
UNIT 1 INSTRUCTIONAL DESIGN

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1.1 INTRODUCTION

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.

1.2 OBJECTIVES

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.

1.3 PROCESS OF LEARNING: HOW DO WE LEARN?

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 12×12 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?

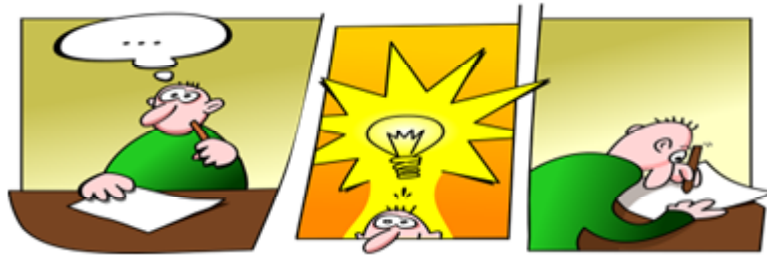
1.



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.

1.4 INSTRUCTIONAL DESIGN

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**

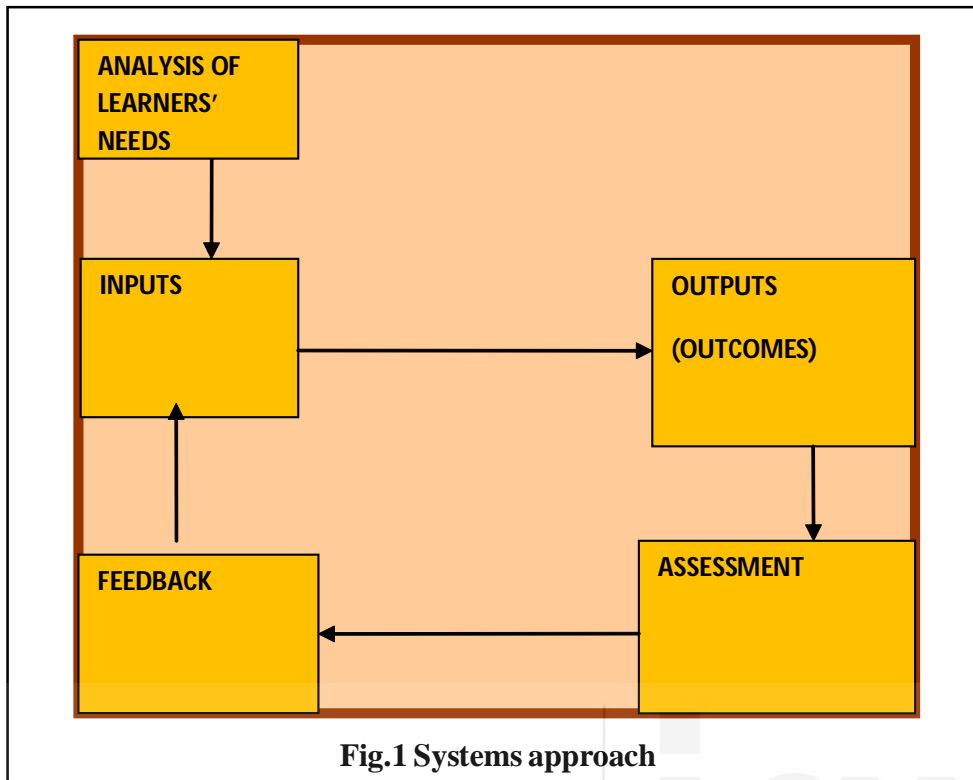
experiences. The instructions were thus **designed** for attaining the instructional goals. Your friend's descriptions (inputs) were perhaps not **designed** in this way as they had not **planned** why, and how they would help you to learn about that country.

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 1st and 3rd events; objectives include the 2nd event; 4th &5th events are in the middle part of the units; 6th is in the activities. Check your progress questions cover the 7th event while answers to check your progress questions cover the 8th event. Cases and events from the real world and cross reference to units pertain to the 9th 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 20th 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.

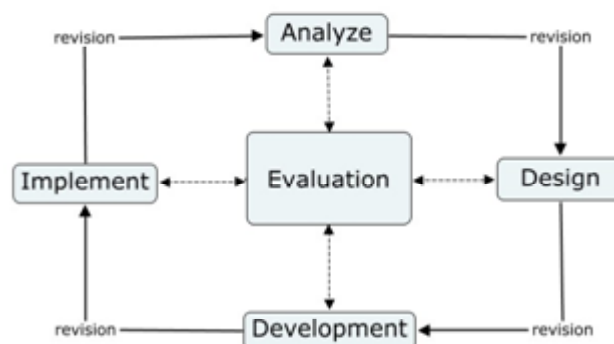


Figure 3: ADDIE model Source: <https://commons.wikimedia.org/w/index.php?curid=19136887>

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

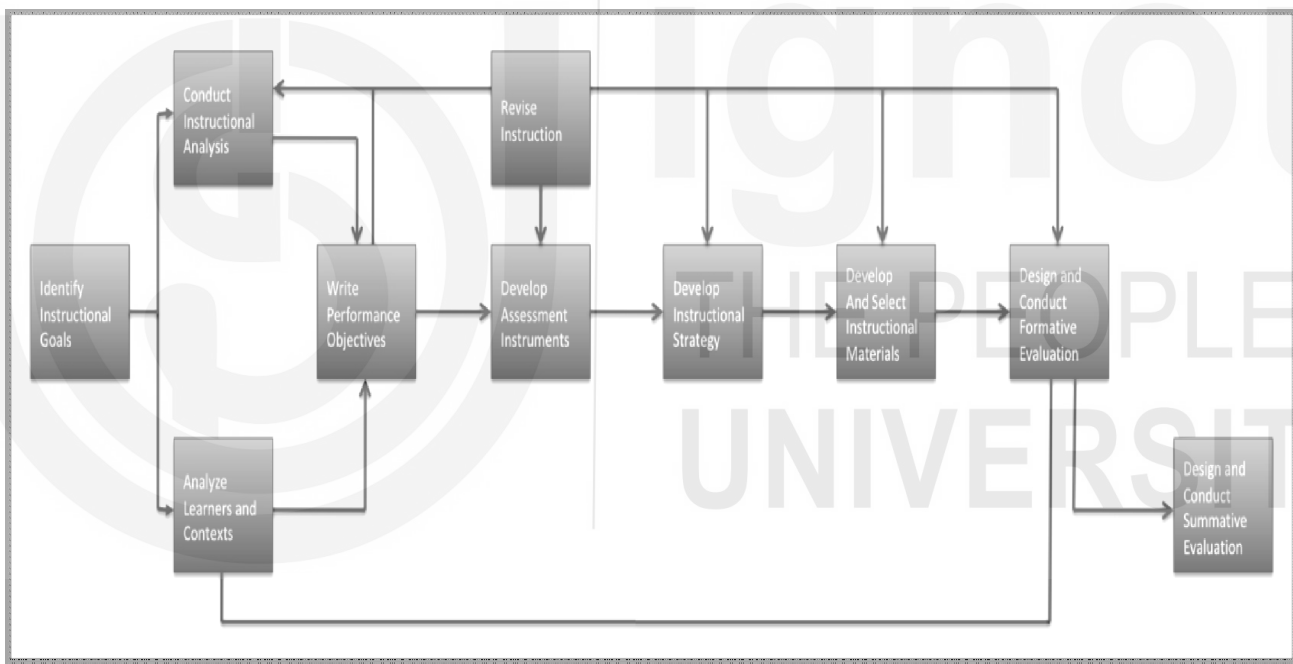


Figure 4: Dick and Carey Model

Source: https://en.wikipedia.org/wiki/Instructional_design#/media/File:Dick_Carey.png

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.

1.6 LEARNING DESIGN: WHAT IS IT?

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 1st 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 2nd 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 3rd 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 4th 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.

1.8 UNIT END EXERCISES

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

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.

