

UNIT – I

LEARNING AND ITS THEORIES

THE CONCEPT OF LEARNING

Conceptually, 'learning' in the conventional sense is the process of assimilation of knowledge resulting from the interaction between the teacher and the taught. The idea of the traditional teacher-student relationship is, however, impossible to achieve with the growing democratisation of education and the increasing demand for learning or continuing education. In distance education, the scope for personal contact and its role in the teaching and learning process are limited. The concept of learning thus needs to be reinterpreted in terms of distance education. In distance education, learning takes place not through the mediation of a teacher but primarily through the mediation of text materials and electronic gadgets.

As you know, in distance education we deal with adult learners, who use their experience to create construct knowledge, a process which is other-wise known as experiential learning. In 'this section, along with considering the other meanings of 'learning', we will discuss the concept of experiential learning and constructivism. If we look at the process of learning and teaching at a distance from the point of view of pedagogies, it is more or less integrated combination of forms of learning which are developed in classroom teaching (Otto Peters, 1998). These include:

- Learning by reading printed material (textbooks, manuals, lexicons, scientific literature, lecture notes).
- Learning by means of guided self-teaching (counselling at the commencement of studies, counselling by tutors, consulting reading lists).
- Learning by means of independent scientific work (preparation for written examination, the writing of assignments).
- Learning by means of personal communications (use of the consultation hours of university teaching staff, and of course counselling, peer interaction, practical case-work, project work, seminars etc.).
- Learning with the help of multi-media.
- Learning by participating in traditional academic teaching (lectures, seminars, counselling sessions, laboratory work).
- What follows below is an elaboration of the theme introduced earlier.

Learning and performance

Learning is a relatively permanent change in behaviour, and it is the result of reinforced practice.

Such a concept of learning assumes that certain conditions in the environment bring about fundamental changes in our behaviour and that these changes persist for a long time. Learning is not directly observable but can be inferred from performance. We can infer that a person has learnt something when she/he does something which she/he could not do before. A person may know something, and yet may not have learned it. You may

Factors in the Design of Print Materials

'know' how a computer works, but may not be able to operate it. Thus, the distinction between learning or the acquisition of knowledge (i.e. capability) and performance (i.e. exhibiting this capability in some form of action) is an important one. We use the term 'behavioural tendency' to maintain the distinction between learning and performance. In this context when we speak of relatively permanent change in behaviour, we refer to a change in performance.

Learning and cognitive development,

We may also define learning in terms of cognitive development. Cognitivists say that learning is the changing or reorganisation of cognitive structures, which involves an acquisition of knowledge and the transformation of new knowledge. ~ o o k e dat this way, we can say that learning is a change in one's knowledge, skills, attitudes and values brought about through experience, and this change may or may not be expressed in overt behaviour.

Learning and maturation

Not all changes in behaviour can be related to learning. Some behavioural changes are due to biological development or maturation. In maturation, the growth tendencies are independent of specific learning conditions, and depend entirely on biological growth. For example, the swimming of tadpoles and the flying of birds simply occur at the moment of anatomical maturation. **A** child walks once its legs are strong enough to support its weight.

Experiential learning and constructivism

Experiential learning has been a very influential idea in recent years. It is argued by Kolb (1984) that mature adults have much to offer to the educational process from their life experiences. Peter (1997) argues that to some extent experiential learning is constructivism in an adult context. Kolb (1984) describes experiential learning as the process whereby knowledge is created through the transformation of experience while Knowles (1984) and Brookfield (1986) link it to self-directed learning. There is certainly a very strong element of self-direction in learning as in a classic study of the constructivist movement. Knowles (1984) postulates certain assumptions about andragogy (the teaching of adults as opposed to pedagogy, which is the teaching of children) and experiential learning. Most of these assumptions also seem to apply to constructivism. Kolb (1984) listed the essential characteristics of experiential learning which are applicable to constructivist theory.

These characteristics are:

1. Learning is a continuous process grounded in experience.
2. Learning is a holistic process of adaptation to the world.

3. Learning involves transactions between the person and the environment.
4. Learning is the process of creating knowledge.
5. The process of learning requires the resolution of conflicts between diametrically opposed modes of adaptation to the world.

Skinner - Operant Conditioning

Operant conditioning is a method of learning that occurs through rewards and punishments for behavior. Through operant conditioning, an individual makes an association between a particular behavior and a consequence (Skinner, 1938).

By the 1920s, John B. Watson had left academic psychology, and other behaviorists were becoming influential, proposing new forms of learning other than classical conditioning. Perhaps the most important of these was Burrhus Frederic Skinner. Although, for obvious reasons, he is more commonly known as B.F. Skinner.

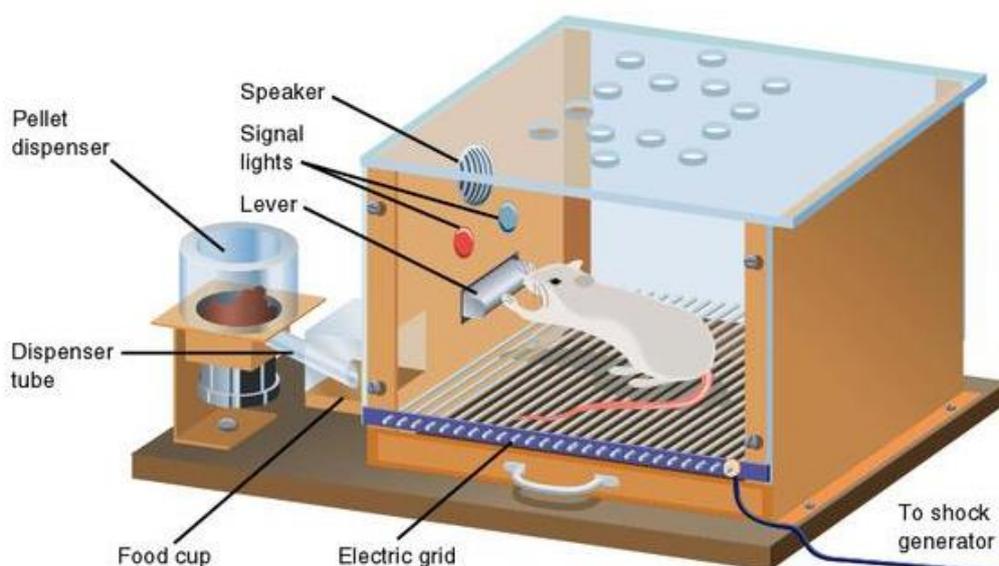
Skinner's views were slightly less extreme than those of Watson (1913). Skinner believed that we do have such a thing as a mind, but that it is simply more productive to study observable behavior rather than internal mental events.

The work of Skinner was rooted in a view that classical conditioning was far too simplistic to be a complete explanation of complex human behavior. He believed that the best way to understand behavior is to look at the causes of an action and its consequences. He called this approach operant conditioning.

Skinner is regarded as the father of Operant Conditioning, but his work was based on Thorndike's (1898) law of effect. According to this principle, behavior that is followed by pleasant consequences is likely to be repeated, and behavior followed by unpleasant consequences is less likely to be repeated.

Skinner introduced a new term into the Law of Effect - Reinforcement. Behavior which is reinforced tends to be repeated (i.e., strengthened); behavior which is not reinforced tends to die out-or be extinguished (i.e., weakened).

Skinner (1948) studied operant conditioning by conducting experiments using animals which he placed in a 'Skinner Box' which was similar to Thorndike's puzzle box.



Skinner identified three types of responses, or operant, that can follow behavior.

- **Neutral operants:** responses from the environment that neither increase nor decrease the probability of a behavior being repeated.
- **Reinforcers:** Responses from the environment that increase the probability of a behavior being repeated. Reinforcers can be either positive or negative.
- **Punishers:** Responses from the environment that decrease the likelihood of a behavior being repeated. Punishment weakens behavior.

We can all think of examples of how our own behavior has been affected by reinforcers and punishers. As a child you probably tried out a number of behaviors and learned from their consequences.

For example, if when you were younger you tried smoking at school, and the chief consequence was that you got in with the crowd you always wanted to hang out with, you would have been positively reinforced (i.e., rewarded) and would be likely to repeat the behavior.

If, however, the main consequence was that you were caught, caned, suspended from school and your parents became involved you would most certainly have been punished, and you would consequently be much less likely to smoke now.

Positive Reinforcement

Skinner showed how positive reinforcement worked by placing a hungry rat in his Skinner box. The box contained a lever on the side, and as the rat moved about the box, it would accidentally knock the lever. Immediately it did so a food pellet would drop into a container next to the lever.

The rats quickly learned to go straight to the lever after a few times of being put in the box. The consequence of receiving food if they pressed the lever ensured that they would repeat the action again and again.

Positive reinforcement strengthens a behavior by providing a consequence an individual finds rewarding. For example, if your teacher gives you £5 each time you complete your homework (i.e., a reward) you will be more likely to repeat this behavior in the future, thus strengthening the behavior of completing your homework.

Negative Reinforcement

The removal of an unpleasant reinforcer can also strengthen behavior. This is known as negative reinforcement because it is the removal of an adverse stimulus which is 'rewarding' to the animal or person. Negative reinforcement strengthens behavior because it stops or removes an unpleasant experience.

For example, if you do not complete your homework, you give your teacher £5. You will complete your homework to avoid paying £5, thus strengthening the behavior of completing your homework.

Skinner showed how negative reinforcement worked by placing a rat in his Skinner box and then subjecting it to an unpleasant electric current which caused it some discomfort. As the rat moved about the box it would accidentally knock the lever. Immediately it did

so the electric current would be switched off. The rats quickly learned to go straight to the lever after a few times of being put in the box. The consequence of escaping the electric current ensured that they would repeat the action again and again.

In fact Skinner even taught the rats to avoid the electric current by turning on a light just before the electric current came on. The rats soon learned to press the lever when the light came on because they knew that this would stop the electric current being switched on.

These two learned responses are known as *Escape Learning* and *Avoidance Learning*.

Punishment (weakens behavior)

Punishment is defined as the opposite of reinforcement since it is designed to weaken or eliminate a response rather than increase it. It is an aversive event that decreases the behavior that it follows.

Like reinforcement, punishment can work either by directly applying an unpleasant stimulus like a shock after a response or by removing a potentially rewarding stimulus, for instance, deducting someone's pocket money to punish undesirable behavior.

Note: It is not always easy to distinguish between punishment and negative reinforcement.

There are many problems with using punishment, such as:

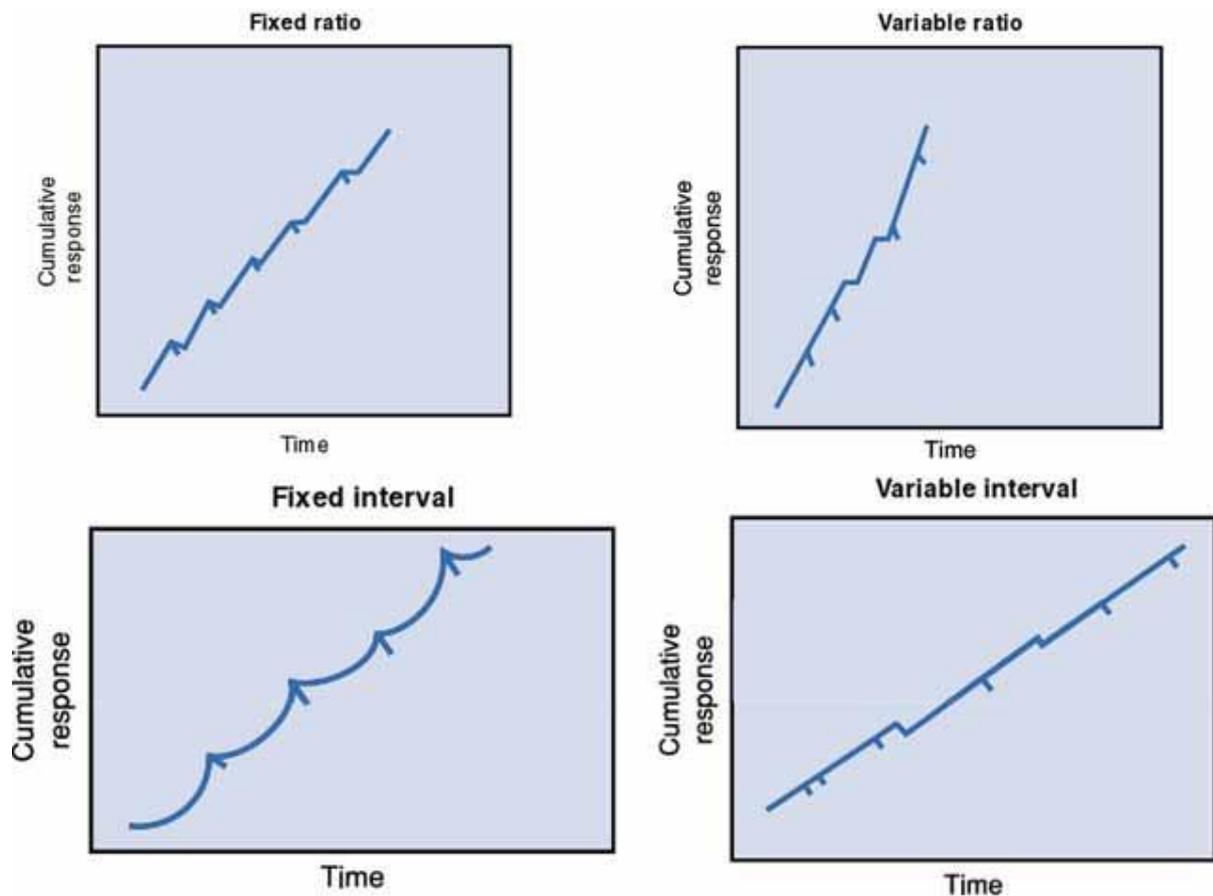
- Punished behavior is not forgotten, it's suppressed - behavior returns when punishment is no longer present.
- Causes increased aggression - shows that aggression is a way to cope with problems.
- Creates fear that can generalize to undesirable behaviors, e.g., fear of school.
- Does not necessarily guide toward desired behavior - reinforcement tells you what to do, punishment only tells you what not to do.

Schedules of Reinforcement

Imagine a rat in a "Skinner box." In operant conditioning, if no food pellet is delivered immediately after the lever is pressed then after several attempts the rat stops pressing the lever (how long would someone continue to go to work if their employer stopped paying them?). The behavior has been extinguished.

Behaviorists discovered that different patterns ([or schedules](#)) of reinforcement had different effects on the speed of learning and extinction. Ferster and Skinner (1957) devised different ways of delivering reinforcement and found that this had effects on

1. **The Response Rate** - The rate at which the rat pressed the lever (i.e., how hard the rat worked).
2. **The Extinction Rate** - The rate at which lever pressing dies out (i.e., how soon the rat gave up).



Skinner found that the type of reinforcement which produces the slowest rate of extinction (i.e., people will go on repeating the behavior for the longest time without reinforcement) is variable-ratio reinforcement. The type of reinforcement which has the quickest rate of extinction is continuous reinforcement.

(A) Continuous Reinforcement

An animal/human is positively reinforced every time a specific behavior occurs, e.g., every time a lever is pressed a pellet is delivered, and then food delivery is shut off.

- Response rate is SLOW
- Extinction rate is FAST

(B) Fixed Ratio Reinforcement

Behavior is reinforced only after the behavior occurs a specified number of times. e.g., one reinforcement is given after every so many correct responses, e.g., after every 5th response. For example, a child receives a star for every five words spelled correctly.

- Response rate is FAST
- Extinction rate is MEDIUM

(C) Fixed Interval Reinforcement

One reinforcement is given after a fixed time interval providing at least one correct response has been made. An example is being paid by the hour. Another example would

be every 15 minutes (half hour, hour, etc.) a pellet is delivered (providing at least one lever press has been made) then food delivery is shut off.

- Response rate is MEDIUM
- Extinction rate is MEDIUM

(D) Variable Ratio Reinforcement

Behavior is reinforced after an unpredictable number of times. For examples gambling or fishing.

- Response rate is FAST
- Extinction rate is SLOW (very hard to extinguish because of unpredictability)

(E) Variable Interval Reinforcement

Providing one correct response has been made, reinforcement is given after an unpredictable amount of time has passed, e.g., on average every 5 minutes. An example is a self-employed person being paid at unpredictable times.

- Response rate is FAST
- Extinction rate is SLOW

Behavior Modification

Behavior modification is a set of therapies / techniques based on operant conditioning (Skinner, 1938, 1953). The main principle comprises changing environmental events that are related to a person's behavior. For example, the reinforcement of desired behaviors and ignoring or punishing undesired ones.

This is not as simple as it sounds — always reinforcing desired behavior, for example, is basically bribery.

There are different types of positive reinforcements. Primary reinforcement is when a reward strengthens a behavior by itself. Secondary reinforcement is when something strengthens a behavior because it leads to a primary reinforcer.

Examples of behavior modification therapy include token economy and behavior shaping.

Token Economy

Token economy is a system in which targeted behaviors are reinforced with tokens (secondary reinforcers) and later exchanged for rewards (primary reinforcers).

Tokens can be in the form of fake money, buttons, poker chips, stickers, etc. While the rewards can range anywhere from snacks to privileges or activities. For example, teachers use token economy at primary school by giving young children stickers to reward good behavior.

Token economy has been found to be very effective in managing psychiatric patients. However, the patients can become over reliant on the tokens, making it difficult for them to adjust to society once they leave prison, hospital, etc.

Staff implementing a token economy programme have a lot of power. It is important that staff do not favor or ignore certain individuals if the programme is to work. Therefore, staff need to be trained to give tokens fairly and consistently even when there are shift changes such as in prisons or in a psychiatric hospital.

Behavior Shaping

A further important contribution made by Skinner (1951) is the notion of behavior shaping through successive approximation. Skinner argues that the principles of operant conditioning can be used to produce extremely complex behavior if rewards and punishments are delivered in such a way as to encourage move an organism closer and closer to the desired behavior each time.

To do this, the conditions (or contingencies) required to receive the reward should shift each time the organism moves a step closer to the desired behavior.

According to Skinner, most animal and human behavior (including language) can be explained as a product of this type of successive approximation.

Educational Applications

In the conventional learning situation, operant conditioning applies largely to issues of class and student management, rather than to learning content. It is very relevant to shaping skill performance.

A simple way to shape behavior is to provide feedback on learner performance, e.g., compliments, approval, encouragement, and affirmation. A variable-ratio produces the highest response rate for students learning a new task, whereby initially reinforcement (e.g., praise) occurs at frequent intervals, and as the performance improves reinforcement occurs less frequently, until eventually only exceptional outcomes are reinforced.

For example, if a teacher wanted to encourage students to answer questions in class they should praise them for every attempt (regardless of whether their answer is correct). Gradually the teacher will only praise the students when their answer is correct, and over time only exceptional answers will be praised.

Unwanted behaviors, such as tardiness and dominating class discussion can be extinguished through being ignored by the teacher (rather than being reinforced by having attention drawn to them). This is not an easy task, as the teacher may appear insincere if he/she thinks too much about the way to behave.

Knowledge of success is also important as it motivates future learning. However, it is important to vary the type of reinforcement given so that the behavior is maintained. This is not an easy task, as the teacher may appear insincere if he/she thinks too much about the way to behave.

Summary

Looking at Skinner's classic studies on pigeons' / rat's behavior we can identify some of the major assumptions of the behaviorist approach.

- Psychology should be seen as a science, to be studied in a scientific manner. Skinner's study of behavior in rats was conducted under carefully controlled laboratory conditions.
- Behaviorism is primarily concerned with observable behavior, as opposed to internal events like thinking and emotion. Note that Skinner did not say that the rats learned to press a lever because they wanted food. He instead concentrated on describing the easily observed behavior that the rats acquired.
- The major influence on human behavior is learning from our environment. In the Skinner study, because food followed a particular behavior the rats learned to repeat that behavior, e.g., operant conditioning.
- There is little difference between the learning that takes place in humans and that in other animals. Therefore research (e.g., operant conditioning) can be carried out on animals (Rats / Pigeons) as well as on humans. Skinner proposed that the way humans learn behavior is much the same as the way the rats learned to press a lever.

So, if your layperson's idea of psychology has always been of people in laboratories wearing white coats and watching hapless rats try to negotiate mazes in order to get to their dinner, then you are probably thinking of behavioral psychology.

Behaviorism and its offshoots tend to be among the most scientific of the psychological perspectives. The emphasis of behavioral psychology is on how we learn to behave in certain ways.

We are all constantly learning new behaviors and how to modify our existing behavior. Behavioral psychology is the psychological approach that focuses on how this learning takes place.

Critical Evaluation

Operant conditioning can be used to explain a wide variety of behaviors, from the process of learning, to addiction and language acquisition. It also has practical application (such as token economy) which can be applied in classrooms, prisons and psychiatric hospitals.

However, operant conditioning fails to take into account the role of inherited and cognitive factors in learning, and thus is an incomplete explanation of the learning process in humans and animals.

For example, Kohler (1924) found that primates often seem to solve problems in a flash of insight rather than be trial and error learning. Also, social learning theory (Bandura, 1977) suggests that humans can learn automatically through observation rather than through personal experience.

The use of animal research in operant conditioning studies also raises the issue of extrapolation. Some psychologists argue we cannot generalize from studies on animals to humans as their anatomy and physiology is different from humans, and they cannot think about their experiences and invoke reason, patience, memory or self-comfort.

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Theory: Conditions of Learning Theorist: Robert M. Gagne

Essence of Theory:

During the 1960s (Anglin, 1991), there was a flurry of activity within the field of instructional development that focused on systems of instruction. It was during this time that the components of the instructional system and their system properties were articulated. In 1965 Robert Gagne published his book entitled *The Conditions of Learning*. In his book, Gagne (1965) described the analysis of learning objectives, and how these different classes of learning objectives relate to the appropriate instructional designs.

Gagne (1985), distinguishes between two types of conditions, internal and external. The internal conditions can be described as "states" and include attention, motivation and recall. The external conditions can be thought of as factors surrounding one's behavior, and include the arrangement and timing of stimulus events. Thus, his phases of learning include:

- Phase I: receiving the stimulus situation
- Phase II stage of acquisition
- Phase III storage
- Phase IV retrieval

In their book Norton and Wilburg (1998) describe Gagne's (1965) outcomes or objects of learning which consist of five major categories of human capabilities:

- Verbal information-ex. learning the alphabet.
- Intellectual skills-ex. addition and subtraction
- Cognitive strategies- inductive & deductive reasoning; exploring the action of a magnet.
- Attitudes-ex. how one feels about reading a book
- Motor skills-ex. fastening buttons.

According to Norton and Wilburg (1998) Gagne's (1965) model for design of instruction includes a sequence of nine instructional events and its corresponding learning processes that guide the design of instruction.

Instructional Event	Relation to Learning Process
1. Gaining attention	Reception of patterns of neural impulses
2. Informing learner of the objective(s)	Activating a process of executive control
3. Stimulating recall of prerequisite learning	Retrieval of prior learning to working memory
4. Presenting the stimulus material	Emphasizing features for selective perception

5. Providing learning guidance	Semantic encoding; cues for retrieval
6. Eliciting the performance	Activating response organization
7. Providing feedback about performance	Establishing reinforcement
8. Assessing performance	Activating retrieval; making reinforcement possible
9. Enhancing retention and transfer	Providing cues and strategies for retrieval

Implications for Instructional Technology:

Gagne's (1965) theory of conditions of learning has several implications for instructional technology. The design of instruction should involve: analyzing requirements, selecting media and designing the instructional events. Additionally the instructional technologist must keep in mind the following learning concepts when developing methods of instruction.

- Skills should be learned one at a time and each new skill learned should build on previously acquired skills
- The analysis phase must identify and describe the prerequisite lower level skills and knowledge required for an instructional objective
- Lower level objectives must be mastered before higher level ones
- Objectives must be stipulated in concrete behavioral terms
- Positive reinforcement should be used in a repetitive manner

Gagne's (1965) work has made significant contributions to the scientific knowledge base in the field of instructional technology particularly in the area of instructional design. He outlined several steps that should be used to plan and design instruction; these include:

- Identify the types of learning outcomes
- Each outcome may have prerequisite knowledge or skills that must be identified
- Identify the internal conditions or processes the learner must have to achieve the outcomes
- Identify the external conditions or instruction needed to achieve the outcomes
- Specify the learning context
- Record the characteristics of the learners
- Select the media for instruction
- Plan to motivate the learners
- The instruction is tested with learners in the form of formative evaluation
- After the instruction has been used, summative evaluation is used to judge the effectiveness of the instruction

Learning Concept: Transfer of Learning

Essence of *Concept:*
Transfer of learning can be defined as the effective application by students of the knowledge and skills gained as a result of attending an educational program. This transferring of learning occurs when learning in one context or with one set of materials impacts on performance in another context or with other related materials. Transfer of learning occurs whenever prior learned knowledge and skills affect the way in which new knowledge and skills are learned and performed (Cormier & Hagman, 1987).

The transfer of learning (transfer of training) is a key concept in adult theories of learning, because most education and training instruction aspires to transfer this knowledge to "real world" situations. The context of learning usually differs somewhat from the actual context of application; thus the end goals of education and training are not achieved unless this transfer takes place. (Cormier & Hagman, 1987).

Work by Perkins and Salomon (1996) in the area of transfer theory suggest that transfer is a multi-faceted phenomena of at least two distinct mechanisms- the low road and the high road. Low road transfer occurs when conditions in the transfer context are similar to those in a previous context of learning to trigger well developed semi-automatic responses. This type of transfer would occur, say for example, in a person who rents a truck to move their household belongings. They find that the familiar steering wheel, shift and other features evoke useful cardriving responses. Driving the truck is an almost automatic response even though it is a different task, which varies in only several minor ways.

High road transfer depends on abstraction from the context of learning as a deliberate search for connections, such as; What is needed?, What is the general pattern?, and What is known that might help? For example leadership strategies learned in a leadership class might be drawn upon to solve new problems that involve leadership issues.

Implications for Instructional Technology:

Designers of instructional material must keep in mind the barriers and enhancers that effect the transfer of learning when developing different methods of instruction. Barriers are seen as factors that inhibit the transfer of learning in the workplace. Barriers include factors such as:

- No time to incorporate what they have learned into job tasks - Participant
- Program lacks application to the job - Program Design
- Students can't use the information - Program Content
- Offers a non-supportive climate for learning - Organizational

Enhancers on the other hand support the transfer of learning. Enhancers include factors such as:

- A willingness to take the time to apply that learning - Participant
- Includes application exercises as a major part of the instructional activities - Program Design
- Builds on previous knowledge and experience of participants - Program Content
- Offers support from key personnel along with tangible rewards - Organizational

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Relationship of Learning Theory to Instructional Design

Theory: Conditions of Learning Theorist: Robert M. Gagne

Our instructional design problem involves developing a workshop that teaches our undergraduate nurses the proper techniques for initiation and maintenance of peripheral intravenous (IV) therapy. This is a clinical skill that requires the learner to use four of Gagne's (1985) five outcomes or objects of learning (human capabilities); verbal information, intellectual skills, cognitive strategies and motor skills.

Central to Gagne's theory on conditions of learning is that instruction must be designed specifically in the context of the learner's needs. Instruction should be designed to include a variety of instructional methods in order to meet the needs of different learners. In applying this to my evolving instructional design I've centered it around Gagne's (1985) nine instructional events.

Instructional Event	Training Activity
1. Gaining attention	Distribute course outline and training agenda
2. Informing learner of the objective(s)	Discussion of student centered learning objectives
3. Stimulating recall of prerequisite learning	Have students complete pre-test available at the on-line site, prior workshop
4. Presenting the stimulus material	Have students review on-line Web tutorial prior to skills workshop
5. Providing learning guidance	Text, audio, and images will be incorporated into the on-line tutorial and

	the hands-on workshop to enhance the encoding of material
6. Eliciting the performance	Students will attend an eight hour hands-on workshop to practice skills
7. Providing feedback about performance	Students to practice skills with partner and teacher as mentor and facilitator
8. Assessing performance	Teacher to assess skills in hands-on competency sessions
9. Enhancing retention and transfer	Apply transfer of learning strategies as discussed below

Transfer of Learning

Transfer of learning is a key learning concept in my instructional design, and is essential if the student is to achieve the learning objectives. Hospitals (organizations) assume that our graduating nursing students are competent in the initiation and maintenance of peripheral intravenous (IV) therapy. This is why it is very important to ensure that transfer of learning takes place in training sessions.

Transfer of Learning can be incorporated into my instructional design using several different learning strategies, such as:

- Designing instruction that addresses different learner characteristics - This will involve the development of an on-line Web based tutorial prior to the lecture and skills workshop.
- Give individualized feedback - This will be provided in the hands-on skills workshop by teacher.
- Provide job performance aids - Development of pocket sized card which outlines the key points and steps covered in the workshop that students can carry on the job.
- Review training content - This can be accomplished by the use of Web based on-line tutorials that students can use to review key points and steps after completion of the training.
- Conduct periodic evaluations of students in the work setting - This will give instructional designers feedback on the effectiveness of the training context, and key points or steps that need to be included in subsequent training sessions.

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