. Further, ID being a systematic development of instructional specifications it ensures the quality of instruction (Commonwealth of Learning, 2005) by requiring re-examination of instructional content (inputs) and even goals and thus makes quality assessment an ongoing process. Moreover, by requiring assessment of learning outcomes ID brings in accountability. Teachers as well as the institution teaching a course are accountable for the goals set, the inputs selected, delivery of instructions as well as learning outcomes. This ensures quality of instructions. Further, teachers' role is often limited to selection, organisation and delivery of instructions through various media but ID provides the justification for monitoring the implementation of programmes. For instance, information about how the content is accessed by learners, how they are writing assignments, how they are interpreting it, how they carry out practical activities, and the like help in taking a holistic view of instructional inputs and revising these.

This brings the teacher closer to ground realities and offers scope for research. It also offers justification and basis for programme revision.

Traditionally there has been a close association between use of media for imparting instructions and ID (Seel, Lehmann, Blumenschein & Podolskiy, 2017). Gagne, Briggs & Wager (1992) say that ID aims to facilitate learning, when instructions are provided through technologies using media like print, audio, video, or a combination of these. ID thus helps to plan the technology to be used, when and how to use it for teaching and learning. Therefore, while **using ICT in teaching and learning processes, ID is essential.**

ICT can be used for all the approaches to learning. It can provide scope for drill (repeated practice) necessary for behaviourism, like repeatedly pronouncing words and getting feedback. Simulations using ICT require thinking and decision making. Knowledge construction through collaborative work like many editors editing a document, participation in online discussions involves constructivism. Goals are set for such instructions and the nine instructional events are planned for designing instructions.

**Check Your Progress 2**

**Answer the following questions:**

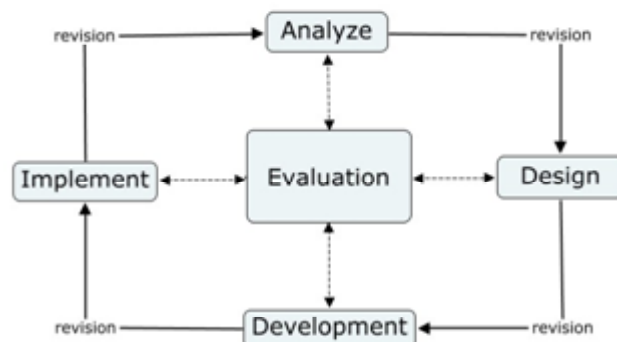
1. Explain systems approach and give an example of a process based on this approach.
2. Differentiate between teaching and instructions.
3. Advertisements often instruct. Describe an advertisement you have watched on television that uses at least some of the steps of an ID.

**1.5 MODELS OF INSTRUCTIONAL DESIGNING**

A teacher may follow a particular model of classroom management. City planners may use a model of urban planning. An engineer may use a particular model of high-rise apartments. We may model our behavior as per the behavior of our role model. There are also various models of running organisations, farming practices, and so on. A model is thus a particular way of carrying out a process, and there are various models for designing instructions. While reading Unit 6 you will find how an ID model is actually used for planning instructions. Some models of ID are as follows:

**ADDIE Model**

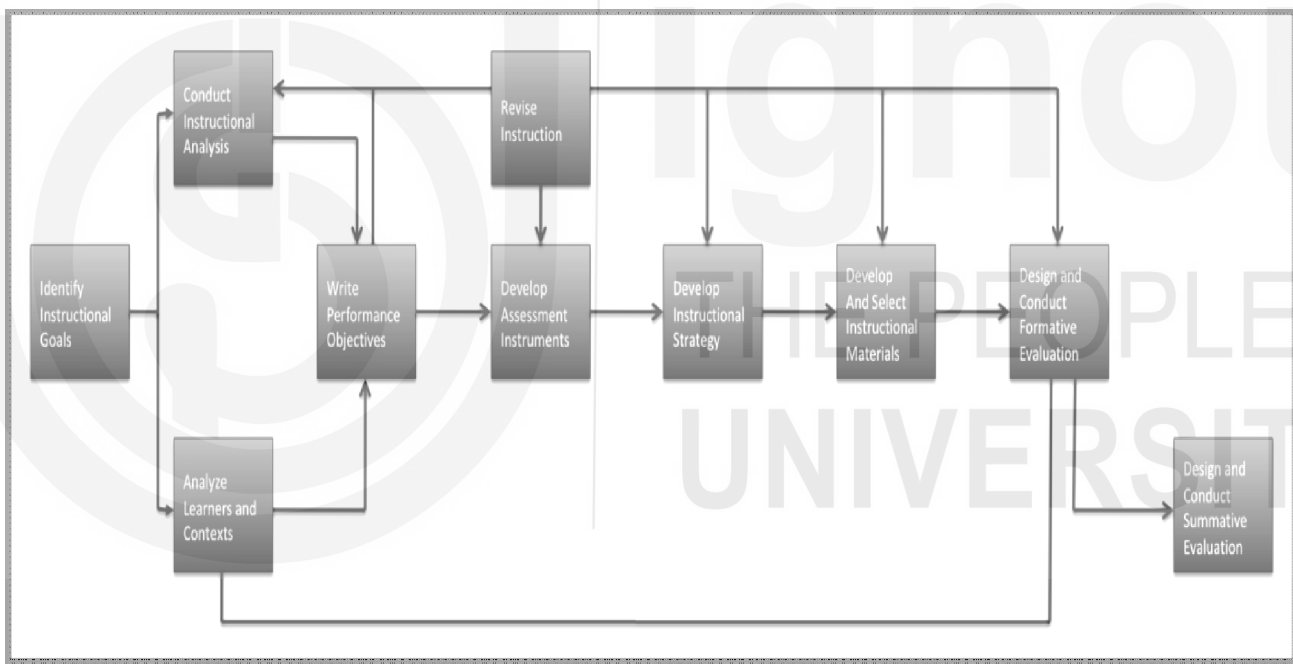
ADDIE is an acronym that covers the major processes of ID, which are -Analysis, Design, Development, Implementation, and Evaluation. Many models developed later are based on this model.



**Figure 3: ADDIE model Source: <https://commons.wikimedia.org/w/index.php?curid=19136887>**

During the ‘Analysis’ phase there is analysis of needs. Learners’ needs (for learning), interests, age, and prior learning are examined and the instructional goals and objectives are established. During the ‘Design phase’ the instructional interventions are planned, i.e. how learners will learn is decided. What would be taught, in which sequence, and using which media are planned. Subject content is selected and analysed as per instructional goals and objectives during this phase. In other words the content that fulfils a particular objective is selected and organised. During the development phase learning material is produced/existing ones are used. For example text based material is developed like the units you are reading now. The content is then tested on a small group and improved on the basis of feedback. The programme/course is implemented during the implementation phase. During the evaluation phase the effectiveness of instruction is assessed in terms of the predefined instructional objectives. Unit 2 describes these steps in details. This approach keeps teaching and learning focused and requires constant monitoring of outputs and improvement of inputs but it also has limitations. For instance it cannot accommodate diverse learning outcomes as there is a fixed goal. Similarly when the objective pertains to the affective domain like, developing respect, the outcomes are hard to define and assess.

### Dick and Carey Model



**Figure 4: Dick and Carey Model**

**Source:** [https://en.wikipedia.org/wiki/Instructional\\_design#/media/File:Dick\\_Carey.png](https://en.wikipedia.org/wiki/Instructional_design#/media/File:Dick_Carey.png)

This model does not treat its component as isolated parts but considers these as interrelated parts that influence each other and work as a system. It also considers context, and hence takes into account learners’ (audience) profile including prior understanding so that instructions are provided to build upon the prior knowledge. This model comprises the following steps:

- Instructional goals- First instructional goals are set to clarify what learners will be able to do after learning.
- Instructional analysis –what learners know and must recall and what they must be able to do are determined.

- Analyse entry behaviour of learners and contexts- profile of target audience is studied and their previous knowledge, experience, interest, age and demographic aspects are examined. Characteristics that are directly related to the skill to be taught are examined like ability to use computer for a computer course is examined for a computer course.
- Write performance objectives- by describing the behaviour that learners will exhibit under a given condition and criteria. For example learners should be able to divide a four digit number by a two digit number (behaviour) without a calculator (condition) up to two decimal points (criteria). The criteria are useful for evaluating learners' performance and aligning 'learning objectives' with how their 'attainment' will be measured. The criteria spelt out thus enhance the possibility of achieving objectives.
- Develop assessment instruments: Instruments (like a pre-test) for testing entry behaviour to test what learners know when they take entry (admission) into a course, tools for post-testing (testing after teaching the course) , items for practice and problem solving are developed.
- Develop instructional strategy: The content to be taught, activities learners will carry out are planned.
- Develop and select instructional materials: Instructional materials are developed/ procured.
- Design and conduct formative evaluation of instruction: This is carried out on a small group of learners and the feedback is used to identify areas of the instructional materials that need improvement.
- Revise instruction: To identify instructional content/tests that need to be revised.
- Design and conduct summative evaluation: carried out after the instructions have been delivered for determining the adequacy of the inputs.

### **ASSURE Model**

This model has the following steps:

A – Analyse Learners- learners' needs and characteristics are examined.

S – State Standards and Objectives for the instructions, specifying what learners will be able to do following the instruction.

S – Select Strategies, Technology, Media, and Materials for imparting instructions.

U – Utilise Technology, Media, and Materials- planning how to use technology, media, and materials. The content needs to be prepared/ procured, previewed and provided as learning experiences.

R – Require Learner Participation- planning how learners will be engaged actively as a group and individually in learning.

E – Evaluate and Revise- same as in ADDIE model

### **ARCS model**

The ARCS model describes strategies for stimulating and sustaining motivation for learning (Park, 2018) through the following steps:

Attention: Need to draw learners' attention. You have read in this unit that attention

is essential for learning. You have also read that strategies that create novelty or stimulate curiosity through questions, description of problematic situations and the like are useful for drawing learners' attention. Creating variation in instructional material also helps to sustain attention. The content of this unit is therefore interspersed with cases, information in boxes, and activities.

**Relevance:** Learning experience that are relevant or meaningful to learners and fulfil their learning needs, motivate them. One way to establish the relevance of the learning materials is to use authentic or real-world examples. For instance in teacher education courses inclusion of problems commonly faced in schools makes the content relevant.

**Confidence:** When instructions enhance the feeling of confidence and self efficacy in learners, learners are motivated. Therefore, we need to take steps like including content that matches prior knowledge of learners, explaining the content well, using simple language and the like.

**Satisfaction:** Satisfying outcomes motivate learners. Intrinsic motivation emerges from accomplishing tasks and feedback communicating this helps. Tasks selected for learners therefore should be doable and provision of feedback should be there.

### **Cognitive apprenticeship model**

This model is useful for teaching skills (psychomotor domain). It is based on Albert Bandura's theory of cognitive apprenticeship. As per this theory a skill is modelled, and learners need to be attentive, motivated, must have access to information and retain the information presented, and must be able to accurately reproduce the desired skill. You have read this in the earlier sections that knowledge can be constructed through observation. Hence, modelling behaviours /acts like an expert's dance steps, way of cooking, repairing machines and so on helps to learn these activities. The steps involved in this model (Dennen & Burner, 2007) are:

- **Modeling:** teacher demonstrates a task
- **Coaching:** teacher assesses learners' performance and provides feedback and scaffolding (support like feedback, hints, re-teaching) when learner performs a task.
- **Reflection:** Self-analysis and assessment of performance by learner
- **Articulation:** Verbalising outcomes of reflection like a learner may say that 'I cannot make the eye movements as well as my teacher makes while dancing' or 'I cannot handle the tool as well as my teacher'.
- **Exploration:** Gradually the teacher lessens the support, i.e. the support fades and finally it is withdrawn as learners perform on their own. For example a mechanic allows the apprentice to carry out the repair of an automobile. Learners at this stage do things on their own, explore strategies for carrying out the activity they have learnt, identify problems in their performance, hypothesise the reasons for the mistake and try to overcome these.

Some of the models we have described have a behaviourist approach. Instructional goals and assessment of learning outcomes vis a vis these goals are important for these models. However some models take into account learners' prior experiences for example while testing entry level knowledge, so that new learning can become a part of it. This brings in the cognitivist approach. The cognitive apprenticeship model however is for knowledge construction through observation and modelling, especially in a 'situation 'where the knowledge is applied by experts like a motor repairing shop. Knowledge is thus constructed within a social setting. However even this

model requires reflection (critical thinking ) and hence has a cognitive approach as well.

Which model will you select while designing instructions? This requires decisions as to the nature of learner, learning and resources available. For example when the target group includes children and you want them to learn to identify animals and birds, a behaviouristic model could be used. For online teaching with discussion forums, a model based on social constructivism could be used. When resources like video conferencing are available for observation and immediate feedback, a model based on cognitive apprenticeship could be useful. However you are free to combine features of various models. Further for different topics of a course different models can be used.

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## 1.6 LEARNING DESIGN: WHAT IS IT?

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A learning design is a description of the teaching-learning process that takes place in a unit of learning like a course and represents the learning activities performed by learners and the support activities that are performed by teachers for the course (Koper, 2006). Unlike an ID that focuses on instructions, a learning design shifts the focus to learning. Hence instead of designing instructions, a learning design, designs learning. This makes teaching learner centered. It visualizes learners' role and describes the 'activities' they will carry out for learning. You have read that Gagne's nine events provide a framework for designing 'instructions'. Similarly a learning design provides a framework comprising components like 'learning tasks, resources, support provided by the teacher designs for designing 'learning' (Donald, Blake, Girault, Datt & Ramsay, 2009) (see Box4). You can use these components to describe the activities learners will carry out for learning. Like an ID that may be based on a particular/more learning approaches, a learning design can also have a commitment towards a particular/more than one theoretical perspective (learning approach) (Koper, 2002, as cited in Dalziel, 2009). For instance it can include activities for practising the association of stimulus and response like learning names of state capitals, symbols of elements. Or it can be designed for information processing required for learning that involves comparisons, finding similarities and dissimilarities and the like; for interpretation of realities like environmental degradation for urbanisation. Therefore learners' role is in focus in a learning design while an ID focuses on teacher's role.

### **BOX 4: Learning design describes activities learners will perform**

ID is about selecting and designing content that should be delivered to learners. The focus is on content and this makes it fixed in nature. Learning design however focuses on learning experiences rather than content and hence activities are designed in such a way that learners use the content necessary for learning but using the content is just one of the tasks. Applying the content, reflecting on it, discussing it, using related resources could be the other tasks that requires will have to carry out. For example a learning design developed for the topic 'classroom management', includes 'activities'. It structures these activities along the components of a learning design in the following way:

**Tasks:** In the 1<sup>st</sup> week before reading the text learners will describe techniques of classroom management, learners will share their idea of classroom management on the discussion forum; In the 2<sup>nd</sup> week after reading the text based resource they will critique it in the light of their experience; They will read additional resources listed for the course in the 3<sup>rd</sup> week and critique the text in the light of their in-depth reading; They will also critique the views of

their peers and enrich the comments with suitable examples. In the 4<sup>th</sup> week they will work on a project in groups of three or four on the theme ‘techniques for classroom management’. The project will require them to describe techniques of classroom management they feel are effective.

**Resources:** Text, audio and videos on classroom management listed for the course

**Role of teacher:** Facilitates access to resources; initiates, anchors, moderates and summarizes discussions; establishes and shares with learners the criteria for assessing learning; assesses learning and provides feedback and support in the form of explanations, and guidance for further readings.

**Learning outcome:** Comments and critiques on the discussion forum; Project

The shift from ID to learning design is because of new approaches to learning that emphasize learning over teaching and the need for learners’ active role in learning. The shift towards learning is also supported by technological evolution. Technologies of the past support transmission of instructional content designed by instructors. For example print, radio, and audio and video players deliver information generated by instructors, to users (learners). These technologies disallow user (learner) generated content. This method of teaching is behaviourist as teachers try to shape learners’ response through specially designed instructional inputs. Advanced technology allows the use of discussion groups, discussion forums in online course, chats with instructors and the like that can accommodate learner generated content. Learning design therefore emerged as an alternative approach to ID (Seel et. al. 2017) with the focus on learning (Laurillard, 2013, as cited in Mor, Ferguson & Wasson, 2015) but to use it we need to use technologies that allow interactivity while delivering courseware.

#### **Box 5-An example of a learning design**

You will find that the project manual of the PG Diploma in Educational Technology programme includes activities. You will also find that every activity is organised along a framework with learning tasks that are described in a stepwise manner for clarifying what learners are supposed to do; resources that can support learning; learning outcomes and the mechanism of assessment of learning. The activities make it clear that learners need to study, reflect, and apply learning for carrying out activities. Learning is thus visualised as an active process.

## **1.7 SUMMARY**

This unit is about ID. Even though new concepts like learning design are challenging the concept of ID, nevertheless, ID remains an important aspect of teaching- learning processes. Teaching becomes instructions once it is planned for attaining certain goals. You have also learnt that instructions are designed by formulating goals and objectives, selecting and organising content for attaining the goals, evaluating outcomes to check if the goals have been attained and using the feedback for altering content. IDs thus follow the steps of systems approach. Since teaching aims to facilitate learning, an ID is developed according to the approach to learning. Therefore IDs may have a behaviouristic approach that considers learning to be a mechanical process of conditioning behaviour and habit formation. Rote learning and reproducing the content learnt as a response to questions could be the outcomes in such cases. An ID with a cognitive approach requires information processing, while that with

constructivist approach encourages diverse thinking and various learning outcomes. The models of ID are developed according to these approaches but we may also combine different approaches to learning in an ID. Learning designs unlike IDs focus on learning experiences gained from active involvement of learners in learning processes. Therefore learning designs structure activities and describe the components of the activities included in the learning design.

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## 1.8 UNIT END EXERCISES

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1. Discuss the concept of learning with your friends. Are the points emerging from the discussions similar to those mentioned in this unit?
2. Which model(s) of ID would you prefer for a courseware that you would like to develop? Why?
3. Develop a learning design for a topic of your choice.

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## 1.10 ANSWERS TO CHECK YOUR PROGRESS

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### Answers to Check your Progress 1

Image 1: There is no interaction. Hence, behaviourism/ cognitivism.

Image 2: Children are playing together. Hence, social constructivism.

Image 3: Thinking but alone. Hence, cognitivism.

Image 4: Behaviourism -learning by conditioning.

### Answers to Check your Progress 2

1. Systems approach begins with goals. Inputs are provided for attaining the goals. Inputs lead to outputs that are assessed on the basis of the goals. Example- The instructional goal is to teach how to develop slides for presentation. Inputs like online tutorials are provided as learning experiences. The slides developed by learners are the outputs that are assessed. On the basis of the learning outcomes, inputs are retained/ improved.
2. Teaching becomes instructions when it is planned and has definite goals, and

inputs are planned and organised, tasks to be performed by learners are conceptualized and learning outcomes are assessed to check whether the goals have been attained.

3. A programme urging parents to take children below the age of 5 years for polio vaccination. It has the goal of making the target group aware of the vaccination campaign and its need and its message is selected accordingly for a target group (parents of children below the age of 5 years). It draws attention of parents with a catchy announcement. It includes content that informs and tries to develop understanding and positive attitude towards vaccination.



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## **UNIT 2    BASICS OF COURSEWARE DESIGNING**

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### **Structure**

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Selection of learning Experiences
  - 2.3.1 Need survey
- 2.4 Instructional Goals and Objectives
- 2.5 Selecting Media
- 2.6 Sequencing Content: Content and Task analysis
- 2.7 Content Development
- 2.8 Evaluation of courseware
- 2.9 Summary
- 2.10 Unit End Activities
- 2.11 References and Suggested Reading
- 2.12 Answers to Check Your Progress

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### **2.1 INTRODUCTION**

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Unit 1 develops the concept of instructional design (ID) and mentions the steps involved in developing an ID. This unit deepens your understanding of ID by describing ‘how’ to take these steps, and thus prepares you for designing instructions for courseware. As you read this unit you will find that the processes involved in instructional designing are not isolated but are interrelated and determine each other. Hence, you will see that the rationale for offering courseware established through need survey, determines goals and objectives, which in turn determine selection, and organisation of content. Evaluation of the courseware assesses the adequacy of these processes in the light of the instructional objectives. Thus this unit will help you in taking a holistic approach towards courseware development.

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### **2.2 OBJECTIVES**

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This unit will help you to:

- Carry out a need survey;
- Develop instructional goals and objectives;
- Select appropriate media for delivering courseware;
- Organise content selected for courseware; and
- Evaluate courseware.

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### **2.3 SELECTION OF LEARNING EXPERIENCES**

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Courseware is developed for teaching a course and includes content that provides necessary learning experiences. What is the basis for selection of learning experiences

for a courseware? Learners' needs provides the basis. Need survey helps to determine the needs.

### 2.3.1 Need Survey

What is need analysis? Need analysis is also known as 'need survey' or 'need assessment'. This requires us to determine what learners want to learn. Do schools ask children what they want to learn? Adult learners unlike children are more likely to be sure of their learning needs. In such cases the need is explicit (clearly stated), and is a major factor that determines what is to be taught. Courses for teaching children with special needs, music, repairing electrical gadgets, programming and the like are offered in response to such explicit needs. However courseware can be offered even when learners do not explicitly demand it. For example an organization may perceive skill deficiency in a particular area and feel that its employees can perform better with training. New developments in a discipline can also lead to courseware development. Social changes also trigger new areas of studies and hence courses, for example on gender equality, child rights and so on. Thus, courseware development is a response to needs for learning. However, need survey is carried out for ascertaining learning needs expressed by learners.

#### How will you carry out need survey?

The group of learners likely to use the courseware comprises the target group (also known as target audience). During need survey you determine 'what' their learning needs are, and proceed towards the determination of 'who' they are. Answer to the first question helps to establish the learning experiences to be provided. Once we have identified the target group and have an understanding of the area of course development, we may carry out a pretest to assess the entry level knowledge of the target group (see unit 1-Dick and Carey Model). For example you may assess your trainee's level of communication skills before you develop a training package for developing communication skills.

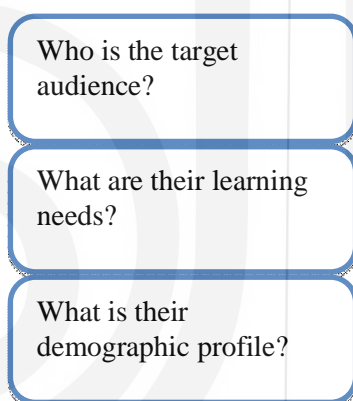
The second question helps to develop the *demographic profile* of learners. Demographic information comprises information about age, place where learners stay, gender, access to technology, whether they are in-service, and the like. Why is demographic information collected? Age is an indicator of the maturity level and hence readiness for learning (see unit 1). Moreover adult learners usually have social responsibilities. As prior learning is important for new learning, information about academic qualification and experience in the concerned field is important. Having in-service people as learners implies that they may be experienced but may not have access to programmes broadcast during their working hours. Further they may not be able to devote much time to the course. Hence, many course providers mention the time (number of hours in a week) learners needs to devote to the course. Learners' access to learning opportunities, especially when content is delivered through technology is also important. For example rural learners especially women could have much lesser access to technology than male learners. Information about access to technology therefore helps to plan the delivery of instructions.

Demographic information collected through need survey also projects the cultural practices of the target group. Hence while designing illustrations we portray people wearing local dresses; include examples of locally available nutritious food in a programme on nutrition; consider the language preference of the learners of the locality. Thus demographic information guides the development and delivery of the content.

## Data collection

If the population of the target group is large it may not be feasible to contact every learner. In such cases data is collected from a sample. A sample should ideally be representative of the population and proper sampling methods (you may read about this from a book on research methodology) should be followed. If the number of learners is not very high data can be collected from all those who wish to enroll in the course.

**Tools for data collection** are usually questionnaires (include a series of items usually expressed as questions for gathering information) &/interviews. Questionnaires are useful when the population is large and scattered. Interview is suitable for small and localized target groups. The data collected is usually qualitative (not in numerical form but descriptive) and has to be analyzed for determining the trends in the data. For example the trends emerging from the data may be -learners need to update their knowledge of macroeconomics; they want the courseware in Hindi medium; they are in-service teachers; their average age is 35; they have limited access to Internet. The trends emerging from data help us to construct learner profile (read case 1). Need survey (Figure1) thus helps instructors to make informed choices about learning inputs and the way to provide such inputs (Commonwealth of Learning, 2005).



**Figure 1: Need survey**

### Case 1

The data collected through open ended interviews during a need survey revealed that -the target group needs to learn about the techniques of providing first aid. The demographic information showed that most learners have not studied beyond primary level; they stay in a forest area far from the town where the study center of the institution is situated; their age ranges from 12 to 60; about 50% of them are women; they understand mainly the local dialect. They cannot use computers and most of them are not willing to visit study centers for availing the support services as a visit to study center would lead to loss of a day's earning.

How will you develop courseware for the target group?

One way could be to create large number of pictures. The pictures can show which type of first aid is required in which case. Series of images depicting the steps of first aid to be provided for injuries caused by burning, falling, insect bite, snake bite, and the like need to be created. For snake bites, even the type of snakes that are non-poisonous and poisonous can be shown pictorially. Text should be less, in large font and supported by images. CDs with audio supporting the print and interactive radio programmes can be used extensively for delivering instructions.

The target group may be concentrated within one organisation. For example the Kendriya Vidyalaya Sangathan as well as the Navodaya Vidyalaya Sangathan had approached IGNOU for providing in-service education to its teachers. The government of several states of India also approached IGNOU for training the elementary level teachers of the state. In such cases identifying the target group was easy and determining its needs was not difficult (case 2). These processes are relatively difficult when the target group is scattered over a wide geographical area.

### Case 2

IGNOU offered the Certificate Programme for Professional Development of Primary teachers in 2014. The target group of the programme comprised teachers teaching at the primary level of Kendriya Vidyalayas (KV). Before developing the programmes there were discussions with a sample representing the target group. The sample was interviewed for determining their learning needs. Demographic information was however not collected as information about their academic background, nature of employment, and the like were known.

The data collected revealed that they required inputs for understanding certain theoretical concepts of teacher education; ways for making classrooms inclusive; developing competencies for implementing the pedagogies required by the Right to Education (2009), and so on. These needs guided courseware development and learning experiences (content) were selected accordingly.

Learners are often spread across geographical areas. In such cases it is not easy to determine needs (Case 3).

### Case 3

Before developing IGNOU's Post Graduate Diploma in Educational Technology (PGDET) programme (revised) we have carried out a study for determining learners' needs. IGNOU's learners are spread across India and predicting who would enroll was not possible. Therefore, it was planned to contact the learners who had enrolled earlier. Academic counsellors of IGNOU's Educational Technology courses were also contacted (Academic counsellors are teachers of conventional teacher education colleges and university departments and carry out tutoring and counselling for IGNOU's learners at IGNOU's study centres usually on weekends).

Questionnaires were mailed to a large sample of learners who had enrolled earlier and academic counselors, to know their opinion about the relevance of the course content. The rate of response was however low. The curriculum of Educational Technology of Indian universities as well as well-known institutions abroad was examined to determine what was being taught. We also studied various documents on Educational Technology including policies, and research papers. We then held meetings with Educational Technology experts. Thus needs of the discipline as well learners' needs in this field were determined. We set the goals for the programme accordingly and selected the themes to be taught through the theory courses. Thereafter we developed the courseware.

MOOCs (short online courses) are developed by many institutions on various themes and a learner selects a course s/he will study. In such cases the perception of need for courseware in a particular area leads to its development. Thus identifying the target group and determining their need is a challenge. Nevertheless, need survey leads to a robust ID and enhances the relevance of the instructions.

**Activity**

Marya’s store sells electronic goods. It has employees for housekeeping, maintaining accounts, describing the products to customers, packaging, and delivering goods. She wants to train those describing the products to customers so that they are able to provide effective and convincing descriptions of products. Which tool should Marya use for identifying the needs of the target group? Develop a tool for Marya.

**Sample tool for need survey**

Dear Respondent,

We are planning to develop an academic programme in the area of Educational Technology. We request you to spare some time and fill up this questionnaire. The information you provide will be treated as confidential. Please answer all the questions as your responses are valuable for this study. You may mail us your response by ..... at ...

**Section 1- Demographic details**

Name (optional):

Postal Address:

**Please put tick mark on one/more options**

Gender: Male/female/Other

Age group: Below 30/ 31-40/41-50/ 51 & above

Educational Qualification: Graduate/Post Graduate/Higher qualification

Whether In-service: Yes/no

You have access to : Computer/Internet

You can use: Computer/Internet

You can visit study center: once in a week/once in a month/ cannot visit

You can devote the number of hours per week for the programme: 4/6/8/ more

You prefer to learn through: Print/audio/video/ a combination of these

You prefer course duration of- 6 months/1 year/2 years

The medium you prefer is: English/Hindi/other

**Section 2- Please use the space given below to answer the following questions :**

1. Have you studied a course on Educational Technology earlier? If yes mention the name and the institution offering it.

.....  
.....  
.....

2. Why do you want to study Educational Technology?  
.....  
.....  
.....

3. What would you exactly like to learn in the field of Educational Technology?  
.....  
.....  
.....

4. Do you have any specific expectations from the programme? If yes, please mention.  
.....  
.....  
.....

### 2.4 INSTRUCTIONAL GOALS AND OBJECTIVES

After need analysis we can set instructional goals. You have read that instructional goals are the basis of instructional designing and guide courseware development. Instructional goals also keep instructions and learning focused, and are standards for assessing learning outcomes.

Goals and objectives are often used interchangeably but we have used goals to imply broader and generic statements regarding learning outcomes from which, more specific objectives are drawn out to indicate what learners will exactly do (see unit 1). According to the Commonwealth of Learning (2005):

**Objectives help teachers to:**

- Clarify educational intentions to learners;
- Provide suitable educational experiences through selection and organization of appropriate instructional inputs;
- Decide most appropriate media for imparting instructions ;
- Develop appropriate instructional strategy in terms of media, techniques, activities, content load, assessment plans, etc.;
- Assess learning (output), instructional inputs, and the instructional process.
- Keep teaching and learning focused;
- Carry out programme evaluation and revision.

**Objectives help learners to:**

- Know what would be covered in the unit and what is expected from them;
- Keep learning focused;
- Prepare for the challenges ahead and standards to be attained;



- Carry out self evaluation;
- Prepare for assessment;

### Objectives help managers to:

- Build accountability by assessing whether teachers have designed instructions effectively;
- Assess whether adequate resources and support are there for the courseware.

#### Activity

Reflect on the functions of objectives discussed in 2.4 and assess the appropriateness of the objectives of this unit.

### How to state goals and objectives?

Let us examine the following example:

The instructional goals of the PG Diploma in Educational Technology programme of IGNOU are to help learners to:

- comprehend the concept of educational technology and the contexts of its use;
- judiciously select and use technology for pedagogic and managerial functions;
- develop skills for using technologies for individual and collaborative educational practices;
- use technology for creating an inclusive learning environment;
- integrate technology effectively in pedagogic processes in contextually appropriate ways; and
- design and develop digital resources for various media and utilise them for creating a courseware.

We find that the goals state what the learners are expected to do after instructions, i.e. after using the courseware. Goals therefore guide the selection of themes and sub themes. For PGDET each theme led to a course and each sub theme led to a block. For instance, the first course 'Educational Technology: An Overview' has been conceptualized on the basis of the theme emerging from the 1<sup>st</sup> and 2<sup>nd</sup> goals. The 3<sup>rd</sup> and 4<sup>th</sup> goals led to the 2<sup>nd</sup> course; the 2<sup>nd</sup> and the 4<sup>th</sup> goals led to the 3<sup>rd</sup> course; and the last goal led to this course.

Instructional goals provide directions and hence, you **need to state these clearly and specifically**. "The goal, or goals, are most inadequately conveyed by the term citizenship; they are better reflected in a statement such as "carries out the activities of a citizen in a democratic society" (Gagne, Briggs & Wager, 1992, 41). We have therefore not stated that the goal is 'teaching educational technology'. Why? This is because this does not clarify what exactly would be taught. Further goals need to reflect learning outcomes as well as the means of attaining the outcomes. Hence, a goal is not stated as 'health' but as 'learners will perform activities that will maintain health' (Gagne, Briggs & Wager, 1992).

To know more about this topic visit [https://en.wikiversity.org/wiki/Instructional design/Learning objectives](https://en.wikiversity.org/wiki/Instructional_design/Learning_objectives)

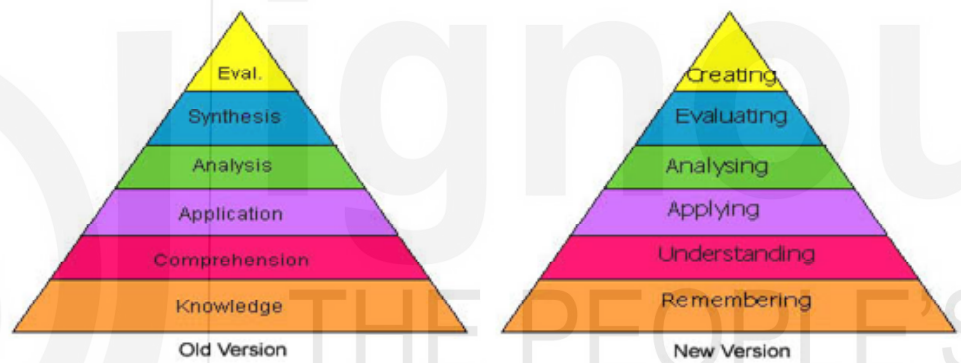
### How to state instructional objectives?

Goals are broader in scope and objectives can be derived from them. Read the objectives of this unit. You will find that we set objectives –

- the attainment of which can be assessed.
- that are achievable (realistic, in keeping with the learner profile).
- that are stated as short and simple sentences. A complicated objective comprising several sentences could be confusing.
- that are few instead of too many objectives.
- That begin with ‘action verbs’ to indicate the action (like describe, explain, calculate, develop, build, analyse and so on) that learners can perform after the instructions.

### How to decide the difficulty level of content?

Learning has three domains (cognitive, psychomotor and affective) (see unit 1). Each of these domains allows different levels of learning beginning with simpler levels to higher ones. In 1956 Benjamin Bloom, an educational psychologist proposed a taxonomy of learning for the cognitive domain (Figure 2).



Source: Wikipedia -[http://www.odu.edu/educ/llschult/blooms\\_taxonomy.htm](http://www.odu.edu/educ/llschult/blooms_taxonomy.htm)

Figure 2: Bloom's Taxonomy and its revised version

Anderson & Krathwohl (2001) revised Bloom's taxonomy (Figure 2). They named the lowest level as remembering. Comprehension and synthesis were made understanding and evaluation respectively, and creating was placed at the highest level.

The levels beginning from simple acts of cognition like just knowing, reach higher levels of cognition like evaluation. Read the following example to understand this:

We **-know** the months when monsoon usually arrives in India; **understand** the reasons for the timing; **apply** our understanding to explain the arrival of monsoon in a particular part of India; **analyse** annual data for rainfall of an area; **synthesize** findings of different years to generalise the rainfall pattern of an area; and **evaluate** the suitability of a particular type of architecture of houses/crop vis a vis the rainfall pattern of the area. Therefore, to evaluate something we must know and understand it, be able to compare it with other similar things, take an analytic view, draw conclusions (synthesize) and thus be in a position to evaluate it.

#### Activity

For which type of learners will you set objectives pertaining to the lower levels- those, having greater or lesser readiness for learning? Why?

Now you can understand that objectives of instructions can pertain to lower/higher levels of cognition. For lower levels providing information suffices but for higher levels, suitable activities, exercises and other devices is required.

**How will you ensure that a learner has actually learnt?** To ensure this we state objectives with ‘action verb’. For example- after studying this unit learners will be able to ‘describe’/ ‘explain’ .....Describe/ explain and the like are actions that learners should be able to perform following the study of the courseware. The use of such action verbs makes learning assessable and we can assess whether the instructional objectives are attained. The following examples (Table 1) will help you to understand how action verbs for different levels of cognition are used for stating objectives.

**Table 1: Use of action verbs for different levels of cognition for stating objectives**

Level of cognition	Examples of Action Verbs	Example of objective
Knowledge-know	Choose, define, find, label, list, match, name, recall, relate, select, spell, tell	Learners will be able to state the major functions of kidneys
Understanding/comprehension	Organize, compare, translate, interpret, describe, distinguish	Learners will be able to compare behaviourism with constructivism.
Application- apply knowledge, facts, techniques and rules	Apply, develop, experiment with, identify, make use of, model, organize, plan, solve, calculate, modify, demonstrate	Learners will be able to calculate simple interest using the formula for it.
Analysis-break down information into its constituent parts	Analyze, categorize, classify, compare, contrast, discover, distinguish, divide, examine, inspect, simplify, test for; arrange, organise, infer	Learners will be able to analyze the information for population growth and predict the population of an area for 2025.
Synthesis-compile information	Develop, prepare, build, combine, compile, compose, construct, create, design, develop, elaborate, estimate, formulate, propose	Learners will be able to develop an instructional design on the basis of the information about its components
Evaluation-make judgments	Evaluate, assess, judge, choose, criticize, decide, deduct, defend, determine, estimate, judge, justify, mark, rate, rank, grade, recommend, rule on, perceive, prioritize, select, etc.	Learners will be able to evaluate the authenticity of information received through social media

Cognitive domain is usually used for instructional designs. We shall not discuss in detail the psychomotor and affective domains but only mention the levels of learning within these domains. You can read about these domains using sources like [https://en.wikiversity.org/wiki/Instructional\\_design/Psychomotor\\_behaviors/Introduction#What is a Domain?](https://en.wikiversity.org/wiki/Instructional_design/Psychomotor_behaviors/Introduction#What_is_a_Domain?)

### Psychomotor Domain

Psychomotor Domain is the skill based domain. It consists of the following five levels.

**Imitation:** Observing and patterning behavior after observing someone/ something, like - imitating the steps for changing car tyre.

**Manipulation:** Learner performs certain actions on his/her own after learning by imitating, like repairing brake on his/her own.

**Precision:** Refining for attaining exactness like fixing brake with precision.

**Articulation:** Complex overt response that expresses learners' views like a learner articulates 'I still cannot handle the tool as well as my instructor'.

**Naturalization:** high level performance that becomes natural, like effortlessly repairing a machine.

### Affective domain

The five major categories of behaviour within the affective domain are as follows:

- **Receiving Phenomena:** Awareness, willingness to hear, for instance a lecture on giving up addiction to gaming.
- **Responding to Phenomena:** Active participation by learners, for instance during a discussion on consequences of excessive gaming.
- **Valuing:** Internalisation of values and their demonstration, for instance not indulging in gaming.
- **Organisation:** Organises values into priorities by comparing and contrasting values, and creating a value system. For example, valuing playing outdoor sports and games rather than gaming.
- **Internalising values (characterisation):** Learner develops a value system that controls his/her behaviour. Such behaviour is pervasive and consistent and characterises the learner who may always try to resist the tendency for engaging in online gaming.

#### Activity

Read the instructional goals of the courses of this programme and examine the instructional objectives listed in the units of these courses in the light of these goals.

Formulate instructional objectives for a topic you would like to teach.

#### Check Your Progress 1

**Select the appropriate option(s) for each of the following:**

1. Need survey for teaching script writing needs to determine:
  - a. Learners' knowledge of essentials of script writing
  - b. Learners' ability to communicate in English
  - c. Learners' experience of script writing
2. An appropriate instructional goal is:
  - a. Learners will describe educational technology
  - b. Learners will describe the concept of educational technology
  - c. Learners will describe the benefits of using technology in education

3. A goal is:
  - a. Broader in scope than an objective
  - b. More specific than an objective

## 2.5 SELECTION OF MEDIA

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The medium/media for delivering instructions has to be selected judiciously. Judicious selection means taking care that the target group has access to the technology, can operate it, and the medium is suitable for the content to be taught. The 3<sup>rd</sup> and 5<sup>th</sup> units of the third course “Selection and Integration of Technology in Educational Processes” describe these aspects.

As per Gagne (1983), as cited in Gagne, Briggs & Wager, (1992) instructional media are the physical means by which an instructional message is communicated and hence, print, audio, television, along with many other physical means, are all considered media. The World Wide Web is also a medium. However media and technology are not the same and along with selection of media, technology selection is also important. For example radio and audio CD are technologies but the medium is audio. Learner may have access to radio but not to a CD player. Similarly a television programme and a DVD are different technologies presenting content in video medium. Text is used for print medium as well as for the web medium but not all learners can access and use web based content. Bates (1995) listed factors that guide selection of technology and used the acronym ACTIONS for representing a model for technology selection.

A- ‘Access’ - The target group should have access to media/technology that is selected/ deployed. Access to technology is determined by a number of factors. Geography, gender, socio economic status and other such factors determine access, and at times in a complex way. For instance, men from socio economically weaker sections may have more access to advanced technology than many women learners of well to do families with male members being the main users of computers and advanced phone. Study centers of IGNOU therefore provide access to IGNOU’s audio and video programmes and also to teleconferencing sessions. However, as learners’ access to technology is important, hence even though print restricts interactions between learner and the instructor, it is the main instructional medium of many distance education intuitions of India.

C-cost involved is crucial. For example broadcast involves expenses that the organization must be able to afford, using student fees or government grants/other means.

T-Teaching and learning should be supported by the media selected.

I- is the degree of interactivity. For example live radio/television programmes and some online courses allow learners to interact with instructors and peers. Ease of use is enhanced by user friendly technologies and this enhances interactivity.

‘O’ stands for the organization. An organization’s human, technological and financial resources as well as willingness and ability to use technology are important factors. An organization having a studio; skilled employees who can operate the technologies; and financial means is in a better position to select audio and video media.

N-novelty factor in the technology used can draw learners’ attention. For example new versions of phones, tablets attract people.

S- Stands for speed and how quickly courses can be mounted and changed are important. For example unlike the content of a video programme, text uploaded for a web based course could be easier to change and update.

The SECTIONS model of technology selection (Bates & Poole, 2003) is based on the ACTIONS model but has some differences. S stands for students and appropriateness of technology is judged on the basis of the target group's age, access, ability to use and so on. E is ease of use and reliability, i.e. how easy it is for both teachers and students to use the technology and how reliable and well tested the technology is. Rest of the factors is the same as that for the ACTIONS model.

The **Technological Pedagogical Content Knowledge (TPACK) model** (Koehler, & Mishra (2005); Mishra & Koehler (2003; 2006) (Course 3 describes this model) is based on the relation among three domains- content, pedagogy (method of teaching) and technology. This model recognizes the 'strengths' and 'weaknesses' of each medium. For example you can select print for elaborate deliberations and narratives but you cannot show processes, demonstrations, situations and so on like you can do using a video; a video is therefore suitable for teaching how to carry out a surgery. You can select audio for descriptions, dramatised narrations, commentaries and so on but not for detailed narratives. Different aspects of a topic can also be taught by using many media. For example print medium can be used to describe instructional designs, videos can explain various models of ID; and audio can explain the genesis of IDs.

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## 2.6 SEQUENCING CONTENT: CONTENT AND TASK ANALYSIS

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Once we have set the goals and objectives we get an idea of 'what' learners should be able to 'do'. For attaining objectives and goals we need to **select content** for enabling learners to perform the task, which they are expected to carry out. You will read in the next few units, especially in unit 5 how content is selected. Therefore, we shall not discuss it in this unit. The content however needs to be selected with care so that it provides the required learning experience. For example the content of this unit provides you with learning experiences pertaining to instructional designing.

The content selected has to be **organised**. Organisation of the content is deciding what to teach first how to end the lesson and what should be there in between. This requires that the content is sequenced.

### **How do we sequence the content?**

Sequencing means placing the content in a certain order and deciding what to teach first and what to teach after that. The ordering is planned in view of what could be learnt first so that subsequent learning is easy. Actually the sequencing is visualised at the stage of setting instructional goals. Instructional goals therefore reflect the sequencing of the content. As a principle, simple and basic things are taught first and then their specificities, i.e. details are taught. Details add to the complexity of a theme. For example we teach about plants then about its parts, then the structure and function of the parts and, after that we teach these at the cellular level during advanced level courses. It is like learning simpler tasks like writing alphabets, then words and then sentences that are more complex than alphabets and words.

Techniques like content analysis and task analysis help to sequence and thus organize the content we have selected for the courseware.

### Content analysis

You have read (unit 1) that new learning is attached to schema (cognitive structures). The content to be taught also has a structure of its own and we need to visualize it. For instance while teaching about the earth we visualise its structure as an outer solid layer (crust), its mantle, and core. We can begin with the crust as learners are already aware of it and see it every day. Hence we may first teach about the earth as a planet, its crust and then teach details like the inner layers of earth. Content analysis thus places general ideas first and specific things later around it. For example, the previous unit provided a general understanding about ID, while this unit teaches its steps and hence the specifics (details). The specifics are thus organised around an axis, which is the ID. By learning specifics learners gain advanced knowledge and make progression in learning.

#### Activity

Reflect on the structure of a content that you would like to teach and sequence the content for teaching.

### Concept map

Content analysis can lead to a concept map for the content to be taught. A concept map structures not only the content but also presents the structural linkage among the constituent parts. This helps us to organize and sequence the content. Figures 3 and 4 present examples of concept map.

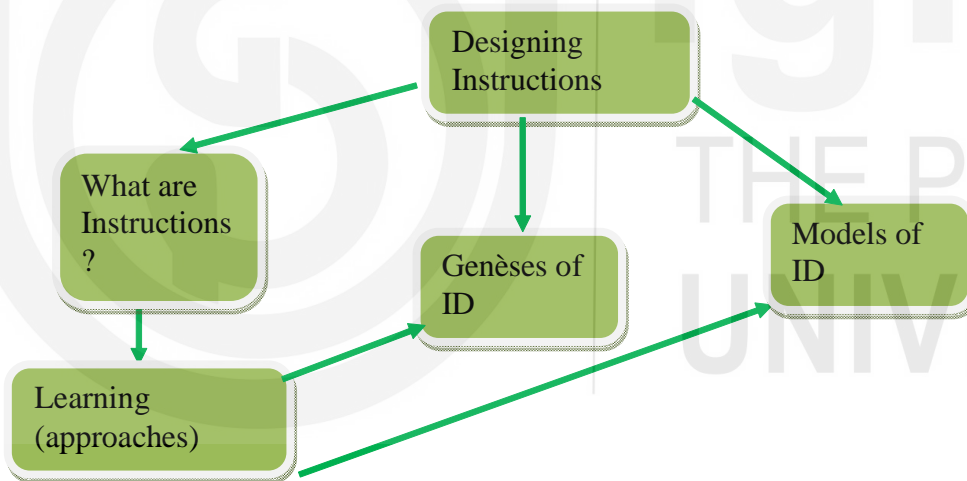


Figure 3: An example of concept map

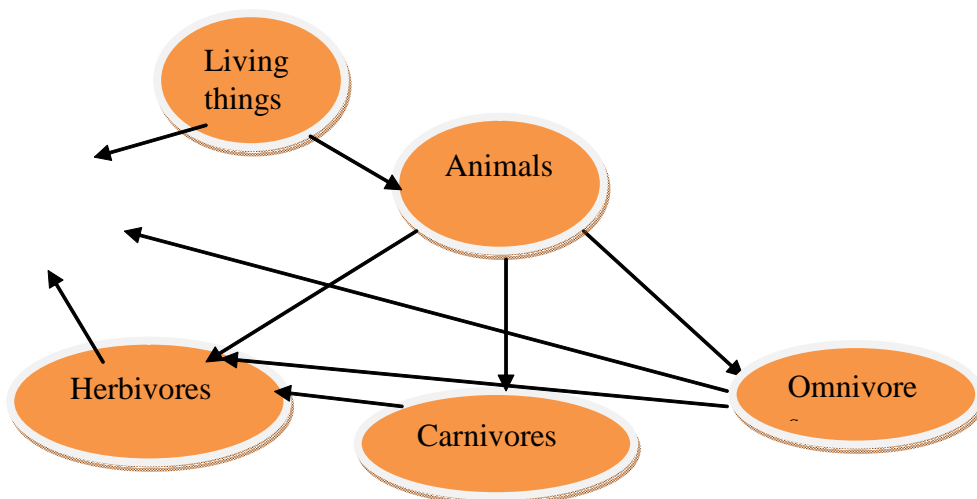
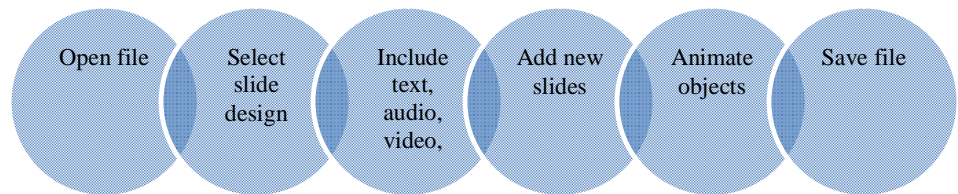


Fig.4- Example of concept map

### Task analysis

Task analysis is also an approach to sequencing learning. Learning in this case is supposed to be manifested as tasks. Task analysis helps to plan what learners should **do** first and what they should do subsequently. Tasks are hence, sequenced. Complex activities can be visualized as a chain of tasks like writing a script, preparing a story board, recording a video programme, evaluating it and so on. See the example (Figure 5) to understand how content is organized in terms of the tasks to be performed by learners. This approach is especially useful while teaching skills. Learners learn in a stepwise manner till they are capable of complex activities requiring multiple skills.



**Figure 5: Example of task analysis: Steps (individual tasks) for developing slides**

To know more about task analysis visit:

<https://www.usabilitybok.org/task-analysis>

[https://en.wikiversity.org/wiki/The\\_Task\\_Analysis](https://en.wikiversity.org/wiki/The_Task_Analysis)

#### Activity

Develop a concept map for a topic, which you would like to teach. The maps should show the relation among the constituent parts of the concept.

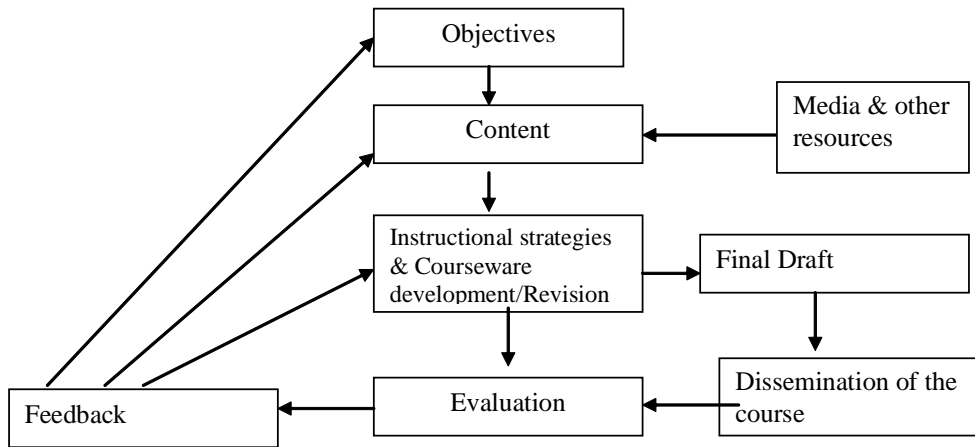
## 2.7 CONTENT DEVELOPMENT

After setting instructional goals and objectives and sequencing the content we have to present learning experiences in a way that facilitates learning. The content has to be authentic and it should have pedagogic elements that teach. We can either develop the content or if it is already available and is an open/free resource, we can use it. Unit 3 describes how content for print or web that requires textual information is to be developed. Units 4 and 5 are for content development for audio and video media respectively. Unit 6 is about content development for multimedia and, use of resources already available. Hence, we shall not discuss this in detail in this unit.

## 2.8 EVALUATION OF INSTRUCTIONS

While developing courseware we need to assess whether the courseware will lead to the attainment of the objectives, and after the delivery of the courseware we need to evaluate whether learners can carry out the tasks as envisioned by the objectives. For instance after studying this course you must be able to carry out the activities that are listed as its objectives. Instructional goals are attained when learners are capable of performing the learning tasks. In case of a mismatch between learners' performance and instructional goals what should we examine? All the components of the ID right from need survey (Figure 6). It is possible that needs might not have been surveyed well. Moreover needs change. For example a courseware teaching about computer programmes used in the past are no longer required by new learners. In such cases when learning needs change, the other components of the ID lose their relevance.





**Figure 6: Evaluation strategy (Source: Dharam Prakash, 2008)**

### Stages at which evaluation is carried out

Evaluation helps to take a re-look at the components of the ID and re-plan instructions. This can be done while developing the courseware. This type of evaluation, carried out at the formation stage, is known as **formative evaluation**. For example the units you are reading have been evaluated by experts before these were finalized. Audio and video programmes (rough cuts) should also be previewed by experts and, preferably even by a sample of learners for whom the programme is being developed. The feedback obtained thus helps to revise and improve the instructions. Evaluation after delivering instructions is known as **summative evaluation**. Formative evaluation requires data collection with the help of tools like questionnaires and interviews from subject matter experts, teachers, peers and even learners.

Some of the reasons for formative evaluation are (Kutiala, 2008):

- identifying the problems in the early stages of courseware development;
- improving the planning, management and implementation of a courseware;
- fine-tuning the implementation of the course;
- improving the impact or effect of the courseware;
- making summative evaluation more meaningful;

### How to carry out formative evaluation?

Formative evaluation requires data collection, and data (feedback) should pertain to:

**Subject matter (content):** Experts and teachers can assess its authenticity and also its suitability for the target group.

**Pedagogic effectiveness of the courseware:** capacity to teach and develop the capacity for performance as per instructional goals

**Other attributes of the courseware:** There are various attributes of a courseware apart from its content and pedagogy. The visual treatment (see unit 5), aesthetics, appropriateness of the format, and the like can be assessed for a video or web based visual content. For example, a pilot (experimental) version of multimedia self-learning package on Atomic Structure and Periodic Table was created and the developers wanted to know learners' reactions on screen design, placement of function buttons, explanation of experiments, their appropriateness, and the like. A sample of

students used the CD with the content and responded through a questionnaire about the aspects examined. The analysis and interpretation of data obtained led to a total revamp of the design of multimedia, and many other features were added, which had not been thought of earlier (Dharam Prakash, 2008 ).

It is therefore important that the feedback is analysed and if the data is qualitative, content analysis can be carried out. Data can also be collected from the drop out sample i.e. those learners who quit the programme before completing it, administrators, and prospective employers.

Some questions that courseware developers should ask themselves are (Usha Rani, 2008):

- i. Questions related to the content
  - Is the difficulty level of the courseware in keeping with the level of readiness of learners?
  - Is the content load appropriate?
  - Is the language suitable for the target group?
  - Is the content appropriate for attaining the objectives?
  - Is the content factually correct and updated?
  - Is the content logically structured?
- ii. Questions related to teaching effectiveness of the courseware:
  - Is the courseware suitable for self-learning?
  - Is the sequencing of the content pedagogically appropriate?
  - Does the courseware meet the goals and objectives of the course?
  - Are the objectives of the course relevant to learners' need?
  - Are aims and objectives relevant to the needs of target population?
  - Are the aims and objectives stated explicitly?
  - Are the objectives supporting the goals?
  - Are there objectives which have been not been included but should be included?
  - Is the courseware interesting to the learners?
  - Are the concepts explained adequately?
  - Are the examples, analogies, case studies, illustrations, etc. used relevant and interesting to learners?

Similar questions can also be asked about the choice of media.

- iii. Questions pertaining to media
  - Do the media present the content appropriately?
  - Do learners have access to the technology?
  - Can learners access the courseware through the devices they use like tablets, phones, laptops etc.?

The feedback obtained can be organised under the following headings in the following way (Dharam Prakash, 2008):

- Concepts and sub-concepts
- Examples/analogies explaining the concept
- Sequencing and structuring of the content
- Difficult areas
- Redundant content
- Content to be added
- Pedagogic aspects
- Language
- Exercises and activities, etc.

The data under each head is analysed and interpreted and action points are listed for improving the courseware.

#### **Examples of formative evaluation (Source: Dharam Prakash, 2008))**

**Example 1:** While developing a video programme for enabling map reading, formative evaluation was carried out by testing the script with the target group. The feedback was about the ideas in the script and the problems in learning. After the formative testing, the script was rewritten.

**Example 2:** While developing a self-learning multimedia package in Chemistry, user's (teachers' and learners' opinion) was taken on the screen design and text presentation style. Based on the feedback that text should be structured along points and the pictures should be accompanied by explanatory text or commentary, the presentation strategy of the multimedia was revised. In this case, formative evaluation helped the courseware developers in fine-tuning their strategies.

The questionnaire for collecting feedback can include different types of questions, such as multiple-choice questions or open ended questions or a mix of both. A sample questionnaire/interview schedule (Dharam Prakash, 2008) is as follows:

##### Sample questionnaire items

- Was the subject matter of the courseware already familiar to you –all of it/ most of it/none of it
- How difficult did you find the courseware? Very difficult/ difficult/ appropriate/ easy
- Were there any sections/words/concepts, which you found difficult? Please mention these.

##### **Group discussion / interviews may include points like:**

- What did you like most about the unit/video/audio?
- What was it that you did not like:
- What was missing in it?
- Which portions/units did you find difficult to understand?
- What kind of additions/deletions/changes do you suggest in the content?

## Summative evaluation

Summative evaluation takes into account learners' achievement scores /grades; percentage of those completing the course; percentage of drop outs and other such information to judge the effectiveness of the courseware. It is carried out after the instructions have been delivered, i.e. the course has been taught. It can be in the form of achievement tests, used for grading and certification. It provides evidence of whether learners are capable of performing the learning tasks envisioned for accomplishing the objectives of the courseware. Higher pass out rates indicate effectiveness while low pass out rates as well as high rate of drop out question the effectiveness of a course. This type of evaluation however considers not only learners' performance but also other factors like employability, admission to advanced courses and the like. Even if learners' performance meets the requirements of instructional goals but they fail to get employment, re-assessment of its instructional inputs is required. If dropout rate is high the programme could be placing demands that learners are unable to fulfill.

An example of summative evaluation (Source: Dharam Prakash, 2008): A series of video programmes were produced. The production team wanted to know how the series would communicate the intended message to the learners. A questionnaire was designed and a semi- structured interview schedule was planned for summative evaluation. The feedback was used to revise and update the video programmes.

Summative evaluation thus sums up the impact and educational effectiveness of the courseware and gives inputs which can be utilized not only for improving the particular courseware but also for guiding the development of similar such courseware.

**Long Term Impact Studies** (Source: Dharam Prakash, 2008) As the impact of a course cannot and will not happen within a short span of time, long term impact studies are undertaken generally to understand the impact of the courseware on learners. Long-term studies however require lots of planning, resources, monitoring, rigorous evaluation methods, and the like. The long term impact study on SITE (Satellite Instructional Television Experiment, 1975-76) of India gave positive feedback and Satellite-based telecast has been used for the telecast of educational television programmes through INSAT series of satellites.

To find out the impact of any courseware rigorous experimental impact studies are also carried out. In such studies, the impact of the courseware is measured experimentally through -

- Pretest and post test design in which the learners are tested for specific abilities before they undergo the course and again after they complete the course.
- Post test only, where the learners are tested for specific abilities after the input of the courseware has been given.

Such experimental impact studies indicate the impact of the courseware on learners. For example, for testing a series of video programmes for teaching Mathematics for class XII, an experimental study with pretest – post test design was used. Tools for pretest and post-test were developed and pilot tested. The randomly selected experimental group was given the pretest for assessing the development of specific abilities that the video programmes were supposed to develop. For three days the series of video programmes was shown to the experimental group. This was followed by a post test. The data was analyzed and the impact study revealed that the video programmes made a significant impact on learning. The students also made certain suggestions for improving the video programmes.

## Project Talent

Longitudinal or follow up studies are undertaken to determine whether the desired outcomes of a programme are being attained. A well known longitudinal study carried out through survey on high school students at the national level in the USA is the Project Talent. Although it was initiated in 1960, nevertheless, it is still famous for its scale and comprehensiveness. The rationale of the study was to determine the effectiveness of schools and its impact on the lives of students.

The study was designed by the American Institute for Research and led by John C. Flanagan. It involved 1,353 public, private, and other types of schools. Extensive data were obtained from a sample of 4,40,000 high school students across USA.

In 1960 competencies of the participants of the study, studying in grades 9 through 12 were tested for subjects like mathematics, science and reading ability was tested. Data about the participants' family background, personal and educational experiences, educational and vocational aspirations and interests in occupations and activities was also collected. Follow-up surveys were conducted one year, five years, and eleven years after their high school education for collecting data about educational and occupational attainments, marriage, family and other aspects. The data collected informed 450 government reports, scholarly articles and books.

This study played an important role in identifying the factors related to schools as well as those related to students' home and other aspects that determine their educational achievements. It also revealed the skills developed during schooling and occupational success and several other such aspects pertaining to the impact of schooling.

**Source:** About Project Talent (<https://www.projecttalent.org/about/overview/>)

### Activity 1

Read the objectives of the units of this course and assess your ability to carry out the activities required for meeting these objectives. Are you capable of carrying out all the activities? Which activities are difficult for you? Why? Write to us.

### Check Your Progress 2

Select the correct option for the following:

1. Learners are taught about specifics and then introduced to the general idea - true /false
2. Content analysis helps to visualise the structural relations among the constituent parts of a concept-true /false
3. Previewing a video helps summative evaluation-true /false
4. Formative evaluation improves a courseware while it is developed-true /false
5. Summative evaluation improves a courseware after its development and delivery-true /false
6. Board examination is a type of formative evaluation-true /false

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## 2.9 SUMMARY

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This unit describes the steps taken for designing courseware. Designing courseware begins with the process of need survey. Data collected from the target group is analysed to determine learning needs and demographic details of the target group. After that instructional goals are set and objectives are derived from goals and stated using action verb. After that media for delivering courseware is selected and the content to be taught is selected and organised through content analysis and task analysis. Next content is developed and that available is used for attaining the instructional goals. Thereafter formative evaluation is carried out during the development of courseware for quality assurance, and summative evaluation is carried out after the delivery of courseware for determining its effectiveness.

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## 2.10 UNIT END ACTIVITIES

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Think of a course that you would like to teach.

1. Prepare a questionnaire/interview schedule to carry out a need survey for the course.
2. Develop instructional goals for the course.
3. Select the media for delivering the course and justify the selection.
4. Carry out content &/ task analysis and develop instructional objectives for any one part of the content/task.
5. Develop a plan for the evaluation of the courseware.

You may carry out these tasks with your peers.

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## 2.12 ANSWER TO CHECK YOUR PROGRESS

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### Answer to Check Your Progress 1

1. a, b & c
2. b& c. This is because a does not clarify which aspects of educational technology learners will learn. The first one therefore lacks ‘specificity’.
3. a

### Answer to Check Your Progress 2

1. False 2. True 3. False 4. True 5. True 6. False



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