TAMIL NADU TEACHERS EDUCATION UNIVERSITY
Chennai-600 097

Course Material for B.Ed. (First Year)
(2016-2017)

Course 7(a): Pedagogy of Computer Science (Part –I Methodology)

Prepared by

Unit I   **AIMS AND OBJECTIVES OF TEACHING COMPUTER SCIENCE**

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Unit II   **PLANNING FOR INSTRUCTION**
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Unit III   **PRACTISING THE TEACHING SKILLS IN COMPUTER SCIENCE**

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COURSE 7(A): PEDAGOGY OF COMPUTER SCIENCE

(Part- I Methodology)

UNIT-I   AIMS AND OBJECTIVES OF TEACHING COMPUTER SCIENCE

Course Objectives

At the end of the course, the pre-service teachers will be able to:

1.   understand the aims and objectives of teaching computer science.

2.   analyze the need and significance of teaching Computer science.

3.   gain the values of teaching Computer science.

Introduction

Computer technology is used in almost every sector of everyday life, including business, laboratories, educational institutions, research etc. In the current world it is almost impossible to imagine that someone can live without computers. Today, everything related to your everyday life can be done using computers. As the 21st century looms ahead, it is clear to see that it has advancements that humanity may never have dreamed of and one of these shinning developments is the well-recognized "Computer"

Meaning

In the beginning computer was able to perform only mathematical calculation but now it can do variety of tasks. So we can say that computer is an electronic device, which works under a set of instructions automatically accepts the supplied data, process and analyses the data and produces the information.

Computer science deals with the theoretical foundations of information and computation, together with practical techniques for the implementation and application of these foundations.

Computer science is the study of the theory, experimentation, and engineering that form the basis for the design and use of computers. It is the scientific and practical approach to computation and its applications and the systematic study of the feasibility, structure, expression, and mechanization of the methodical procedures that underlie the acquisition, representation, processing, storage, communication of, and access to information.

Nature and Scope

Change is said to be the law of nature that is brought into practices through the services of science. As science remains constantly busy in bringing changes in its body of knowledge, ways of investigation and the fruits of its investigation. As a result, the nature and scope of computer science always remains in the state of flux. Therefore, it becomes imperative to have up to data knowledge about the evolving concept of the nature and scope of the computer sciences.

- What are major thrust areas at present in computer sciences?

- In what way, modern communities have been influenced by the ongoing development and progress in computer sciences?

- How the development in computer science has helped in globalization?

- What have been the various path tracking discoveries and landmark development in computer science?

- Who have been the men (scientists) behind the scientific progress both from India and abroad?

- What types of avenues and professions are said to be available through one or the other specialization in computer sciences?

Let us try to think over these issues for being acquainted with the nature of scope of computer sciences in modern context.

A. Trust Areas in computer sciences

Some of the major thrust areas in computer sciences at the present juncture may be named as below:

1. Alternate sources of Energy.
2. Water sources management.
3. Super conductivity, super fluidity and low temperature phenomena.
4. Plasma Physical and plasma diagnostic teaching.
5. Holography and optical information processing.
6. Applied optics.
7. Fusion reactors.
8. Thermo nuclear energy production.

9. The fiber optics communication technology.

10. Laser engineering.

11. Material science – development of non-load bearing and load bearing material.

12. Optical and IR Astronomy.

13. Middle Atmosphere Studies.

B. Impact of computer sciences on modern communities

Development and progress in the field of computer sciences has influenced the life and livings of the modern communities and society in so many ways like below:

1. Construction of Buildings and Residential Colonies

On account of the availability of a variety of load bearable and non-load bearable material through the development in computer sciences, the modern communities look modern in terms of the construction of their buildings in the form of business centers, offices and residential colonies.

2. Transportation and communication systems

Development in computer science has been able to provide the latest available transportation and communication systems to the modern communities. The distances are no more a barrier for the people living at the farthest distances of the globe.

3. Modernization of the systems of food production and its availability to the people

The development in the computer sciences have modernized the sources of availability of food stuff in the shape of modernization of the method of framing, poultry farming, cattle, fisheries, bee keeping etc. it has resulted in multiplying the production of the food stuff as well as reducing the complexities or manual labour. The food stuff cannot be better preserved through the modern technique available as a result of invention and discoveries in computer sciences.

4. Water sources management and its purification

Development in computer sciences is helping the modern communities to take care of their water resources. It has provided artificial irrigation means as well as availability of drinking water with the construction of big water reservoirs, dams and sophisticated distribution system. It has provided big plants and simple household gadgets for the arability   of pure drinking water to the

modern communities. It has also provided means to have artificial rains and cultivation of water for providing additional sources of water to the modern communities.

5. Modern means for the entertainment and leisure time hobbies

Development in computer science has provided modern and methods for the entertainment and uplifting of leisure to the modern communities. Radio, Television video, Films and computer services have taken a total command of providing entertainment and leisure time hobbies to the modern communities.

6. Health care and treatment of diseases

Development in computer sciences has helped much in taking care of the health including treatment of illness and diseases of the members of the modern communities. It has provided better knowledge and information for the prevention and care of the diseases as well maintenance of good physical and mental health through its wider network of information technology. With the vast discoveries and invention in the field of health and medical sciences as well as tremendous progress in chemical sciences. Modern communities can avail the latest treatment of the diseases and look after their health.

7. Development of inter-relationship and dependence

Development of computer sciences is responsible for making the modern communities too much inter-related and inter-dependent. It has given birth to the phenomenon of globalization in every aspect physical, mental, emotional, social and cultural of the behaviour person belonging to the modern communities of this globe.

With all what has been said above, we should not conclude the developments in computer sciences are always bound to cast positive and desirable impact wellbeing and progress of the modern communities. If handle improperly and utilized destructively these can yield bitter and horrifying results. Such negative impact of the development computer sciences on modern communities may be summarized as below:

- Too much urbanization of the communities.
- Causing heavy pollution of every sort like air pollution, water pollution, noise pollution, cultural pollution etc.
- Inequitable distribution of wealth and other material comforts in the population.

- Abolishment of the concept and existence of the harming of health and welfare of the people.

- Development of the weapons of destruction and their unmindful application.

- Side effects of the fertilizer, chemicals, pesticides insecticides used in growing foodstuff and killing harmful bio-stuff.

- Neglect of moral values and social responsibilities at the cost of material development and individualism.

C. Globalization and computer sciences:

The term globalization derived from the words 'globe' and 'signifies' the removal of barriers of distance or of other nature for bringing people of the world together in terms of their relationships of event. For the understanding of its meaning let us think over on a few definitions given below:

1. The sociologist, Anthony Giddens, defines globalization as a decoupling of space and time, emphasizing that with instantaneous communications, knowledge and culture can be shared around the world simultaneously.

2. The Dutch academician Rudd Lubbess defines it as process in which geographical distance become of diminishing importance in the establishment and maintenance of cross economic, political and socio-cultural relations.

- **Aims and Objectives of Teaching Computer Science in Schools**

Technology has struggled to find its way into the classroom in all sorts of ways, from projectors and Television to Computer labs and student laptops. Along with improving the way of the students are taught, it is also vitally important that students learn to use computers have become as common as the pencil and paper.Students who use computers have been shown to attend the school more steadily and perform better than students who do not use computers. Computer usage makes students to become more focused on their work on their work at home, in collaborative projects with other students and on their own. The following are some chief aims and objectives of teaching Computer Science

> ➢ Arousing and maintaining interest
> ➢ Developing the ability to reach generalizations and to apply them for solving everyday problems.
> ➢ Developing interest in hobbies related to computer's their generations and so on.
> ➢ To develop scientific attitude.

➢ To familiarize the student with the world in which he is living and to make them understand the impact of computer science on society, so as to enable them to adjust them self to the environment.

• **Need and significance of teaching Computer Science**

The need to use computer and learn computer science in everyday life and in workplace has become very vital and important.

Computer science for the scientific and technology purposes: The Digital age needs Computer Scientists. Modernizing Education has benefited from the inclusion of technology and computers by making it easier for Computer science is driving development from the sciences to expressions of the human experience. A gander at any significant news source uncovers the impact of Computer Science and innovation on the worldwide economy. Barely characterized, Computer science depends on a center arrangement of critical thinking ideas; it has been characterized as "the investigation of PCs and algorithmic procedures, including their standards, their equipment and programming outlines, their applications, and their effect on society" (Association of Computing Machinery, 2003). Be that as it may, it doesn't stop there. Computer science is a lens and passages into abilities in basic and intelligent believing that apply over all orders, including composing and the humanities (Carey, 2010).

The contentions for Computer Science training fall into two primary classes: Learning key apparatuses for the web age, and figuring out how to comprehend the world by comprehension media.

Today, in the period of web 2.0, we are very prone to consider online networking, messaging, and email as regular media you utilize as often as possible.

Today PCs assume a crucial part in industry, business, government, research, training, prescription, correspondence frameworks, excitement and numerous different zones of our public. Experts who add to the configuration, improvement, investigation, detail, confirmation, support and assessment of the various uses of PC frameworks significantly affect society, making along these lines valuable commitments to society, additionally, conceivably, some less positive.

To guarantee that their endeavors will be utilized for the general great, registering experts must submit themselves to making processing an advantageous and regarded calling, elevating a moral way to deal with their expert practice.

Today from cell phone alarm that wakes them to the tablets used to chat with friends and complete homework, today's students are surrounded by computer technology.

- ➢ Professional Development
- ➢ Career Education
- ➢ Student Incentives
- ➢ Mentor Programs
- ➢ Coding for Kids

Therefore, Computer is inseparable from the future of Our society.

Values of Teaching Computer Science

The real values of Teaching Computer Science in our modern world can be quite obvious from chief values which are described below.

Practical values

Utilization of the various facts drawn from the study of computer science in modern life has revolutionized our life. Today we cannot find even a single thing which is left untouched by the hands of computer. Uses of computers in transportation and communication have shortened the world.

Social values

Computers have achieved the best place in the society as well. They form the foundations of so many professions like medicines, Engineers,etc. Computers are highly helpful to the society. Lots and lots of social changes have taken place after the introduction of computers. The study of computers science develops in us honesty, truthfulness and critical reasoning, objective thinking and belief in basic facts.

Disciplinary value

The learning of computer science involves some scientific discipline and scientific attitudes which are transferable to our later life also. It involves self-expression, creativeness, open mindedness, critical thinking and observation suspended judgement which are free from superstitious and false beliefs etc. The good habits if they are once developed in a child can prove beneficial for their later life.

Cultural value

The role of computers in the development of modern civilization can be obvious just by our comparison with our ancestors. Our present culture and advancement in our standard of living gives a clear-cut picture of our cultural development and role of computers in this field for removing old traditional beliefs and superstitions. Computers have proved itself as in best helper in overhauling the consciousness of the universe.

So at the end, from the above mentioned values of computer science, we come to this conclusion that computer science has achieved a most important place in our place in our daily life as well as in the modern establishment of the whole world**.**

Conclusion

The computer is widely used in the field of education and computer science has developed which is very popular these days. At every stage computer is compulsory. The distance education is using computer for instructional purpose as multimedia approach. The computer makes teacher learning process effective by involving audio and visual sense of learners. So, this unit tells about the nature and scope of Computer Science, the need and significance of teaching Computer science. At last the values of teaching computer Science**.**

Questions for Discussions and Reflection

1. Explain the nature and scope of teaching computer science.
2. Explain the Objectives of teaching computer science.
3. List the values of teaching computer science.

UNIT II: PLANNING FOR INSTRUCTION

Course Objectives

At the end of the course, the pre-service teachers will be able to:

1. understand the steps in planning a lesson plan.
2. formulate the educational objectives of Bloom's taxonomy.
3. analyze the structure of a lesson plan
4. gain the mastery of constructing test-item for formative evaluation.

Introduction

Every work requires a plan of action for its perfect completion. In the same way teaching process also requires a systematic plan. A lesson plan represents a single teaching unit for a class period. The teacher should know the objectives of teaching. Designing test is very important part of assessing students understanding of course content and their level of competency in applying what they are learning.

Steps in planning a lesson

Herbartian steps in Lesson Planning

Six formula involved in developing a lesson plan have been suggested by Herbart, J.F and thus, named after him as Herbartian steps in planning and are given below.

1. Introduction / Motivation
2. Presentation
3. Comparison or Association
4. Generalization
5. Application and
6. Recapitulation

Introduction/Motivation

This step is considered to the preparatory step, where in you are trying to prepare the minds of the students ready to receive the subject matter. One of the laws of learning given by Edward Lee Thorndike, the "law of readiness" emphasizes the need for the mental readiness. Unless the minds of the students are ready, learning will not take place. Hence this step, otherwise, identifies the mental readiness of the students. In general, with the help of this

step, the teacher can check the students' entering behavior before he starts teaching the lesson. Thus, testing students' previous knowledge (entering behavior), developing interest in the minds of students and maintaining curiosity of the student can be achieved with the help of this step.

Presentation

It is the key step and only through which the actual process of teaching is going to take place. Here the aims of the lesson should be stated clearly and the heading should be written on the blackboard. We have to provide situation for both the teacher and the students to participate in the process of teaching and learning. Our ultimate aim of the presentation is to make the concepts understandable to the students. Therefore use of simple language is recommended. Appropriate and specific example and illustrations of the concepts will make the understanding better. The interest of the students on the subject matter should be maintained continuously by the way of asking questions from time to time in this stage. For quick learning, more learning and for longer retention of the subject matter, use of instructional software in an appropriate manner is strongly recommended during presentation.

Comparison or Association

Due importance should be given in this stage to compare the facts observed by the students with another concept by way of giving examples. By making use of this comparison, the students can derive definitions or theories. The students are encouraged to give new suitable examples for the concepts instead of the examples given in the book to make them think in an innovative manner.

Generalization

While explaining the concepts in science, as far possible the teacher should try to get the answer from the students, which makes them understand the concept and through which generalizations are possible. Restating the concepts in a simpler from will be useful for the students to understand the concept very easily.

Application

In this stage, the teacher makes the students to use the understood knowledge in an unfamiliar situation. Unless the knowledge of science is applied in new situations or in our day-to-day life, the study of science will become meaningless. This application of scientific principles will strengthen learning and will make the learning permanent.

Recapitulation

This stage is meant for the teachers to know whether the students have grasped and understood the concepts taught or not. This can be achieved by reviewing a lesson or giving assignments to the students. Only through this step, achieving closure (in teaching) is possible.

Setting lesson goal

Goal are nothing but the destination or the target point. In other words , detailed explanation of aims is known as goals. Achieving goal is important and we will be trying to reach the same through an intermediate stage called "Aims".

It is important to know the purpose,

- **Designing a unit plan**

Unit Planning

A large segment of the subject matter with lessons possessing common features related to that area of study or with lessons under a common heading. For example optics is a unit in physics and under this unit, we have different topics life lens, mirrors, laws of reflection, refraction, Refractive index, etc. Therefore a unit consists of many lessons and a lesson consists of many topics. Also one should not think that a unit is a large block of subject matter alone. It is otherwise, consisting of both subject matter and method. According to Preston, a unit is as large a bock of related subject matter as can be over-viewed by the learner. Sam ford defines a unit is an outline of carefully selected subject matter which has been isolated because of its relationship to pupils needs and interests. According to bossing a unit consists of a comprehensive series of related and meaningful activities so as to achieve pupil's purpose provide significant educational experience, and results in appropriate behavioral changes.

In general a unit consists of well organized subject matter, appropriate learning experiences and method with enough provision for evaluation and follow up activities.

Important characteristics of a unit

- A unit must be flexible in such a way to cater to the needs of individual differences.

- A unit should contain subject matter and methods with respect to the students interest and abilities.

- The subject matter must be segmented and arranged according to the instructional objectives in a unit.

- It should contain the interrelated content.

- Proper evaluation and follow-up activities must find a place in a unit.

Factors of unit planning

A unit plan should contain the following factors.

➢ Content analysis

➢ Objectives & specifications

➢ Teaching learning activities

➢ Teaching learning resources

➢ Evaluation tools

Content Analysis

It refers to the actual subject matter segmented based on the objectives of teaching. Here the concepts with major importance should alone be written and not all the minute details, as the subject matter is voluminous. Then this content should be arranged in a sequential manner throughout the unit.

Objective and specifications

Objectives are the expired behavioral change of the students. The entire unit should have arrangement of the content based on the objectives. The objectives must be stated in terms of students behavioural outcomes and they are termed as specifications. Specifications are the behavioural verbs of the respective objectives.

Teaching and learning Activities

This factor suggests appropriate methods for appropriate content. For example preparation of hydrogen may be taught by using demonstration method than mere lecture method alone. On some occasions, the discussion method with help of small groups formed within the class may be used by the teacher as a suitable method. A lot of varieties of activities to student must be provided.

Teaching and learning Resources

A proper scheme of the available material for practical activities must be planned in order to ensure their availability at the time they are needed. Similarly, the required reference books useful for teaching and also for learning must be identified and a list needs to be prepared.

Evaluation Tools

Proper evaluation technique must be included throughout the study of the unit as a continuous process. Quiz assignments, unit tests and so on may be used as evaluation tools in the unit evaluation should be based on the objectives of the unit

Preparation of unit plan

A unit plan may be designed in the following steps:

A. Steps for the entire unit (Entire unit consists of several sub-units)

- Subject: here one should mention the subject as physics , chemistry, biology or science.
- Name of the unit: it should be the heading of the unit chosen
- Class: to whom the unit is going to be taught.
- Time: total number of class hours or periods
- Instructional software: it is the list of teaching aids going to be used throughout the unit
- Contend: it is the segmented subject matter of the syllabus to be covered
- Sub-units: it indicates the number of lessons and their names
- Objectives: these have to be achieved after completing the unit

B. Steps for each sub-unit

- Sub-unit no. and name: it should contain the exact number of the sub-unit and its name.
- Time: it indicates number of class period or hours
- Teacher's Activities
- Students Activities
- Joint Activities (teacher and student)

- Assignment

- Follow-up Activities

- Evaluation

- References

  With the help of the steps mentioned above, one can prepare a unit plan for any subject in an easier manner.

User/Advantages of unit planning

- It makes the students work better, as the whole unit consists of small sub-units of content.

- It is very useful for the teachers to identify the general objectives and specifications, as they are clearly stated and differentiated in a unit.

- It gives an overall view of the subject matter well in advance and thus makes the teaching process systematic and smooth

- It require efficient, hard working and trained teachers

- If the sub-units are not properly arranged, the students may get confused.

- If the format is not followed systematically while preparing a unit plan, then it will be not useful in preparing a lesson plan

- Thus a unit plan is very useful for both teaching and learning process and has lot of advantages for teacher and students and if it is designed as per the format in a systematic way, then it will certainly bridge the gap, if any, between the teacher and the learner.

- **Bloom's Taxonomy of educational objectives**

Benjamin s. bloom and his associates have classified educational objectives into the following three broad categories or domains.

- Cognitive Domain (Thinking/Intellectual Operations)

- Affective Domain (Feelings, Attitudes and Values)

- Psychomotor Domain (Doing or Performing)

- Here is a comparison of the original and revised taxonomies:
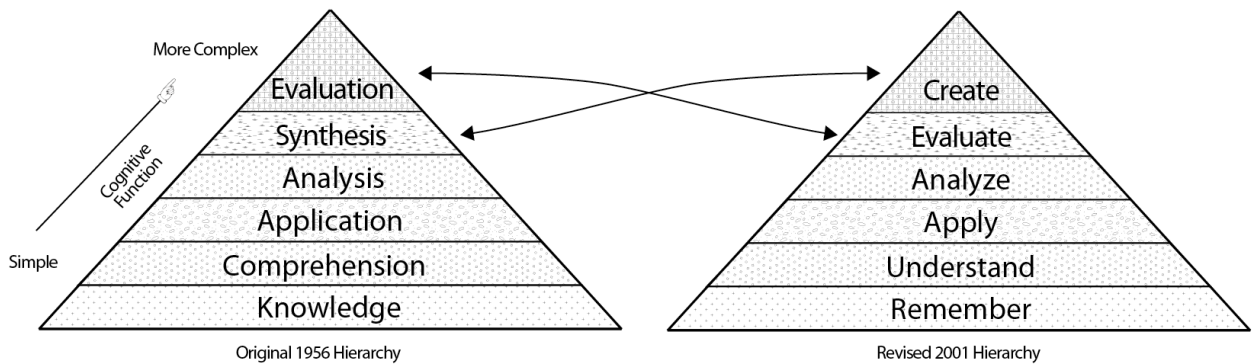
Each of the three domains mentioned above can further be split up into categories which are also in a hierarchical order.

Cognitive Domain (B.S.Bloom,1956)

❖ Knowledge

- Remembering previously learned material
- Knowledge of specifics
- Knowledge of ways and means of dealing with specifics and
- Knowledge of the universals and abstractions in a field.

❖ Comprehension

- Grasping the meaning of material
- Translation (Converting from one from to another)
- Interpretation (explaining of summarizing materials) and
- Extrapolation (extending the meaning beyond data)

❖ Application

- This refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws and theories.

❖ Analysis

- Analysis of elements (identifying the parts)
- Analysis of relationships, (identifying the relationship) and
- Analysis of organizational principles (identifying he way the parts are organized)

❖ Synthesis
  • (Putting parts together into a whole). Production of a unique communication or a plan.
❖ Evaluation
  • Judging the value of a thing for a given purpose using define criteria.

The six categories listed above are arranged in order of increasing complexity. They begin with the relatively simple recall of factual information, go to the lowest level of understanding (comprehension) and then proceed through the increasingly complex levels of application, analysis, synthesis and evaluation. This scheme for classifying student behavior is, hierarchical in nature i.e. the more complex behaviors include the simple behavior in the lower categories.

Affective Domain

The affective domain concerns the attitudinal, emotional and valuing responses desired of the student. These are called interests; attitudes, appreciation and the like, while most teaches write instructional objectives in the cognitive and psychomotor domains, affective adjectives are seldom written out and included in instructional plans. Writing down affective objectives may increase the likelihood of their being achieved. Positive technique for teaching affective adjective involves differential reinforcements, modeling behavior and behavior modification techniques.

This domain includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. The five major categories listed in order are;

Receiving phenomena: Awareness, willingness to hear, selected attention.	Examples: Listen to others with respect. Listen for and remember the name of newly introduced people. Keywords: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.
Responding to phenomena: Active participation on the part of the learners.	Examples: participates in class discussions. Gives a presentation. Questions new ideals,

Attends and reacts to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation)	concepts, models, etc. in order to fully understand them. Know the safety rules and practices them.
	Keywords: answer, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects , tells, writes.
Valuing: the worth or value a person attaches to a particular object, phenomenon, or behavior. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable.	Example: Demonstrates belief in the democratic process. Is sensitive towards individual and cultural differences (value diversity) shows the ability to solve problems. Proposes a plan to social improvement and follows through with commitment. Informs management on matters that one feels strongly about. Keywords: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.
Organization: Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system. The emphasis is on comparing, relating, and synthesizing values.	Example: Recognizes the need for balance between freedom and responsible behavior. Accepts responsibility for one's behavior. Explains the role of systematic planning in solving problems. Accepts professional ethical standards. Creates a life pla in harmony with abilities, interests, and beliefs. Prioritizes time effectively to meet the needs of the organization, family and self. Keywords: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies,

	integrates, modifies, orders, organizes, prepares, relates, synthesizes.
Internalizing values (characterization): has a value system that controls their behavior. The behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner. Instructional objectives are concerned With the student's general patterns of adjustment (personal, social, emotional)	Example: shows self-reliance when working independently. Cooperates in group activities (displays teamwork) Uses an objective approach in problem solving. Displays a professional commitment to ethical practice on a daily basis. Revises judgments and changes behavior in light of new evidence. Values people for what they are, not how they look. Keywords: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, services, solves, verifies.

Psychomotor domain

It comprises of physical or motor or manipulative skills which are involved in the performance of a task.

Example:

❖ Drawing a sketch

❖ Operating a machinery

❖ Constructing an object/model

❖ Using a tool

It has the following seven major categories given by Simpson (1972)

| Perception: the ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation. | Examples: detects nonverbal communication cures. Estimate where a ball will land after it is thrown and then moving to the correct location to catch the ball. Adjusts heat of stove to correct temperature by smell and taste of food. Adjusts the height of the forks on a forklift by comparing where the forks |

	are in relation to the pallet.
	Keywords: choose, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects.
Set: readiness to act it includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (some-times called mindsets)	Examples: know and acts upon a sequence of steps in a manufacturing process. Recognize one's abilities and limitations. Show desire to learn a new process (motivation) Note: this subdivision of psychomotor is closely related with the responding to phenomena subdivision of the affective domain Keywords: begin, displays, explains, moves, proceeds, react, shows, states, volunteers.
Guided response: the early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing	Examples: performs a mathematical equation as demonstrated. Follows instructions to build a model. Responds hand-signals of instructor while learning to operate a forklift. Keywords: copies, traces, follows, react, reproduce, responds.
Mechanism: this is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.	Example: Use a personal computer. Repair a leaking faucet. Drive a car. Keywords: assembles, calibrates, constructs, dismantles, displays, fattens, fixes, grinds, heats, manipulates, measures, mends, mixes, and organizes, sketches.
Complex overt Response: the skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes	Examples: Maneuvers a car into a tight parallel parking spot. Operates a computer quickly and accurately. Displays competence while playing the piano. Keywords: assembles, builds, calibrates, constructs, dismantles, displays, fastens,

performing without hesitation, and automatic performance. For example players are often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce	fixes, grinds, heats, manipulates, measures, mends, mixes, and organizes, sketches. Note: the key words are the same as mechanism, but will have adverbs or adjectives that indicate that the performance is quicker, better, more accurate, etc.
Adaptation: skills are well developed and the individual can modify movement patterns to fit special requirements.	Examples: Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Perform a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task) Keywords: adapts, alters changes, rearranges, reorganizes, revises, and varies.
Origination: creating new movement pattern to fit a particular situation to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	Example: constructs a new theory. Develops a new and comprehensive training programming. Creates a new gymnastic routine. Keywords: arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates

Structure of a four-fold lesson plan

Name of the pre-service teacher   :   **subject :**   **Date :**

Class /Section and Section   :   **Unit   :**

Name of the school   :   **Topic   :**

Instructional Objectives: The student

1. **acquires knowledge of ……………..**
2. **understands………………………….**
3. **applies the scientific knowledge……**
4. **develops skills……………………….**
5. **develops interest…………………….**
6. **develops attitude……………………**
7. **appreciates………………………….. **

Instructional Resources Required

Required   : Chart, Model, Rotating disk.

Previous Knowledge of Learners:

Content/Concept	Specification of Behavioural Objectives	Learning Experiences (Teacher/Learner activities)	Evaluation

Follow up Activities (if any):

Signature of the Guide   **Signature of the pre-service-Teacher**

LESSON PLAN MODEL

Name of the Student- teacher:

Name of the School :

Class/Section :

Subject : Computer Science

Unit :

Topic :

Number of Students :

Instructional Objectives : The Students

- ❖ recall the types of users.
- ❖ define about list command.
- ❖ discuss18 commands and options in linux.
- ❖ list the types of path names.
- ❖ explain cd directory and pwd command.
- ❖ explain the concept of cd command and pwd command with example.

Instructional resources required:

- ❖ Chart, flashcard

Previous Knowledge of learners

The Teacher asks questions to the students to test previous knowledge.

Mention the types of users. What is the role of file owner?

Content/Concept	Specifications of Behavioural objectives	Learning Experiences (Teacher/learner activities)	Evaluation
ls Command	define	The teacher explains, what list command (ls) is. The students understand the purpose of ls command and take notes.	Define ls command. Write an example for ls command.

Command, and argument in ls command:	discuss	The teacher explains the command and various options in ls command.	What is the ls command?
		The teacher asks the students to write an example for command and argument in ls command.	What is argument in ls command?
		The students discuss among themselves and write the ls command and argument in ls command in their note book.	
Path and types	List	The teacher explains path name, and the types of path name, with a chart. The teacher asks the students to write absolute and relative path with two examples.	Listthe path name. Define Absolute path.
		The students immediately write about absolute and relative path with examples in their note books.	
cd directory pwdcommand:	explain	The teacher explains the cd directory and pwd command. The teacher asks the students to form small groups and write examples for pwd command.	Explain the use of cd directory. Expand pwd.

		The students form small groups and write examples for pwd command.	
Concept of cd command and pwd command.	explain	The teacher explains the concept of cd and pwd command. Teacher asks questions and clarifies the doubts of students. The teacher divided the students to small groups and asked them to write cd and pwd command concept with examples. The students write example for cd and pwd command.	Explain cd command. Why we use cd command?

Follow up activities:

1. Write an example for ls command?

2. What is cd directory?

3. Explain concept of cd command.

Signature of the Guide   **Signature of the Student-teacher**

(This model Lesson plan is an example for 20 minutes and this can be continued &written for 45 minutes.)

Types of test-items

Tests

There are several types of tests available. A few important types are listed below.

- Teacher-made tests
- Standardized tests
- Diagnostic tests and so on.

Teacher-made tests

These types of tests are prepared by the teacher for their classroom purposes, through which the conclusions suitable for that classroom alone may be drawn. General conclusions cannot be derived. For example, a teacher can prepare an achievement test to measure students achievement in the respective subjects.

Standardized Tests

Standardized tests are tests which have been carefully constructed by experts after try analysis and revision. They have explicit instructions for standard administration and tables of norms for score interpretation derived from administration of the test to a defined sample of students. Objective type questions are best suited for standardization. They are used for research purpose, as we can derive general conclusions based on these test results.

Diagnostic tests

Diagnostic tests are those tests used by the teacher to identify the students difficulties in the respective subject based on symptoms, Diagnostic tests help us to locate the areas of strength and areas of weakness of the pupils. If the students do not commit any mistakes in certain concepts then we can say that they are strong in that area. Similarly if they go wrong always or occasionally we can take a clue-they are not thorough in a select the unit for which the difficulties had to be located. Diagnostic test could be administered for the unit which the teacher handles also. For this, the teacher has to identify the areas where the pupils can have doubts. Then objective type questions alone should be asked in the diagnostic test; thereby we can identify the students difficulties. The main difference between the diagnostic test and the achievement test are given below.

❖ In an achievement test , marks are going to be given for the answers for the questions and diagnostic tests, correct answers are denoted with a tick mark and no marks are going to be awarded.

❖ Another difference is that in the achievement test, questions are not repeatedly asked for the same concepts whereas in the diagnostic test for each difficult concept fouror five questions are going to be asked, as the very purpose of the diagnostic test is to find out whether the pupils are strong in the concept or not and also we are not measuring their achievement.

Questionnaires

A questionnaire is a form prepared and distributed to secure responses to certain questions. It is a systematic compilation of questions that are submitted to a sampling of population from which information is desired. It is an important tool in normative survey research, used to gather information form widely scattered sources. Normally this can be used when one cannot readily see personally all of the people from who he needs responses or where there is no particular reason to monitor them personally. It has the following forms:

- Structured from
- Non-Structured from
- Closed form
- Open form

Structured form

It contains define, concrete and directed questions and the subject is going to give the responses directly with respect to the questions.

Non-structured form

It consists of partially completed questions or statements. it is often used as the interview guide, which is non-directive in nature.

Closed form

The questions that call for short check responses are known as restricted or closed from type. It restricts the choice of response for the respondent. One has to simply select a response out of supplied responses and has not to frame his response in his own way.

Open form

In this form, the person who responds to the questionnaire is given enough freedom. He can express his idea without any restriction and can frame his response in his own way.

Rating Scale

Many of the variables with which research is concerned cannot be measured directly and the degree of their existence has to be estimated on the basis of subjective judgment. At this stage the tool used to measure the degree of existence of variables is known as a rating scale. It will give the rate of our responses. For example you may agree with a statement and sometime you may strongly agree with a statement. This type of he difference in the response can be shown with the help of rating scales. Attitudes can be found with the help of rating scales.

Checklists

It is similar to that of the laundry list. It consists of a list of items with a place to check. Or to mark yes or no. the chief aim of the checklist is to call attention to overlooked. It an important tool used to gather facts in educational surveys. For example, to find out the availability of the equipments in a laboratory, a checklist can be used and thereby one can verify the equipments available in a laboratory.

Schedules

They are also of great use in gathering information through surveys. It is nothing but a list of questions to which responses are obtained from the respondent by the investigator in a face-to-face contact. I is also applied to a set of questions which are asked by the interview from the interview. A schedule is different from a questionnaire in that it is administered personally to respondent or a group of respondents while the questionnaire is usually sent by mail expecting return of response by mail.

Constructing test-items for formative evaluation in class

Evaluating instruments or tools depend mainly on the purpose for which the evaluation is going to be carried out. For example, if you want to evaluate a particular model of car, you can go for a test drive and thus the performance of the vehicle will be analyzed. Here test drive of the vehicle is considered to be best evaluating tools. In the same way, one can make use of several evaluating tools

with respect to the purpose of evaluation. But in the teaching and learning process, the commonly used evaluating tools are testing and questioning. The teacher may administer several tests or may ask questions and thereby evaluate the students learning.

Principles of test construction and Administration of an Achievement Test

One the important duties of a teacher is to observe the student in the classroom, laboratory and in other settings. He may also make use of test in his classroom. Some of the objectives of his teaching can be measured efficiently, realistically and completely by tests given in the classroom; some may be measured partially by such tests, and some may not be measured at all in this way. Anyhow tests have their own place in the educational setting. The main purpose of examination and assessment is to find out how far the efforts made in teaching and learning have become successful in achieving the objectives.

There, the third stage of evaluation approach is to develop test material in relation to the objectives of teaching. The material when administered to pupils, should provide trust-worthy evidences as to whether the new method of test construction seeks to link the particular objective or its specification with the topic so that item is valid and through-provoking. Here again, the specific behavioral change that are expected as learning outcomes under each objective are of great importance in establishing a close relationship between the test-item and the objective. They also direct our own thinking and facilitate the task of constructing good items. Achievement test is directly related to student's growth and development in education situations. This is used to find out how much has been learnt by the students. Achievement tests measure the quality and quantity of learning attained in a subject. Achievement tests can be classified as (i) Teacher-made test and (ii) standardized tests. Teacher-made achievement test can be used by the teachers for particular classroom purpose and standardized tests can be used to drive general conclusions and may be used for research purposes.

Construction of an Achievement Test

A good achievement test requires much careful planning. A mere collection of questions whatever their number and individual quality, does not make a full test. The main considerations to be borne in mind while planning a test are:

❖ The coverage of behavior implied by predetermined objectives;
❖ The coverage of syllabus;

❖ The grouping and arrangement of items of various forms;

❖ The number of items to be include in the test;

❖ The range of item difficulty.

Steps involved in the Construction of an Achievement Test

The following steps are involved in preparing an Achievement test. They are:

- Preparation of weightage tables in terms of content, objectives and forms questions.
- Preparation of a Blueprint by using the weightage tables.
- Preparation of a questionnaire (test paper) and soon.

Preparation of weightage tables/charts

Weightage (marks) tables in terms of content, objectives and forms of questions can be prepared in the following way.

Weightages in term content

Content	Marks	%
Total		

Weightages in terms objectives

Objectives	Marks	%
Knowledge		
Understanding		
Application		
Skills		
Total		

Weightages in terms forms of questions

Forms of Questions	Marks	*%*
Objective		
Short answer type		
Essay type		
Total		

Preparation of a Blueprint

A blueprint is nothing but a three dimensional scheme for test. It is the basic (layout) for the construction of an achievement test. A three dimensional blueprint chart is given below:

BLUEPRINT

Subject: Computer Science   Date:

Standard: Duration:

Maximum Marks:

Objectives	Knowledge			Understanding			Application			Skill			Total
Forms of Questions	O	SA	E	O	SA	E	O	SA	E	O	SA	E	
Content													
Sub-total													
Total													

Note: O-Objective Type Question; SA-Short Answer Type Question; E-Essay Type Questions. The marks and number of questions may be represented inside and outside the brackets.

Conclusion

As we know planning is very important for any work. For teaching, too planning is very important for teaching lessons in the classroom. So, we have learnt the importance of designing a lesson plan. The teacher has the responsibility of planning and evaluating. So, this unit will help the pre-service teachers to plan a lesson, construct test and evaluate the students.

QUESTIONS FOR DISCUSSIONS AND REFLECTION

1.Explain the importance of lesson plan.

2.What is a unit plan? Explain.

3.Describe Bloom's Taxonomy of Educational objectives.

4.What are the characteristics of a good lesson plan.

UNIT III PRACTISING THE TEACHING SKILLS IN COMPUTER SCIENCE

Course Objectives

At the end of the course, the pre-service teachers will be able to:

1.understand the meaning of teaching.

2.analyze major teaching skills and steps in teaching mini – lesson.

3.gain the mastery preparing mini-lesson.

Introduction

Mini-teaching is a short lesson with narrow focus that provides instruction with skills, steps and concept that the pre-service teacher will relate to a larger lesson. It is the combination of teaching skills and teaching steps. The curriculum Framework by the NCTE for the B.Ed. two year programme insists that "teaching should not be practiced through the reductionist approach of micro-teaching of isolated 'skills' and stimulated lessons''. The practice of lesson plans must be meaningful and holistic event and not isolated and disintegrated one.

- **Meaning of teaching**

    Teaching of Computer Science means teaching Students how to use and understand the uses of technology, mainly (though not limited to) computers. And just to be clear, a computer is an electronic device we use to store and process data.

- **Understanding Major teaching skills**

    A teaching skill is a group of teaching acts/behaviours intended to facilitate student's learning directly/indirectly.

Introducing

The skill of introduction is one of the teaching skills mainly concerned with the sets of rules to be followed while introducing a lesson while teaching. It is otherwise known as "set induction" Many research findings revealed that if the introduction of a lesson is effective then the learning would be very effective. One can also motivate the students during the introduction stage of teaching and thereby attention towards the lesson would be maintained fully without any distraction. In this stage the teacher can identify the amount of entry behavior possessed by the students. Unless the students have the sufficient entry behavior, they will not learn the new ideas going to be taught in the class. The amount of terminal behavior going to be acquired by the students through teaching depends mainly on the amount of entry behavior. The terminal behavior of today will act as entry behaviour of tomorrow and hence the skill of introducing a lesson plays an important role in the teaching process. The following points must be borne in mind while introducing the lesson.

- ❖ Start the lesson with the related ideas or concepts
- ❖ A lesson may be introduced by the way of asking lower order questions related to the lesson to be taught
- ❖ You can start the lesson with an anecdote related to the lesson
- ❖ A lesson may be introduced through demonstration
- ❖ Even through dramatization a lesson may be introduced

Set induction is about preparation, usually for a formal lesson. When the students are set. They are ready to learn. Set induction is thus about getting them ready, inducting them into the right mindset. Sets are used before any new activity, from introduction of a new concept to giving homework. It is important in each set both to create clarity about what is expected happen (both what you will do and what they should do), and to create motivation for this to occur, with students being fully engaged in the learning.

Set induction can be done by such as:

- • Explaining potential benefits to the learner.
- • Giving clear instructions.
- • Describing what is going to happen.

The STEP acronym may be used to help remember what to do:

- • Start: welcome the students settle them down and gain attention.

- Transact: Understand their expectations and explain yours. Link with previous learning.

- Evaluate: Assess the gap between their expectations and current reality. Clarify any discrepancies for them.

- Progress: Move on to the main body of learning.

There are mainly four purpose of set induction.

- Focusing attention on what is to be learned by gaining the interest of students.

- Moving from old to new materials and linking of the two.

- Providing a structure for the lesson and setting expectations of what will happen.

- Giving meaning to a new concept or principle, such as giving examples.

So if you are teaching think about and prepare carefully for getting your students in the right state of mind to be ready to understand and to learn.

In other words, if your introduction of the lesson is effective, then the whole teaching process would be effective and useful to the students.

Explaining

It is the duty of the teacher to organize a number of learning experiences in the classroom keeping students in the mind. Explanation may be stated as "the use of interrelated statements about a concept, phenomenon and generalization with a view to provide its understanding to someone else". If the explainer keeps in mind the previous knowledge of the students, then the explanation would be understood by the students. The previous knowledge is otherwise known as "entry behavior" of the students.

There are mainly three types of explanation viz., descriptive, the interpretive and the reason giving; trying to give answer for the questions; 'what', 'How' and 'Why' respectively. A descriptive explanation tries to describe the structure or phenomenon or principle or a procedure and the interpretive type of explanation tries to explain the central meaning of the concept, generalization or the principle. On the other hand, reason giving explanation describes the reason for a phenomenon. Depending upon the situation, the teacher can make use of any one of the types of explanation or in combination. If the students understand your explanation, then it is considered to

be good. Therefore, it is a must to know all the behavioral patterns of the teacher which make an explanation effective and otherwise. Thus the skill of explaining involves increasing the occurrence of desirable behavioural patterns and avoiding the use of undesirable behaviours. So the components of the skill of explanation may be divided under two headings; viz., components of desirable behaviour and components of undesirable behaviour, and are given below.

Components of skill of Explaining

- **Desirable behaviours**
  - ❖ **Using appropriate beginning and concluding statements.**
  - ❖ **Using explaining links**
  - ❖ **Covering essential points**
- **Undesirable behaviours**
  - ❖ **Using irrelevant statements**
  - ❖ **Lacking fluency**
  - ❖ **Lacking continuity in statements**
  - ❖ **Using inappropriate vocabulary**

Using appropriate Beginning and Concluding Statements

It is nothing but the opening statement used by the teacher before trying to explain a concept or a principle. It gives an idea to the students about the concept to be explained and hence it makes the students ready to receive the explanation. In the same way after the explanation is over and if you want to conclude your explanation, a concluding statement may be used to help the students in structuring the ideas explained. Though the beginning and the concluding statements are very important from the view point of cognitive structuring they do not from a part of the act of explaining.

Questioning

Questioning in the classroom play a vital role in a teaching and learning process. The first step in classroom questioning refers to the structuring of questions. Sufficient practice in structuring questions at different levels may be done before entering the training using microteaching. Like any other type of statement, questions also follow structures which include format and such

characteristics as relevance, precision, clarity, grammatical correctness and the level of thinking it generate in the pupils. There are a few general guidelines for structuring classroom questions, which are given below.

- ❖ Avoid questions requiring yes or no answer
- ❖ Avoid the use leading question
- ❖ Avoid double barreled questions
- ❖ Avoid ambiguous questions

After consider the general guidelines, the skill of questioning can be practiced. It consists of the following components

- ▪ Relevance
- ▪ Precision
- ▪ Clarity
- ▪ Grammatical correctness
- ▪ Levels of questions

Relevance

It refers to the suitability of the questions to the specific instructional objectives of the lesson and the content being covered. In other words, the questions asked by the teacher should be pertinent to main themes of the lesson need to be avoided.

Precision

It refers to the length of the question with respect to the context of classroom question. If a question is too lengthy it may be fully get registered are always better than extra worded questions. Unduly long questions cause wastage of time, diversion of students, attention and reduce the questioning fluency. The length of the question should be appropriate to the purpose and the level of the questions.

Clarity

Clarity refers to the understandability of the language of the question. An effective question should not use terms that are beyond the understanding and experience of the students.

Grammatical correctness

If a question structured by a teacher is not grammatically correct, it creates confusion in the minds of the students. For such questions, students take more time to understand and to answer. Thus, fluency of questioning is reduced. Grammatically incorrect questions also fail to communicate their intention. Some of the source of this error observed in classroom are a) not using appropriate interrogatives at the beginning of the questions, b) use of inappropriate tense and c) use of double negatives in a single question.

Levels of questions

Different levels of questions stimulate corresponding level of thinking in students. The level is determined by the structure of the question. Students' response also provide clue to the thinking level which the question has generated in them. Therefore, questions can be structured at different levels which generate thinking at corresponding levels in students. There are three levels of classroom questions viz.

❖ Lower order questions

❖ Middle order questions

❖ Higher order question

Varying the Stimulus

The attention of the students on the lesson taught is very important for making teaching effective as learning in the classroom mainly depends on the attention of the students on the subject. Normally their attention tends to shift from one stimulus to another frequently and it is a challenging task to the teacher to keep the attention of the students intact and fully on the subject taught. It the teacher fails to do so, learning cannot take place.

To secure and to sustain students; attention, the element of variation may be introduced in teaching. The variation may be introduced in several ways depending upon the teaching activity. For example, variation in voice, variation in teacher's position, variation in gestures etc may be appropriately used in teaching activity to sustain students' attention. Keeping this idea in the mind, the skill stimulus variation has been developed. Stimulus variation is nothing but "the set of teacher behaviours that

tend to secure and sustain students' attention in teaching and learning process in the classroom". It consists of the following components.viz.,

- Movement
- Gesture
- Change in voice
- Focusing
- Change in interaction patter
- Pausing
- Pupil physical participation
- Aural visual switching

Movement

It is making movements from one place to another with some purpose. (For writing on the black board; to conduct experiment; to explain the chart or model; to pay attention to the pupil who is responding to some question etc.)

Gesture

These include movements of head, hand and body parts to arrest attention, to express emotions or to indicate shapes, size and movements. All these acts are performed to become more expressive.

Change in voice

When the teacher wants show emotions or to put emphasis on a particular point, sudden or radial change in tone, volume or speed of the verbal presentation are brought out. The change in the speech pattern makes the pupils attentive and creates interest in the lesson.

Focusing

The teacher draws the attention of the pupils to the particular point in the lesson either by using verbal or gestural focusing. In verbal focusing the teacher makes statements like, "look here" "listen to me ""note it carefully ". In gestural focusing pointing towards some object with fingers or underlining the important words on the blackboard.

Change in interaction pattern

When two or more persons communicate their views with each other, they are said to be interacting. In the classroom the following three styles of interaction are possible:

- o   Teacher ←→ class (Teacher talks to class and vice versa)
- o   Teacher ←→pupil (Teacher talks to pupil and vice versa)
- o   Pupil ←→ pupil (Pupil talks to pupil)

All types of interaction should go side by side to secure and sustain pupils' attention.

Pausing

This means "stop talking" by the teacher for a moment. When the teacher becomes silent during teaching. It at once draws the attention of the pupils with curiosity towards the teacher. The message given at this point is easily received by the pupils.

Pupil physical participation

Pupils tend to prefer those lessons in which they get an opportunity for physical participation. It holds their interest and attention in the task in which they are engaged. Physical participation can be in the from handling apparatus, writing on the blackboard and so on.

Aural visual switching

The teacher gives information to the class verbally about something. This is called oral medium. When the teacher is showing maps, chart and object without saying something, then it is called visual medium. If the teacher is giving information to the pupils through any one medium for a long time, it is possible that the students may lose attention to what the teacher is conveying to them. Therefore it is essential for the teacher to change medium rapidly in order to secure and sustain pupils' attention to what he says. They are three types of media:

- ▪   Oral oral-visual: when the teacher while speaking shows objects, charts and models and explains their various parts it is switching from oral to oral-visual.
- ▪   Oral visual: when the teacher while speaking, shows objects, maps, chart, globe etc. it is switching form oral to visual.

▪ Visual oral-visual: when the teacher demonstrates the experiment silently and then explains the phenomenon with the help of charts, maps, diagram etc. it is visual-oral switching.

These devices are used interchangeably to secure and sustain pupils; attention to the lesson.

Non-Verbal Cues

Express Non-Verbal cues are power. It primary express feelings.

Non -verbal cues are

- ▪ Gestures
- ▪ Postures
- ▪ Movements

Non-verbal or verbal play a vital role in the teaching and learning process. Non-verbal cues in the classroom occurs with distance, physical environment, facial expression, vocal cues, body movements and gestures, touch, time, physical attractiveness, and dress.

Reinforcement

Every responding pupil of the class needs social approval of his behaviour. To satisfy his need. He is always eager to answer each question known to him. If the teacher is encouraging the pupils by statements like, "good"; that is very good and certain nonverbal expressions, as smiling, nodding the head, and paying attention to the responding pupil, the pupil participation in the class is maximized. The main theme of the skill is that encouraging remarks of the teacher increase and discouraging remarks decrease the pupil-participation in the development of the learning process. So keeping this idea in mind this skill of reinforcement may be well explained with the following components.

- Positive verbal reinforcement.
- Positive Nonverbal Reinforcement
- Negative Verbal Reinforcement
- Negative Nonverbal Reinforcement
- Wrong use of Reinforcement
- Inappropriate use of Reinforcement.

Positive verbal Reinforcement: these are the positive comments given by the teacher on the correct response of the pupil.

They are:

- Using words and phrases like, good, very good and excellent.
- Repeating and rephrasing pupil's response
- Using pupils' idea in the development of the lesson
- Using extra-verbal cues like um, um, aha to encourage pupils.
- Using prompts like carry on, think again etc. to help the pupil give correct response.

Positive Nonverbal Reinforcement:

The teacher gives comments to pupils on their correct response without using words: this he does By: nodding the head, smiling, patting, looking attentively at the responding pupil, writing pupil's answer on the black board. The teacher encourages the pupils to participate maximally in the development of the lesson.

Negative verbal Reinforcement:

The teacher gives comments on the incorrect or partially incorrect response by that the pupil's response is incorrect or making sarcastic remark like "idiots", "stupid" etc. such behavior of the teacher discourages pupil-participation and should not be used.

Negative Nonverbal Reinforcement:

The teacher shows his disapproval without using words. This involves, frowning, staring, and looking angrily at the responding pupil, when he gives wrong response. This type of behavior of the teacher creates fear in the minds of the pupil and decreases pupil-participation.

Wrong use of reinforcement:

This is the situation, where the teacher does not give reinforcement when the situation is demanding encouragement.

Inappropriate use of reinforcement:

This is the situation when the teacher does not encourage the pupil with respect to quality of his response. He use same type of comment for every response.

Fluency in Communication

Aldous Huxley(1958) once wrote "Language has made possible man's progress from animality to civilization"(p.167).Classroom talk is very important . Flanders(1970) reported that teachers of high achieving students spent about 55 percent of the class time talking, compared with 80 percent for teachers of low-achieving students. So communication plays a vital role in a classroom. As a teacher communication skill is very much needed and only through this he/she can make the students understand the content taught to them. Communication in general is a process of sending and receiving messages that enables humans to share knowledge, attitude, and skills.

- **Practicing a mini- lesson with multiple teaching skills (for 20 minutes)**

Name :   xxxxx

Subject: Computer science

Topic :   Introduction to computers

Focus: Generations of computers

Date :

Time : 15-20 minutes

Objectives: The peer group

- acquires knowledge of the calculators, computer.

- understands the generation of computers.

- develops skills in selecting a suitable electronic component accurately from the diagram shown.

Materials

- A calculator.
- A chart showing generations of computers.
- A chart showing parts of computers

Content

- First-generations of computers.
- Parts of computers
- Central processing unit
- Speed of computers.

Teaching skills

Important skills are as follows:

1. **Introducing**

   The pre-service teacher gives introduction about the first-generation computers

   The first generation of computers had vacuum tubes. These early computers used vacuum tubes as circuitry and magnetic drums for memory. The period of first generation was 1946-1959

2. **Explaining**

   The pre-service teacher explains-

   The first generations computers were often enormous, taking up entire rooms. The vacuum tube was developed by Lee DeForest. A vacuum tube is a device generally used to amplify a signal by controlling the movement of electrons in an evacuated space". The basic parts of a computer system are Monitor, CPU (central processing unit), keyboard, Mouse, Speakers and Printer. A central processing unit is the electronic circuitry within the computer program by performing the basic arithmetic, logical, control and input/output operations specified by the instructions. The faster the CPU runs, the more processes it can run at any given time. A CPU with a clock speed of 3 GHZ, for example can run 3 thousand million cycles each second.

3. **Questioning**

   The pre-service teacher poses a few questions to the peer group

The First generations computers used----------- tubes.

Mention the period of first generation computers.

What is the expansion of CPU?

4. **Varying the stimulus**

   The pre-service teacher uses some teaching aids to get the attention of the peer group

   There will be variation in teachers' position in the classroom while he is teaching. Variation in voice represents another dimension. Use of media like vacuum tubes pictures and Chart showing diagrams of first generation computers provides yet another area of vibration. There can also be variation in the classroom interaction pattern.

5. **Non-verbal cues**

   The pre-service teacher uses non-verbal cues to make the class lively.

   Positive non-verbal cues include smiling; nodding the head, a delighted laugh, patting on the shoulder, asking the students to clap etc can be used while the class is going on.

   The students can be asked to clap their hands for correct answers given by a student.

6. **Reinforcement**

   The pre-service teacher reinforces the peer group when they give correct answer.

   Positive verbal reinforces like saying good, , excellent, fantastic, , right, yes, correct, fine etc. can be used in the class for the desirable behavior of the students like being calm, clarifying their doubts, answering the questions, drawing the pictures on the board etc.

7. **Closure/Summing up**

   The pre-service teacher summarizes the content delivered in the classroom

   The topic will be summed up as a first-generation computer used vacuum tubes for circuitry and magnetic drums for memory and were often enormous, taking up entire rooms. This tube is a device generally used to amplify a signal by controlling the movement of electrons in an evacuated space.

8. **Fluency in communication**

Communication is a process of sending and receiving messages that humans to share knowledge, attitudes, and skills. Fluency in communication is very important skill for a good teacher so that he can communicate his ideas as naturally as possible. Eg pronouncing the vacuum tube correctly

- **Observation and feedback on the practice of integration of Teaching skills**

INTEGRATING SKILLS IN MINI TEACHING (Assessment by Peers/Teacher Educators)				
Teaching skills	**AVERAGE (SCORE 1)**	**GOOD (SCORE 2)**	**VERY GOOD (SCORE 3)**	**TOTAL**
Introducing				
Explaining				
Questioning				
Varying the stimulus				
Non verbal cues				
Reinforcement				
Closure				
Fluency in Communication				

Range of scores:8-24

OVERALL ASSESSMENT OF TEA CHING STEPS

AVERAGE _____   GOOD _____ VERY GOOD_____

Interpretation of scores

Average   : 8

Good   : 9-16

Very Good   :17-24

- **Understanding major Steps in Teaching a mini lesson**

  Mini-Teaching is an actual classroom teaching in miniature. Mini-teaching is much smaller than usual teaching. In Mini-teaching, a pre-service teacher practices a mini-lesson to a minimum of 10 peers for 15-20 minutes.

  Steps in Mini-teaching

  The pre-service teacher-

  1. Chooses a mini-lesson for 15-20 minutes

  2. Identifies a few appropriate teaching skills required for teaching the mini-lesson.

  3. Teaches the mini-lesson with gradual integration of the teaching skills identified.

  4. As soon as a pre-service teacher finishes teaching mini-lesson. The peers and the teacher-educator provide a feedback to the pre-service teacher about teaching.

  5. Then the next pre-service teacher in the peer group takes up his mini-lesson and practice teaching.

  Major steps in teaching a mini-lesson

  Teaching a mini-lesson consists of five specific steps.

  They are

  ➢   **Motivation**

  Motivation is a warm-up activity to get the students actively engaged in a new lesson. So, the pre-service teacher should use all the teaching skills.

  ➢   **Presentation**

  Presentation refers to the delivery of the content in the classroom in a original way. The pre-service teacher should focus on

  1. Verbal and non-verbal communication

  2. Effective use of the blackboard.

➢ **Interaction**

Interaction refers to the communication between the teacher and students during the delivery of the lesson in the class room. The pre-service teachers should encourage group interaction in the classroom.

1. Classroom interaction

2. Student-Teacher interaction

3. Student-Student interaction.

➢ **Reflection**

Reflection refers to encouraging students to think about their thought .The teacher ask the students to reflect on their learning (output).The pre-service teachers can help their peers to reflect about their learning in the following ways.

1. Discussions

2. Interviews

3. Questioning

➢ **Summing up**

Summing up refers to ending a lesson with a summary. The pre-service teachers can use the all teaching techniques in front of peers.

• **Practicing mini-lesson (for 20 minutes)**

• **Introductory Activities (*Motivation*) (Skills used are Introducing and Questioning),**
The pre-service teacher motivates the class

The device used to solve mathematical problems. (Calculator will be answer answered by the peer group) A model of calculator is shown to the peer group. Then the peers will be asked about another device used for calculating. The answer will be given by the peer group "Computer"

• **Development Activities (Presentation, Interaction, Reflection)**
(skills used are Introducing, Explaining, Questioning, Closure)

The pre-service teacher explains

A Computer is an electronic device that can be instructed to carry out an arbitrary set of arithmetic or logical operations automatically. The ability of computer to follow a

sequence of operations, called a program, make computers very flexible and useful. Such computers are used as control systems for a very wide variety of industrial and consumer devices. The term Hardware covers all those parts of a computer that are tangible physical objects. The Data is sent to the computer with the help of input devices. Some of the examples of input device are keyboard, joystick, mouse, Trackball, Touch screen and etc. The means through which the computer gives output are known as output devices. Some of the output devices are monitor, printer, projector, PC speaker and etc. The Input/output devices Picture chart is shown. Interaction will take place Reflection takes place during communication between the pre-service teacher and the peer group.

- **Concluding Activities (*summing Up/Closure*)(Skill used is Closure)**

A computer is an electronic device. The ability of computer to follow a sequence of operations, called a program, make computers very flexible and useful. Such computers are used as control systems for a very wide variety of industrial and consumer devices. The term Hardware covers all those parts of a computer that are tangible physical objects. The Data is sent to the computer with the help of input devices. Some of the examples of input device are keyboard, joystick, mouse, Trackball, Touch screen and etc. The means through which the computer gives output are known as output devices. Some of the output devices are monitor, printer, projector, PC speaker and etc. Name some of the input device. Draw block diagram of computer.

- **Observation and feedback on mini-teaching**

INTEGRATING THE STEPS IN MINI TEACHING			
(Assessment by Peers/Teacher Education)			
TEACHING STEPS	**AVERAGE (SCORE 1)**	**GOOD (SCORE 2)**	**VERY GOOD (SCORE 3)**	**TOTAL**
Motivation				
Presentation				
Interaction				
Reflection				
Summing Up				

Range of scores: 5 - 15

OVERALL ASSESSMENT OF TEA CHING STEPS

AVERAGE _____   GOOD _____ VERY GOOD_____

Interpretation of scores

Average   : 5

Good   : 6-10

Very Good   :11-15

CONCLUSION

A mini-lesson focuses on a specific teaching point. This is an extension of micro-teaching. This unit will help the pre-service teachers to know about the teaching skills and teaching steps. Practice makes a man perfect so the pre-service teachers after practicing mini lesson will become a perfect teacher for teaching practice.

QUESTIONS FOR DISCUSSIONS AND REFLECTION

1. Define mini-teaching.

2. Explain the major steps in a mini-teaching.

3. Write a mini-lesson by integrating major steps.

SUGGESTED READING/REFERENCE BOOK

1.   Kokila Thangasamy (2016), *Pedagogy of English,* Chennai: Vinoth Publications

2.   Rajasekar S .(2013), *Methods of teaching Computer science*, New Delhi: Neelkamal publications.

3.   Singh,Y.K. (2005), *Teaching of computer science*, New Delhi: A.P.H.Publishing Corporation.

4.   Venugopal.G. (2014), *Teaching of biology* , Chennai: Sriram Publishers.

5.   www.ascd.org, Why talk is important in classrooms'.

UNIT IV - METHODS OF TEACHING COMPUTER SCIENCE

Objectives

After the completion of the unit, the student teachers will be able to

acquire knowledge about the methods of teaching computer science

apply appropriate methods in their teaching

understand the applications of various resources

understand how the community resources are used in their teaching.

Teacher centered Method

Lecture Method

Lecture method refers to the teaching procedure to clarify or explain to the students some ideas that have been presented or created as a problem. This methods is most commonly used in colleges and not a very suitable method for teaching computer science at high school classes. This method is teacher controlled and information-centred and in this method the teacher works as a sole resource in classroom instruction. As this method does not call for students' involvement in the learning process, Students may get bored and lose interest in learning. In this method the students are provided with readymade information by the teacher. The teachers goes ahead with the subject matter at this own speed.

Merits of Lecture Method
lecture method has following merits.
- It is an easy, concise and attractive method. Using this method the teacher feels safe and secure.
- Using this method, a large amount of subject matter can be presented within a short time and the prescribed syllabus can be covered easily.

- It can be used for a large number of students.
- Using this method it is quite easy to impart factual information and historical anecdotes.
- Using this method the teacher can easily maintain the logical sequence of the subject matter by planning his lecture in advance.
- This method gives the students as well as the teacher a sense of satisfaction and achievement.
- Lecture method trains good listeners who are able to concentrate on subject matter for a long duration.

Demerits of Lecture Method

The demerits of lecture method are as under:

- The lecture method is lengthy and time-consuming.
- In this method students become passive recipients of information as their involvement in classroom interaction is negligible.
- Due to long duration of lecture, students' attention is likely to wander.
- Receiving information is not computer science learning and hence it does not hence mathematical ability of the students.
- In this method there is no way to ensure the students' concentration and understanding of the subject matter presented to them.
- In this method ideas are presented so rapidly that is not possible for all students, especially the weaker ones to catch's presentation.
- Inability to understand one essential point may make the rest of the lecture unintelligible.
- It does not provide for corrective feedback and remedial help to show learners.
- It does not call for the development of mental faculties such as power of observation, reasoning, critical thinking, independent thinking and so on.
- It does not provide for individual differences and individual needs.
- This method does not help in developing problem-solving skills.
- Using this method results in totally neglecting the experimental side learning.
- It is a teacher-oriented method and it is likely that students profit very little due to lack of maturity of thought and many other psychological reasons.

Lecture-Demonstration Method

Lecture-Demonstration Method is considered to be a method superior to lecture method as it combines the advantages of both the lecture method and the demonstration method. In this method both the teacher and the taught are active participants in the process of teaching.

The lecture-demonstration can be effectively used for teaching computer science. By using this method it is possible to easily impart concrete experiences to students during the course of a lesson, when the teacher wants to explain some abstract points. This method combines the instructional strategy ' information imparting and showing how'. For example, while teaching geometrical constructions the teacher has to explain how to construct the geometrical figure with the give specifications, simultaneously demonstrating how to carry out the construction following the sequence of steps.

In this method, the teacher performs the experiments before the class and simultaneously explains what he is doing.

Merits of Lecture-Demonstration Method

- It is psychological method as students take active interest in the learning process.
- It is useful for all students of varying abilities.
- It is an economical method as compared to purely student-centred methods.
- It leads the students from concrete experiences to abstract concepts.
- It encourages students' participation in learning.
- It trains mental faculties such as power of observation, reasoning and drawing inferences.

Demerits of Lecture- Demonstration Method

- It does not provide first-hand experiences to the students.
- It does not provide for individual differences. It caters to the of average students.
- It does not develop manual and manipulative skills and cannot be a substitute for laboratory method.
- If not very attentive, the students fail to observe minute details of the demonstration.
- It is not application for higher level computer science.

TEAM TEACHING

Team teaching a style of instruction in which resources as well as interests and expertise of a team of teachers are pooled in order to enhance the effectiveness of instruction/curriculum transaction to the maximum possible by utilizing all facilities available in school.

Characteristic of Team teaching

1. It utilizes the service of two or more teacher in the process of teaching the same class.

2. It is an instructional strategy rather than training strategy.

3. In team teaching a group of teachers are responsible for realization of the educational objectives,

rather than an individual teacher.

4. A team of teachers of the same subjects work together to deal relevant content area to the same group of students.

5. It can be termed as co-operative teaching , in which teachers together plan to pool resources, interests and expertise for teaching the same content for the same group of students.

6. Every individual teacher of the team gets an appropriate role in the instructional process in accordance with one's special competencies or area of specialization.

7. The group of teachers involves have shared responsibilities in planning, organizing, leading, controlling and evaluating.

8. In team teaching, the group of teachers have to jointly consider the needs of their pupils.

Objectives of Team teaching

1. To make the best use of expertise of a number of teachers.

2. To improve the quality of teaching by utilizing the sills of more then one person.

3. To develop positive attitude towards co-operation or group in teaching – learning situations.

4. To help the student to satisfy the needs and solve the difficulties relating special content areas.

5. To develop the sense of shared responsibility in teaching and evaluation.

6. To minimize the scope of teaching wrong things to the students by any individual teacher.

Types of Team teaching

1. Team teaching in the same class period.

Here the members of the team discuss the various aspects of the same topic to be covered in the same class period and share these aspects in tune with the special knowledge area in which each has expertise.

2. Team teaching based on ability.

In this type, units are shared by different teachers not on the basis of subject matter, but on the basis of special competencies such as lecturing, demonstrating, guiding discussion etc.

3. Team teaching based on specialization

Teachers with different subject specialization are jointly made responsibilities for instruction, starting from course formation to evaluation. They share the content according to their specialization areas.

4. Team teaching on relay system.

Hear one teacher starts the instructional process, when he completes, another follows and so on. Hear the division of work not based on subject competency or skill. Each teacher supplements, enriches and supports what others have done.

Principles of team teaching

1. Principle of size and composition of the class.

The size of the class should be vary according to the objectives of the team teaching.Eg. To remove the difficulties of students in certain subject, the size of the class should be small.

2. Principle of level of instruction

The entering behavior of the group of students should be determined so that the presentation of each member of the team in tune with the level of the class.

3. Principle of assigning duties to teachers of the work.

Duties to the teachers should be appropriate according to their competencies of teaching.

4. Principle of learning environment.

Learning environment must be generated by employing appropriate teaching aids and other inputs.

5. Principle of time factor

Time schedule should be prepared by allotting appropriate time to subtopics, lead lecture, group work etc.

6. Principle of Supervision

  i.   The aim of team teaching is to develop mastery over subject matter by utilizing the expertise of teachers
 ii.   Supervised study is essential for assimilating various items of knowledge of a topic
iii.   The nature and duration of supervising students activities depends upon the purpose for which team teaching is employed.

Procedure of Organizing the Team teaching

Team teaching involves three steps

1. Planning

This step involves the following activities

• Formulating the objectives of the team teaching session.
• Writing these in behavioral terms.
• Identifying the entering behavior of the learners.
• Deciding the details of the material to be taught.
• Assigning duties to teachers, such as lead lecture, follow up work and supervision considering their interest and competencies.
• Fixing up the level of instruction.
• selecting appropriate teaching aids and other inputs, if any, for generating learning environment.
• Deciding ways and means to be adopted for evaluating the student performance.

2. Organizing

The organization of team teaching is decided by considering the needs of the learners. The following are the general activities which are usually performed by a team of teachers.

- Determining the level of instruction. Some questions are asked to explore the background of the leaner's.
- Selecting the appropriate communication strategy by considering the level of language achievement of the learners.
- Presentation of lead lecture by a competent of the team; other teachers listen the lecture and note down the element of the topic that appear to be not easily understandable to the learners or nor appropriately presented.
- Follow up work. The other teachers have to supplement the lead lecture by explaining the elements of the topic in a simpler way so that the learners can understand easily.
- Providing motivation or reinforcement during both the stages. i.e, during the lead lecture and follow up work.
- Supervision of student activities which are assigned in lead lecture or group work or follow up work. This stage is considered to be important for assimilation. Every member of the team should be conscious about time schedule and about the duty assigned to him. He must be well prepared and ready for implementing the plan.

3. Evaluating

-
  Evaluation is an important aspect of ant type of teaching. It will helpful to measure the performance of learners. It also provides reinforcement to the team of teachers as well as to the learners, this stage involves the following activities.
  Asking oral questions. Each question should measure a particular objective envisaged by the team.
- Taking decision about the level of performance and realization of the objectives.

- Diagnosing difficulties of the learners and providing the remediation.
- Revising the planning and organizing phase of team teaching itself on the basis of evaluation of the student.

Advantages of team teaching

1. Better planning

• Team teaching has to overcome repetition and hence every teacher has to devote more time towards planning and preparation of his unit.

2. Better utilization of resources.

• It results in the optimum use of available resources, human, material, finance. A number of teachers can work together and make the best use of their specialized knowledge.

3. Effective use of teaching techniques.

• Teachers observe each other and thus improve their teaching techniques.

4. Better motivation.

• It provides better motivation for good teachers to become team leaders. Student too are better motivated while they are being taught by a number of teachers. Teachers with greater technical skills influence the performance of their colleagues.

5. Better follow-up work.

• It ensure better follow-up work as a number of specialists teach the same subject to the same class.

Limitation of team teaching

1. It is very difficult to ensure co-operation among teachers of a team.
2. It is not east to assign powers and responsibilities to a group of teachers. It might happen no one takes care of the responsibilities expected.
3. Many teachers do not maintain regard and respect. Every teacher considers himself an expert of the subject and has his own style of teaching.
4. Teachers generally do not like to deviate from the routine methods of teaching and they do not prefer any change in the system of education.

LEARNER CENTRED METHODS

Laboratory Method

laboratory method is a procedure for stimulating the activities of the students and to encourage them to make discoveries. In this method students are required to do some experiments or carry out certain activities in order to verify the validity of the mathematical generalisation, a law or a statement. it is the experimental portion of the inductive method or the practical form of the heuristic method. Therefore, in this method one proceeds from concrete to abstract. it is based on the psychological principles of learning such as 'learning by doing', 'learning by observation' and so on. Laboratory method is quite competent to relate the theoretical knowledge with the practical base. This approach makes the learning process more interesting, lively and meaningful.

The success of the laboratory method depends on an able and skilled teacher as well as the availability of a well-equipped computer science laboratory. According to J.W.A. Young "a room specially filled withdrawing instruments, suitable tables and desks, good blackboards and the apparatus necessary to perform the experiment of the course is really essential for the best success of the laboratory method". A well-furnished laboratory helps in providing stimulating and worthwhile experiences in clarifying the meanings of mathematical principles and for the acquisition of understanding and skills.

Merits of Laboratory Method

- It is based on the psychological laws of learning: law of exercise and law of effect
- It is based on the principle of learning by doing.
- It stimulates the interest of the students to work with concrete material.
- It provides an opportunity for the students to verify the validity of the mathematical rules through their application.
- Knowledge and skills acquired through experiments help in better understanding and longer retention.
- It provides for individual differences and best suited for average and below average students for thorough understanding of abstract concepts.
- It promotes self-confidence and self-reliance and a sense of achievement among the students.
- It provides opportunities for social interaction and cooperation among the students.
- It develops in the child a habit of scientific enquiry and investigation.

Demerits of Laboratory Method

- Laboratory method does not contribute much towards the mental development of the students.
- It is an expensive method in terms of time, equipment, laboratory facilities and number of skilled and able teachers.
- Only very few topics in computer science can be taught through this method and hence it has limited applicability.
- It is too much to expect the students to work independently and discover and verify mathematical facts like a mathematician

o It is not suitable for large classes as the teacher has to give individual attention to each students.
o It is suitable only for lower classes.
o There is dearth of textbooks written on the lines of laboratory method.

Applicability of Laboratory Method

Laboratory Method is best suited for teaching computer science at lower classes. This method does not provide much scope for teaching computer science at high school and higher secondary classes. This method does not contribute much towards the development of reflective thinking, reasoning and problem-solving skills which are the important aims of teaching computer science. Whenever the teacher selects the laboratory method, it should be integrate with other methods to yield desirable outcomes.

PROJECT METHOD

Project Method is of American origin and is an outcome of Dewey's philosophy of pragmatism. However, this method is developed and applied practically by Dr. Kilpatrick. The advocate of project method believe that different branches knowledge are different aspects of one whole and they are studied separately for the sake of convenience. Moreover the exponents of the method contend that knowledge turns into power only through application.

The term project' has been defined differently by different educationists. A few definitions have been given below.

Project is defined in Oxford's Advanced. Learner's Dictionary as a 'Plan of action'. It usually involves a task or problem, calling for constructive thought, or action or both. According to Dr. Kilpatrick 'A project is a unit of wholehearted purposeful activity carried on preferably in its natural selling'.

In the opinion of J.A. Stevenson "A project is a problematic act carried to completion in its most natural setting".

Ballard defined project 'as a bit of real life that has been imported into the school".

All the definitions stated above emphasise that project should be a purposeful activity related to life and it should be carried out in a natural environment. In project method, teaching and learning are considered from the child's point of view and in this method knowledge and skills are learnt by pupils through practical handling of problem in their natural setting. This method is an ideal way of promoting creativity, arousing curiosity and inculcating the spirit of enquiry among the student. However, in this method teaching is more or less incidental.

Basic Principles of Project Method

Psychological Principles of Learning

The project method is based on the psychological principles of learning namely.

    I. Learning by doing

    II. Learning by living

    III. Children learn better through association, cooperation and activity.

Psychological Laws of Learning

The project method is based on the psychological laws of learning namely,

    I.   Law of readiness

    II.   Law of exercise

    III. Law of effect

Principle of Activity

Activity is a significant feature of this method. Children select, plan, execute and evaluate their projects themselves.

Principles of Social Experience

The project is selected from real life situations and every project should be a social experience for the children

Principle of Reality

The project cannot be motivating and interesting for the learner unless it is natural and real from the learner's point of view.

Principle of utility

Knowledge is meaningful and worthwhile if it is practicable and useful

Principles of Motivation

The selected project should be purposeful and therefore motivating for the learner.

Purpose and goal and goal make the project meaningful and significant.

Project method involves the following steps

-Providing a situation

-Selecting and purposing of the project

-Planning of the project

-Executing the project

-Evaluating the project

-Recording

Providing a situation

The project should arise out of the felt needs of the students. The teacher should provide such situations to students which may arouse some suitable questions to which the students seek answer. It should look important, must be interesting, and purposeful for the students. The teacher can provide a variety of situations through a variety of situations through discussion, questioning, library work, field word etc.

Selecting and purposing

The selection of the project is done by the students themselves. The teacher should refrain from proposing any project; otherwise the whole purpose of the method would be defeated. However, the teacher can guide the students in the selection of a good project, keeping in mine the interest, aptitude and ability of the students. In this step the nature and goal of the project is clearly determined as well as the limits and scope of the project is clearly defined.

Planning

Planning involves the selection of the most appropriate and feasible set of activities to be executed. The students should choose the most practical plan of action. The students themselves should do the planning with the teacher as a guide. While planning, the points to be taken into consideration are: (1) the nature and scope of the projects (2) the degree of complexity of project (3) time allotted to finish the project and (4) and availability of material resources. Discussion may be held among students before the final draft of the plan is agreed upon.

Execution

In this step the teacher helps the students in assigning work to different students in accordance with their interest, aptitude and capabilities. Each member of the group should be actively involved in the execution of the project. The teacher should carefully supervise and guide the students in the execution of the project as per the proposed action plan.

Evaluation

The students along with the teacher should review the progress of the project at frequent intervals. This is to ensure that the students are progressing towards the realisation of the of the objectives of the project. Without evaluation, the project can move out of focus. The evaluation of the project has to be done in the light of (i) proposed plan (ii) difficulties in the execution and (iii) achieved result.

Recording

The students are required to maintain a complete record of work including the choice of the project, the planning, the discussions help and duties assigned. Also reference and books consulted and readings taken, difficulties faced, guidance sought, details of places visited and surveyed and so on should be carefully recorded.

Criteria of a Good Project

A good project can be assessed using the following criteria.

-The project should be purposeful, useful, and practically applicable to the daily life of the students, with clear, well defined objectives.

-The project should help in providing useful and meaningful learning experiences to each member of the group.

-The project should be within the reach of the students in accordance with their interest and ability levels.

-The project should be feasible in terms of the availability of human and material resources and time limit.

-The level of complexity of the project should match the ability level of the students.

-The learning activities of the project should be life-like, purposeful and natural.

Role of the Teacher

The teacher should assume the following role while following project method.

- Guide students in selecting the project according to their interest, aptitude and ability.

- Help students in planning and allotting activities to each member according to the nature of

  abilities.

- Help in creating a friendly and democratic atmosphere in the classroom promoting co-operation

  and harmony.

- Be available to the students and willing to help as and when it is necessary.

- Supervise and check whether the project is running in time as planned.

- Suggest extra resources, if necessary, for the successful execution of the project

- Check in the records maintained by the students.

- Help in the periodic assessment of the progress of the project.

Merits of Project Method

- It is based on sound psychological principle and laws of teaching.
- It provides scope for independent work and individual development.
- It promotes habits of critical thinking and encourages the students to adopt problem-solving methods.
- It provides for individual differences as the students can select the activity and exchanges of experiences among the students.
- It promotes social interaction, inculcated spirit of co0opration and exchanges of experiences among the students.
- It encourages practical applications of the subject, making the subject functional and meaningful to the learner.

- It provides opportunities for children to acquire a lot of skills-observation, reference, interpretation and so on.
- In this method the children are active participants in the learning task.
- It develops self-confidence and self-discipline among the students.
- It upholds the dignity of labour.
- It widens the mental horizon of the students.
- It makes the learning more interesting and facilitates better understanding of the subject matter as the learning is related to reality and the world around him.

Demerits of Project Method

- The project method is uneconomical in terms in terms of terms of time and is not possible to fit into the regular timetable
- It does not provide any training in mathematical thinking and reasoning.
- The learning is incomplete and uniform learning or balanced learning is not possible for all students as each student performs a different activity.
- Textbooks and instructional materials are hardly available.
- For the success of this method the teachers should be exceptionally resourceful and gifted and knowledgeable.
- It is an expensive method as it makes use of a lo of resources which aew not immediately available in the school.
- Syllabus cannot be completed no time using this method.
- Teaching is disorganised.

PEER TUTORING

Peer tutoring refers to an instructional method that uses pairings of high-performing students to tutor lower-performing students in a class-wide setting or in a common venue outside of school under the supervision of a teacher. The terms "tutoring" and "mentoring" will be used synonymously, as the role of tutor also includes maintaining a supportive and encouraging relationship with the tutee.

Benefits of Peer Tutoring

Currently, there is sufficient research that documents the benefits of peer tutoring as a supplement to traditional instruction. Peer tutoring has been used across academic subjects, and has been found to result in improvement in academic achievement for a diversity of learners within a wide range of content areas [12-14]. Common components of peer tutoring programs facilitate both cognitive and social gains in both higher-performing mentors and low-performing mentees in an individualized and positive way.

Academic and Cognitive Gains through Peer Tutoring:

Positively affects computer science performance

Overall, peer tutoring in computer science is most effective in improving computer science performance for students at risk for or experiencing computer science disabilities, elementaryaged participants, and computer science computation content .

Improves reading achievement for students of all levels

Some established positive outcomes of peer tutoring in reading classes include improvements in key reading skills as well as gains in self-concept and competency in reading [16]. Results from a study of peer tutoring reading programs in middle schools indicated that students' oral reading rate increased following peer tutoring programs.

Accommodates diverse students within a classroom

Inclusive learning, which is the practice of teaching disabled students alongside non-disabled peers in regular classroom settings, can be facilitated through an emphasis on differentiated learning, where students of varying academic levels receive instruction appropriate for their individual learning styles and speeds. Differentiated learning, which emphasizes providing students with varied opportunities to acquire knowledge and master skills, can be difficult to implement in a traditional classroom setting. Peer tutoring can be an effective strategy for educators to facilitate differentiated learning without stigmatizing and alienating students. When peer tutoring is implemented in a class-wide setting, students are able to approach the curriculum at their individual learning level, using strategies tailored to individual mentees.

Promotes higher-order thinking

By explaining concepts in detail, high-level questioning, and the use of supportive communication skills, peer tutors can help low-performing students master material previously introduced in a traditional classroom setting and build on their knowledge using higher-ordering thinking skills [18].

Social and Behavioral Gains through Peer Tutoring:

Results in positive effects on social, self-concept, and behavioral outcomes

Social, self-concept, and behavioral outcomes were affected positively with the use of peer assisted learning strategies, including peer tutoring. Additionally, researchers found a significant positive relationship between social and self-concept outcomes and academic achievement. Decreases in disruptive behavior and improvement in social interactions among culturally and developmentally diverse peers are also noted outcomes of peer tutoring programs.

Increases students' sense of control and responsibility for their academic achievement

Peer tutoring increases students' sense of internal responsibility for their achievement. Peer tutoring programs have also been shown to improve student's ability to accept constructive feedback from adults. Training students in peer tutoring strategies can help students take responsibility for their learning, and their ability to recognize and accept responsibility for academic failures.

EXPERIENTIAL LEARNING

"Experiential [learning] is a philosophy and methodology in which educators purposefully engage with students in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values" (Association for Experiential Education, para. 2).

Experiential learning is also referred to as learning through action, learning by doing, learning through experience, and learning through discovery and exploration, all which are clearly defined by these well known maxims:

I hear and I forget, I see and I remember, I do and I understand. (Confucius, 450 BC)

Tell me and I forget, Teach me and I remember, Involve me and I will learn. (Benjamin Franklin, 1750)

There is an intimate and necessary relation between the process of actual experience and education. (John Dewey, 1938)

The following is a list of experiential learning principles as noted from the (Association for Experiential Education, 2011, para 4):

- Experiential learning occurs when carefully chosen experiences are supported by reflection, critical analysis and synthesis.
- Experiences are structured to require the student to take initiative, make decisions and be accountable for results.
- Throughout the experiential learning process, the student is actively engaged in posing questions, investigating, experimenting, being curious, solving problems, assuming responsibility, being creative and constructing meaning.
- Students are engaged intellectually, emotionally, socially, soulfully and/or physically. This involvement produces a perception that the learning task is authentic.
- The results of the learning are personal and form the basis for future experience and learning.
- Relationships are developed and nurtured: student to self, student to others and student to the world at large.
- The instructor and student may experience success, failure, adventure, risk-taking and uncertainty, because the outcomes of the experience cannot totally be predicted.
- Opportunities are nurtured for students and instructors to explore and examine their own values.
- The instructor's primary roles include setting suitable experiences, posing problems, setting boundaries, supporting students, insuring physical and emotional safety, and facilitating the learning process.
- The instructor recognizes and encourages spontaneous opportunities for learning.
- Instructors strive to be aware of their biases, judgments and preconceptions, and how these influence the student.
- The design of the learning experience includes the possibility to learn from natural consequences, mistakes and successes.

The instructor and student may experience success, failure, adventure, risk taking and uncertainty, because the outcomes of the experience cannot totally be predicted.

The Experiential Learning Process involves a number of steps that offer student a hands-on, collaborative and reflective learning experience which helps them to "fully learn new skills and knowledge" (Haynes, 2007). Although learning content is important, learning from the process is at the heart of experiential learning. During each step of the experience, students will engage with the content, the instructor, each other as well as self–reflect and apply what they have learned in another situation.

The following describes the steps that comprise experiential learning as noted by (Haynes, 2007, para. 6 and UC Davis, 2011)

Experiencing/Exploring "Doing" Students will perform or do a hands-on minds-on experience with little or no help from the instructor. Examples might include: Making products or models, role-playing, giving a presentation, problem-solving, playing a game. A key facet of experiential learning is what the student learns from the experience rather than the quantity or quality of the experience.

Sharing/Reflecting "What Happened?" Students will share the results, reactions and observations with their peers. Students will also get other peers to talk about their own experience, share their reactions and observations and discuss feelings generated by the experience. The sharing equates to reflecting on what they discovered and relating it to past experiences which can be used for future use.

Processing/Analyzing "What's Important?" Students will discuss, analyze and reflect upon the experience. Describing and analyzing their experiences allow students to relate them to future learning experiences. Students will also discuss how the experience was carried out, how themes, problems and issues emerged as a result of the experience. Students will discuss how specific problems or issues were addressed and to identify recurring themes.

Generalizing "So What?" Students will connect the experience with real world examples, find trends or common truths in the experience, and identify "real life" principles that emerged.

Application "Now What?" Students will apply what they learned in the experience (and what they learned from past experiences and practice) to a similar or different situation. Also, students will discuss how the newly learned process can be applied to other situations. Students will discuss how issues raised can be useful in future situations and how more effective behaviors can develop from what they learned. The instructor should help each student feel a sense of ownership for what was learned.

Although learning content is important, learning from the process is at the heart of experiential learning.

In experiential learning, the instructor guides rather than directs the learning process where students are naturally interested in learning.

INSTRUCTOR'S ROLE

The instructor guides rather than directs the learning process where students are naturally interested in learning. The instructor assumes the role of facilitator and is guided by a number of steps crucial to experiential learning as noted by (Wurdinger & Carlson, 2010, p. 13).

1. Be willing to accept a less teacher-centric role in the classroom.

2. Approach the learning experience in a positive, non-dominating way.

3. Identify an experience in which students will find interest and be personally committed.

4. Explain the purpose of the experiential learning situation to the students.

5. Share your feelings and thoughts with your students and let them know that you are learning from the experience too.

6. Tie the course learning objectives to course activities and direct experiences so students know what they are supposed to do.

7. Provide relevant and meaningful resources to help students succeed.

8. Allow students to experiment and discover solutions on their own.

9. Find a sense of balance between the academic and nurturing aspects of teaching.

10. Clarify students' and instructor roles.

Student Roles in Experiential Learning Qualities of experiential learning are those in which students decide themselves to be personally involved in the learning experience (students are actively participating in their own learning and have a personal role in the direction of learning). Students are not completely left to teach themselves; however, the instructor assumes the role of guide and facilitates the learning process. The following list of student roles has been adapted from (UC-Davis, 2011 and Wurdinger & Carlson, 2010).

1. Students will be involved in problems which are practical, social and personal.

2. Students will be allowed freedom in the classroom as long as they make headway in the learning process.

3. Students often will need to be involved with difficult and challenging situations while discovering. 4. Students will self-evaluate their own progression or success in the learning process which becomes the primary means of assessment.

5. Students will learn from the learning process and become open to change. This change includes less reliance on the instructor and more on fellow peers, the development of skills to investigate (research) and learn from an authentic experience, and the ability to objectively self-evaluate one's performance.

Integrating Experiential Learning (EL) in Teaching As previously noted, a primary role for instructors is to identify a situation which challenges students through problem-solving, cooperation, collaboration, self discovery and self-reflection. At the same time, decide what the students should learn or gain from the learning experience. Below are some primary points to consider when integrating experiential learning in your own teaching.

Qualities of experiential learning are those in which students decide themselves to be personally involved in the learning experience…

Once the EL experience has been decided upon, plan the experience by tying it to the course learning objectives and determine what students will need to successfully complete the exercise.

Plan: Once the EL experience has been decided upon, plan the experience by tying it to the course learning objectives and determine what students will need to successfully complete the exercise (resources such as readings and worksheets, research, rubrics, supplies and directions to off-campus locations, etc.). Also, determine the logistics: how much time will be allotted for the students to complete the experience (a complete class session, one week or more)? Will students need to work outside of class? How will the experience end? What forms of assessment will you employ? Will you use ongoing assessments such as observations and journals (called formative assessment), end of experience assessments such as written reports and projects, self and/or peer assessments, or a combination of all three?

Prepare: After the planning has been completed, prepare materials, rubrics, and assessment tools and ensure that everything is ready before the experience begins.

Facilitate: As with most instructional strategies, the instructor should commence the experience. Once begun, you should refrain from providing students with all of the content and information and complete answers to their questions. Instead, guide students through the process of finding and determining solutions for themselves.

Evaluate: Success of an experiential learning activity can be determined during discussions, reflections and a debriefing session. Debriefing, as a culminating experience, can help to reinforce and extend the learning process. In addition, make use of the assessment strategies previously planned.

GUIDED LEARNING

What is guided learning? A springboard for independence

Guided learning is an instructional sequence for small groups which is integrated into lessons to provide a bridge between whole-class teaching and independent work. It is direct teaching and works best when pupils are acquiring and developing concepts or skills in a subject. It can also be used to consolidate and refine skills and understanding. Guided sessions are flexible and can last from 10 to 30 minutes depending on the nature of the task and objectives. It is not a discrete or separate programme, but is one part of a rich, challenging and coherent curriculum.

It is about pupils taking control of their learning through a managed process. In a guided learning group:

• pupils are grouped according to ability, or particular learning need;

• the teacher plans the session, which is structured to provide pupils with just the right amount of challenge and support so that they can begin to stretch themselves as learners;

• the emphasis is on supporting pupils so that they learn to work independently on a particular aspect.

Guided learning enables teachers to support and challenge pupils by intervening in a sustained and proactive way at the point of learning, as pupils read, write, talk, design, plan, make or practise. It helps to develop personalised learning since it is a means of tailoring teaching and learning to the needs of individual pupils. It does this by grouping pupils to provide structured support and challenge inside or outside normal lessons to address aspects of progress and specific needs. Guided learning builds pupils' independence through focused intervention, interaction and collaboration.

In guided learning groups, the teacher does more than 'listen in', or 'join in'. It is a place where you continue to teach, but are much closer to the pupils – you can monitor their responses, and adjust what you say or do, and what you ask them to do or say, accordingly. It is assessment for learning in action.

As with all good teaching, good subject knowledge and assessment are prerequisites for an effective guided session. Groups should be formed on the basis of the stage of progress or point of need of the pupils. They involve a small group of pupils, usually between four and six, and can take place in or outside the classroom. They are led by a teacher or, with structured notes and guidance, a teaching assistant. Sometimes the teacher will remain with the group for the duration of the guided session, but this is flexible. At appointed times during the session it is possible for the teacher to circulate among the other pupils working independently to monitor and support their work.

For guided work to take place, an effective learning climate needs to be established with the whole class, including good behaviour and positive relationships, clear routines and a well-presented environment. Guided work is helped with the greater number of teaching assistants available in schools.

> Once the rationale is established, the routines are in place and pupils accept that the teacher will at times spend more sustained time with specific groups, both independent and guided work become more productive as the outcome for both is a reduced dependency on the teacher.

Problem-Solving Method

The Problem Solving Method is one which involves the use of the process of problem solving or reflective thinking or reasoning. It may be noted that all problem solving does not necessarily include reflective thinking or reasoning because problems may be solved through trial and error or analogy. In analogy we compare the problem in hand with similar problem in our past experience, but the comparison may be so superficial that hardly any deep thinking may occur. A problem may be solved accidentally without involving much individual effort. When this happens, it is problem-solving in a limited or wrong sense of the word.

Problem-solving method, as the name indicates, begins with the statement of a problem that challenges the students to find a solution. The problem centres around the subject matter under study and requires the use of information and skills available to the students. In the process of solving the problem the students may be required to gather data, analyse and interpret the information, to arrive at a solution to the problems.

Definitions of Problem Solving

Problem Solving presupposes the existence of a problem in the teaching-learning situation. A problem is an obstruction of some sort to the attainment of an objective, a sort of difficulty which does not enable the individual to reach a goal easily. According to Yokam and Simpson. "A problem occurs in a situation in which a felt difficulty to act is realised. It is a difficulty that is clearly present and recognised by the thinker. It may be a purely mental difficulty or it may be physical and involve the manipulation of data. The distinguishing thing about a problem. However, is that it impresses the individual who meets it as needing a solution. He recognises it as a challenge. Hence problem solving is a child's bounding curiosity which manifests itself in lists of questions that he raises of nature, of mean and book.

Risk, T.M. defines problem solving as "Planned attack upon a difficulty or perplexity for the purpose of finding a satisfactory solution". Risk further elaborates that problem-solving teaching procedure is a process of raising a problem in the minds of students in such a way as to stimulate purposeful, reflective thinking in arriving at a rational solution.

According to James Ross "Problem solving is an educational device whereby the teacher and the pupils attempt in a conscious, Planned, Purposeful manner to arrive at an explanation or solution to some educationally significant difficulty".

Therefore, as used in teaching-learning situation, problem-solving is a methd in which the felt difficulty to act in an educational situation is realised and then an attempt is made in a conscious and purposeful way to find its solution.

Main Objectives of Problems-Solving Method

The main objective of problem-solving method is to stimulate the reflective and creative thinking of the students. It involves the though process that result from a doubt, a perplexity or a problem. The approach leads to the formulation of generalisations that are useful in future situations involving the solution problems. The solution of a problem, Whatever be its nature, practical or informational, involves the process of reflective thinking.

What is Reflective Thinking?

Reflective thinking is not a sudden impulsive thought. Bossing has discussed a few essentials of reflective thinking.

- Ability to sense the presence of a perplexing problem.
- Ability to recognise clearly the nature of the problem.
- Ability to hold the problem in mind as it is studies and to lose enthusiasm.
- Ability and readiness to a bold guess as hypothesis by way of solution.
- Ability to examine and evaluate critically the proposed solution or solutions.
- Ability and readiness to cast aside hypothesis which has not been found valid. This requires courage and a sense of objectivity.
- Ability to maintain an attitude of suspended judgements until all facts are gathered weighed, and evaluated.
- Ability and readiness to re-check conclusion and to test their validity.

Steps in Problem Solving

Problem solving follows definite and specific steps.

Identifying and defining the problem

The problem arises out of a felt need and out of existing students activities and environment activities. The students should be able to identify and clearly define the problem. The problem that has been identified should be interesting, challenging and motivating for the students to participate in exploring.

Analysing the problem

The problem should be carefully analysed as to what is give and what is to be found out. Give facts must be identified and expressed, if necessary in symbolic form. The relationship are to be clearly stated. Relations that are not explicitly state may be supplied by the students.

Formulating tentative hypothesis

The focus at this stage is hypothesising-searching for a tentative solution to the problem. Analysis of the give data, and analysis of interrelationships among the give facts help the students in formulating hypothesis or educated guesses as the solution to the problem at hand.

Testing the hypothesis

Appropriate method should be selected to test the validity of the tentative hypothesis as a solution to the problem. If it is not proved to be the solution, the students are asked to formulated alternative hypothesis and proceed.

Checking the result or verification of the result

At this step the student are asked to determine if their results substantiate the expected solution. The student should be able to make generalisations and apply them to their daily life.

Approaches to Problem Solving

Problem solving advocates the following approaches

- Analytic and synthetic approaches.

- Inductive and deductive approaches.

Teacher's Role in Problem-Solving Method

The teacher plays a significant role in problem-solving method. The teacher's role is to

- ensure an atmosphere of freedom in the class.
- create the problem situation.
- assist the students in accepting, defining and stating the problem.
- help the student in analysing the problem and in breaking up the problem into simple units.
- help the students keep their attention focussed on the main problem all the time.

- guide the students in locating relevant source materials.
- encourage the students in seeking important relationships in the data.
- help the students develop an attitude of open-mindedness and critical enquiry.
- exhibit spirit of enquiry and discovery

Criteria of a Good Problem

The teachers should be aware of the criteria of a good problem for evaluating the problems identified by the students.

- The problem should be real rather than an artificial one.

- The problem should be educational significant, productive of important and worthwhile learning.

- It should be possible of a solution. The students should be equipped with background information

   and skills which are prerequisite for solving the given problem.

- It should be related to the subunits, the unit and the course.

- It should be clear and free from ambiguities.

- It should be interesting and challenging.

- It should arouse the curiosity of the students.

- it should occur frequently in life situations.

- It should provide best mental discipline to the students.

- It should have both practical and social values.

- It should be neither too difficult nor too easy for the students.

Demerits of Problem-Solving Method

- Not all students are problem solvers.
- The problem-solving method becomes monotonous if used too frequently.
- It is time-consuming and consequently it is not possible to cover the syllabus on time.
- The success of this method depends upon computer science teachers who are well versed in critical thinking and reflective thinking. Not all computer science teachers are well versed in these types of thinking.
- Reference and resource materials may be difficult to come by.

STUDENT SEMINAR METHOD

The seminar method is the most modern and advanced method of teaching. A seminar is an advanced group technique which is usually used in higher education. It is an instructional technique it involves generating a situation for a group to have a guided interaction among themselves on a theme. It refers to a structured group discussion what usually follows a formal lecture or lectures often in the form of an essay or a paper presentation on a theme.

Reading maketh a full man; writing an exact man; and conference a ready man stated by Francis Bacon. The skills such as reading, writing and talking are essential for the personality

development of a man. The seminar method integrates such skills of reading and writing with presentation skills. This seminar method is employed to realize the higher objectives of cognitive & affective domains. The higher learning process requires the interactive and integrated methodologies based on the psychological principles. The seminar method applies such technique of human interaction / intervention with the learning and teaching experiences.

Aims & Objectives

This seminar method is utilized to realize the higher objectives of cognitive and affective domains.

Cognitive objectives

i. To develop higher cognitive abilities.

ii. To develop the ability of responding in this manner would involve higher cognitive actions.

iii. To develop the ability of keen observation of experience, feelings and

iv. To develop the ability to seek clarification and defend the ideas of others effectively.

Affective objectives

i. To develop the feeling of tolerance to the opposite ideas of others.

ii. To develop the feelings of co-operation with other colleagues and respect of the ideas and

feelings of others.

iii. To develop the emotional ability among the participants of the seminar.

iv. To acquire the good manners of putting questions and answering the questions of others

effectively.

The human interaction under this technique develops the good manners and skills among the participants. Provide a good learning and scholastic experience to the participants of seminar.

Pre-requisites (Basic Principles) to be included in the seminar:

This seminar method depends with the lingual, social and emotional instances and its maturity level. The complex and undefined concept or article must be read and discussed for the meaningful learning experiences and new concept. Group discussion is emphasized. The kernel of seminar is stressed. The value and success of the seminar depends on the path of the learner and their learning experiences through the discussion. The learner can advocate and interact in group discussion with his experiences and concept derived. Both the group and learner can transform their ideas and to derive a new conclusion also be anticipated. In the lower level of learning experiences the concepts are explanatory but in this higher level of learning experience the theme or concept and need more evidences and explanations through the discussion. The interactions in this method develop observation and questioning skills, evaluation skills using their own learning experience.

Advantages and special features of Seminar Method.

This seminar method gives good motivation and learning experience.

Help to evaluate the learn-ability of learners.

Regulate the creating and organizing of facts and information.

Dissemination and retrieval of information is scientifically managed.

Develop the self reliance and self confidence.

Also inculcates the responsibility and cooperative nature.

This method is the best for socialization.

Students' interaction is possible in participation and production of teaching learning

process.

Traditional monotony is abolished in this method.

Ensures the understandability and enhances the capability of the students learning.

Seminar is always subject / theme specific, so that sufficient knowledge about the

concerned subject can be developed.

The presenter or the reader of the article can get further clarifications in his subject. Develop the questioning skills. The data processing and analysis also play a vital role in this method. This makes teaching and learning process lively. The student receives good information from his teacher and the fellow students. A seminar does not end in the premises after the completion of discussion, the group in

smaller groups carries on the discussion in informal settings in off campus. This is

certainly a strong advantage of using seminar method.

Types of Seminar

Seminars are conducted in various stages. Based on the size

and organizational aspects the seminars can be classified in to four

types. viz.

1. Mini seminar

2. Major seminar

3. National seminar

4. International seminar

Mini seminar:

Its coverage and scope are small and simple. A small population is enough to hold this

seminar. A discussion held over the topic taught or to be taught with the students is known as Group discussion. Such group discussions held in an organized way within a class room, it is called mini seminar. This mini seminar gives the students training in questioning skills, organizing the information and presentation skills of seminar. A mini seminar is felt necessary because it gives good experience to conduct a major seminar at Institutional level.

Major seminar:

The seminar conducted at an institutional or departmental level for a specific topic or subject is known as Major seminar. Usually students and teachers are participating in this type of seminar. This major seminar can be organized at department level for every month. A specific topic or subject is selected for the theme of the seminar.

National seminar:

An association of any kind particularly with academic or professional interest or an

organization (Government, Firm, etc.,) conducts the seminar at National level is called National seminar. The subject experts are invited to the seminar for discussion. The Secretary of the seminar prepares the schedule and functionaries for seminar.

International seminar:

Usually the seminar conducted by an international organization or agency is known as International seminar. Theme of this seminar has wider aspects. Globalization, Renovation, Atomic energy agreements, Policies implementation and modification etc., are examples for themes of International seminars. A Nation or its body can conduct or organize the international seminar.

Merits of Seminar method:

☺ Naturally, the spontaneous learning can be achieved effectively in this method. ☺ Seminar is usually learner centered. ☺ Information seeking and retrieval behavior is encouraged very much in this method. ☺ The learner himself prepares and compiles his own paper for the seminar gives readiness of mind and learning becomes structured. ☺ Learning by doing is encouraged in this method. ☺ The paper presenter / participant receive a reinforced learning experience from the Group discussion. ☺ Learning experiences is highly structured by the learner himself. ☺ The

teacher or chair person of technical session only plays the Guidance and instructional role. ☺ Develops cognitive, affective domains based learning. ☺ Norms of behavior is developed and reinforced. ☺ Develops open mindedness, suppress the subjective ideas from the learners. ☺ The interactions and interrogations develops the spirit of information seeking behaviors (norms of behavior) ☺ The data processing skills, compilation skills, communication skill are easily inculcated in this method. ☺ Learner gets in-depth knowledge of the subject he presented. ☺ This method built better social values and fault tolerance levels in the minds of learner.

Limitations of Seminar method

Setting up of a seminar for every topic in the Text is not feasible. The subject area to be taught must be relevant to the theme of the seminar. The seminar themes must conform the

learning experiences to be inculcated to the students. This method found fit for higher learning only. Implementation of this method for lower classes is cumbersome. Only matured and balanced minded teachers can make this method successful. The teacher must be resourceful (both in academic and administrative) in nature. Time management is some what difficult.

Unnecessary gossips, glitches among the participants may deteriorate the scope and objectives of seminar. Passive observation without interaction also make seminar dull and worthless.

WHAT IS GROUP DISCUSSION?

Nowadays Group Discussion is being extensively used along with personal interviews for the final selection of candidates. It plays a main role in selecting the best among the best. Having scored high marks, students who get selected for a higher/another course or employment are placed on a par - on equal footing - based on their age, qualification and experience. It becomes necessary to conduct further screening for choosing a few among many. It is here, the Group Discussion plays an important part. It helps in choosing the socially suitable candidate among the academically superior achievers. It is one of the best tools to study the behavioral and attitudinal responses of the participants.

Rightly speaking, Group Discussion is more a technique than a conventional test. In fact it is one of the most important and popular techniques being used in a number of personality tests. It is a technique or a method used for screening candidates as well as testing their potential. It is also designed as a situation test wherein a sample of a candidate's group worthiness and potential as a worker comes out quite explicitly

Features Of Group Discussion

1.Group Discussion, as the name itself indicates, is a group activity carried out by participating individuals. It is an exchange of ideas among the individuals of a group on a specific topic.

2 It is used as reliable, testing device - mainly as a tool to assess all the candidates in a group at one go -in order to select the best in comparative perspective.

3.Group Discussion is an informal discussion in which participants of the same educational standard discuss a topic of current interest.

4.It is also known as leaderless discussion. It means its aim is to find out the natural leadership level of the candidates. Strictly speaking, no one from the group or outside will be officially designated as leader or president or chairman or anything of the sort. Even the examiner or supervisor who launches the discussion will retire to the background. No one will participate or intervene in the deliberations of the group.

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MIXED ABILITY GROUP

Mixed Ability Teaching Harris and Snow (2004) express their concern that the drive to raise achievement may have left Modern Languages teachers feeling they should be drawing yet more colourful flashcards or making up differentiated worksheets. They suggest that an alternative approach would be to focus on helping pupils to become more effective learners. They recommend giving pupils more ownership not only in the choice of content but also how they go about learning. This is in keeping with the findings of the HM Inspectors of Education (HMIE). In February 2007 HMIE produced a publication entitled "Modern Languages – A Portrait of Current Practice in Scottish Schools". It outlined good and bad practices within the 16 secondary schools visited by inspectors. Lessons that were considered to be poor were too teacher-led with interactions only through the teacher. In these classes teachers did not explain the purpose of activities to learners, relied too heavily on the textbook and there was no choice of activities. There was not enough collaboration in groups and insufficient differentiated tasks on offer. The report also gave examples of schools doing good work within the framework of a Curriculum for Excellence. In these schools teachers used a variety of teaching methods and shared the purposes of lessons and activities with learners. Pupils were given interesting and challenging tasks to complete co-operatively in groups. Teaching a mixed ability class will work if all pupils are allowed to experience success and to learn as individuals. It is less likely to be successful if teachers insist on whole class teaching and teaching to the average child. It is unrealistic to expect any group of pupils whatever the ability to work through a body of work at exactly the same pace. Two thirds of pupils will be working out of their learning style unless the type of task is varied. Fisher (2001:1) suggests that many children don't

achieve their potential because they are told "to make a journey but they have no map". Children cannot overcome blocks to learning if they have not learnt how to learn. Teachers should act as role models for learning and teach pupils how to become independent and effective learners. Pupils need to be taught learning techniques and how to be resourceful. Pupils will be more motivated if they understand the aim of a lesson and have some input. The teacher should reflect on classroom practice, adopt a problemsolving approach to any difficulties identified and experiment with a range of approaches. Teachers need to accept their new role first of all as a learner themselves and a facilitator of learning. "A secure teacher comes away from today with important questions to puzzle about overnight and the belief that today contains the insights necessary for a more effective tomorrow" (Tomlinson, 1999:28). The emphasis is not on what teachers teach but on what pupils learn. Researchers (Hallam & Toutounji, 1996; Harlen & Malcolm, 1997) are now suggesting that the key to success is not how pupils are grouped but the attitude and skills of the teacher in the classroom. So how can teachers become facilitators of learning and help pupils to become more effective learners?

Advantages of Mixed-Ability Grouping

Students who are placed in groups with mixed abilities benefit because they are grouped with other students who are not like themselves. This allows for the opportunity to learn about and accept differences. Mixed-ability grouping is great for discussion purposes and getting others' perspectives on things. It also helps students to understand each other better by increasing interaction among students who may not otherwise have the opportunity to interact. This can promote tolerance and the understanding and acceptance of differences.

In academics, higher-level students can help to push lower-level students further by modeling and encouraging them. This builds higher-level students' skills in consolidating information and mentoring others. It also exposes lower-level students to some of the higher-level thinking questions and problem-solving skills they might not observe if they remained in a low-level group. Also, working in a mixed-ability group builds self-confidence academically and socially, as well as patience and kindness.

Recent trends in Teaching

1. Constructivist learning

2. Problem based learning

3. Brain based learning

4. Collaborative learning

5. Flipped learning

6. Blended learning

7. e-learning trends

8. Video conferencing

RECENT TRENDS IN TEACHING

Constructivist learning

(1) Constructivist learning

Constructivism is a learning theory that has its foundation in philosophy and anthropology as well as psychology. The constructivist approach to education attempts to shift education from a teacher-dominated focus to a student-centered one. The role of the teacher focuses on assisting students in developing new insights. Students are taught to assimilate experience, knowledge and insights with what they already know and from this they need to construct new meanings. Constructivist learning is based on students' active participation in problem solving and critical thinking regarding a learning activity which they find relevant and engaging. They are "constructing" their own knowledge by testing ideas and approaches base on their prior knowledge and experience, applying these to new situations and integrating the new knowledge gained withpre-existing intellectual constructs.

In the constructivist theory the emphasis is placed on the learner or the student rather than the teacher of the instructor. It is the learner who interacts with objects and events and thereby gains an understanding of the features held by such objects or events. The learner constructs her own conceptualizations and solutions to problems. Learner autonomy and initiative is accepted and encouraged. Exploring or experiencing the physical surroundings, experiential education is a key method of constructivism. To the constructivists, the act of teaching is the process of helping learners creates knowledge. In constructivist thinking learning is also affected by the context, beliefs and attitude of the learner.

There are many different schools of thought within this theory, all of which fall within the same basic assumption about learning. The main two are: Cognitive constructivism (e.g., Theory of Piaget) and Social constructivism (e.g., Theory of L.S. Vygotsky).

Cognitive Constructivism

Cognitive constructivism is generally attributed to Jean Piaget, who articulated mechanisms by which knowledge is internalized by learners. The process of accumulating the knowledge are through accommodation and assimilation, individuals construct new knowledge from their experiences.

It is important to note that constructivism is not a particular pedagogy. In fact, constructivism is a

theory describing how learning happens, regardless of whether learners are using their experiences to understand a lecture of following the instructions for building a model airplane. In both cases, the theory of constructivism suggests that learners construct knowledge out of their experiences. However, constructivism is often associated with pedagogic approaches that promote active learning, or learning by doing. Today constructivist teaching is based on recent research about the human brain.

The major views of constructivism can be summarized as follows:

- Emphasis learning and not teaching
- Encourage and accepts learner autonomy and initiative
- Sees learners as creatures of will and purpose
- Thanks of learning as a process
- Encourages learner inquiry
- Acknowledges the critical role of experience in learning
- Nurtures learners natural curiosity
- Takes the learner's mental model into account etc..

Social Constructivism

Social constructivism maintains that human development is socially situated and knowledge is constructed through interaction with others. It is a sociological theory of knowledge that applies the general philosophical constructivism into the social assumptions of Social Constructivism.Social constructivism is based on specific assumptions about reality, knowledge, and learning. To understand and apply models of instruction that are rooted in the perspectives of social constructivists, it is important to know the premises that underlie them. The most important assumptions of the theory of social constructivism is

1. The assumption that human beings rationalize their experience by creating a model of the social world and the way that it functions

2. The belief in language as the most essential system through which humans construct reality

PROBLEM BASED LEARNING (PBL)

Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a

subject through the experience of solving an open -ended problem. Students learn both thinking strategies and domain knowledge. Problem - based learning (PBL) is an approach that challenges students to learn through engagement in a real problem. It is a format that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem-solvers confronted with an ill-structured situation that simulates the kind of problems they are likely to face as future managers in complex organizations. Problem-based learning makes a fundamental shift from a focus on teaching to a focus on learning. The process is aimed at using the power of authentic problem solving to engage students and enhance their learning and motivation. There are several unique aspects that define the PBL approach:

- Learning takes place within the contexts of authentic tasks, issues, and problems that are aligned with real world concerns.

- In a PBL course, students and the instructor become co-learners, co-planners, co-producers, and co-evaluators as they design, implement, and continually refine their curricula.

- The PBL approach is grounded in solid academic research on learning and on the best practices that promote it. This approach stimulates students to take responsibility for their own learning, since there are few lectures, no structured sequence of assigned readings, and so on.

- PBL is unique in that it fosters collaboration among students, stresses the development of problem solving skills within the context of professional practice, promotes effective reasoning and self-directed learning, and is aimed at increasing motivation for life-long learning.

Problem-based learning begins with the introduction of an ill-structured problem on which all learning is centered. Most of the learning occurs in small groups rather than in lectures. Teacher's role is more like that of a facilitator and coach of student learning, acting at times as a resource person, rather than as knowledge-holder and disseminator. Similarly, your role, as a student, is more active, as you are engaged as a problem-solver, decision-maker, and meaning-maker, rather than being merely a passive listener and note-taker.

Characteristics of Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is a pedagogical approach and curriculum design

methodology often used in higher education and K-12 standard settings.

The following are some of the defining characteristics of PBL:

1. Learning is driven by challenging, open-ended problems with no one "right" answer
2. Problems/cases are context specific
3. Students work as self-directed, active investigators and problem-solvers in small collaborative groups (typically of about five students)
4. A key problem is identified and a solution is agreed upon and implemented
5. Teachers adopt the role as facilitators of learning, guiding the learning process and promoting an environment of inquiry

Learning outcomes of Problem Based Learning

A well designed Problem based learning task provides students with the opportunity to develop skills related to:

- Managing tasks and holding leadership roles
- Oral and written communication
- Self-awareness and evaluation of group processes
- Working independently
- Critical thinking and analysis

Basic Steps in designing a Problem Based Learning Task

There are some important aspect which we want to take care before going for a problem based learning task

1. Articulate the learning outcomes of the task. What do you want students to know or be able to do as a result of participating in the assignment?
2. Create the problem. Ideally, this will be a real-world situation that resembles something students may encounter in their future class or lives. Cases are often the basis of PBL activities.
3. Establish ground rules at the beginning to prepare students to work effectively in groups.

4. Introduce students to group processes and do some warm up exercises to allow them to practice assessing both their own work and that of their peers.

BRAIN BASED LEARNING (BBL)

Brain - based learning refers to teaching methods, lesson designs, and school programs that are based on the latest scientific research about how the brain learns, including such factors as cognitive development-how students learn differently as they age, grow, and mature socially, emotionally, and cognitively. It is totally based on the structure and function of the brain. As long as the brain is not prohibited from fulfilling its normal processes, learning will occur. Brain-based learning is motivated by the general belief that learning can be accelerated and improved if educators base how and what they teach on the science of learning, rather than on past educational practices, established conventions, or assumptions about the learning process. For example, it was commonly believed that intelligence is a fixed characteristic that remains largely unchanged throughout a person's life. However, recent discoveries in cognitive science have revealed that the human brain physically changes when it learns, and that after practicing certain skills it becomes increasingly easier to continue learning and improving those skills.

Instructional techniques emerges from Brain Based Learning

The three instructional techniques associated with brain-based learning:

1. ***Orchestrated immersion***: Creating learning environments that fully immerse students in an educational experience.

2. ***Relaxed alertness***: Trying to eliminate fear in learners, while maintaining a highly challenging environment.

3. ***Active processing***: Allowing the learner to consolidate and internalize information by actively processing it.

COLLABORATIVE LEARNING

Effective communication and Collaboration are essential for becoming a successful learner. It is primarily through dialogue and examining different perspectives that students become knowledgeable, strategic and self-determined and empathetic. Moreover, involving students in real world tasks and linking new information to prior knowledge requires effective communication and collaboration among teachers, students and others. Indeed it is through dialogue and interaction that

curriculum objectives come alive. Collaborative learning affords students enormous advantages which is not available in traditional instruction.

"Collaborative learning" is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning activities vary widely, but most center on students' exploration or application of the course material, not simply the teacher's presentation or explication of it.

Collaborative learning represents a significant shift away from the typical teacher centered or lecture-centered milieu in college classrooms. In collaborative classrooms, the lecturing/ listening/note-taking process may not disappear entirely, but it lives alongside other processes that are based in students' discussion and active work with the course material. Teachers who use collaborative learning approaches tend to think of themselves less as expert transmitters of knowledge to students, and more as expert designers of intellectual experiences for students-as coaches or mid-wives of a more emergent learning process.

Essential features of Collaborative Learning

1. A group learning task is designed based on shared learning goals and outcomes
2. Students work in teams to master academic materials
3. Reward systems are group oriented than individual oriented
4. Co-operative behavior involves trust building activities, joint planning and understanding of team support.
5. Students involvement in learning activities are more
6. Encourages students to acquire an active-voice in shaping their ideas

Advantages of Collaborative Learning

1. Promotes social and intellectual involvement
2. Cultivation of teamwork, community building, and leadership skills
3. Enhanced student satisfaction and promoting positive attitudes
4. Open expression of ideas in groups

5. Patience in hearing others

6. Team building

7. Shared responsibility

FLIPPED LEARNING

Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter.

Flipped Learning Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions. The flipped classroom describes a reversal of traditional teaching where students gain first exposure to new material outside of class, usually via reading or lecture videos, and then class time is used to do the harder work of assimilating that knowledge through strategies such as problem solving discussion or debates.

Flipped Classroom and Implications for Teaching

The flipped classroom constitutes a role change for instructors, who give up their front-of-the-class position in favor of a more collaborative and cooperative contribution to the teaching process. There is a concomitant change in the role of students, many of whom are used to being cast as passive participants in the education process, where instruction is served to them. The flipped model puts more of the responsibility for learning on the shoulders of students while giving them greater impetus to experiment. Activities can be student-led, and communication among students can become the determining dynamic of a session devoted to learning through hands-on work.

BLENDED LEARNING

Blended learning is a planned combination of online learning and face-to-face instruction using variety of learning resources. It is a flexible learning strategy that integrates innovative and technological advances of online learning with interaction and participation of traditional face-to-face classroom learning.

Blended learning strategies vary according to the discipline, the year level, student characteristics and learning outcomes, and have a student-centered approach to the learning design.

Blended learning can promote learner's access and flexibility, increase the level of active learning, and achieve better student experiences and outcomes. For teachers, blended learning can improve teaching and class management practices. A blend might include:

1. Face-to-face and online learning activities and formats

2. Traditional classes with different modalities, such as regular, weekend, evening, part time, semester

3. Use of technology interfaces like social media, wikis and various web sources

4. Group work, Simulation, debate, Online Assignments, Practicals etc.

5. Both usual classroom human factors and digital learning resources of the web

6. Psychological concerns are addressed in the face to face interaction and technological concerns are addressed in the online learning

Blended learning should be viewed as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment, rather than a ratio of delivery modalities.

Teachers in the Blended learning modality can

- Foster a class culture of hard work and persistence
- Monitor students throughout the period for motivation and learning
- Intervene to personalize instruction when data shows that students are struggling
- Build personal relationships of trust and caring

E-LEARNING

e-learning is the use of electronic media and information and communication technologies (ICT) in education. E-learning is broadly inclusive of all forms of educational technology in learning and teaching. Technology-Enhanced Learning (TEL), Computer-Based Instruction(CBI). Computer-Based Training (CBT), Computer-Assisted Instruction or Computer - Aided Instruction (CAI),Internet-Based Training (IBT), Web-Based Training (WBT), Online education, Virtual education, Virtual Learning Environments (VIE). e-learning can occur in or out of the classroom.

Synchronous and asynchronous

e-learning may either be synchronous or asynchronous. Synchronous learning occurs in real-time, with all participants interacting at the same time, while asynchronous learning is

self-paced and allows participants to engage in the exchange of ideas or information without the dependency of other participants involvement at the same time.

Synchronous learning involves the exchange of ideas and information with one or more participants during the same period of time. A face-to-face discussion is an example of synchronous communications. In e-learning environments, examples of synchronous communications include online real-time live teacher instruction and feedback, Skype conversations, or chat rooms or virtual classrooms where everyone is online and working collaboratively at the same time.

Asynchronous learning may use technologies such as email, blogs, wikis, and discussion boards, as well as web-supported textbooks, hypertext documents, audio video courses, and social networking. Asynchronous learning is particularly beneficial for students who have health problems or have child care responsibilities and regularly leaving the home to attend lectures is difficult.

e-Learning trends

1. Automation
2. Augmented Learning
3. Big Data
4. Going for Cloud Computing
5. Gamification
6. M - Learning
7. Personalization

VIDEO CONFERENCING

Video conferencing is two-way interactive communication delivered using telephone or Internet technologies that allows people at different location to come together for a meeting. The video conference can be as simple as a conversation between two people in private offices involve several siteswith more than one person in large rooms at different sites. A basic video conference setup has a camera and a microphone. Video from the camera and audio from the microphone is converted into a digital format and transmitted to a receiving location using a coding and decoding device, often referred to as a "codec". At that receiving location is another codec device that decodes the receiving digital stream into a form that can be seen and heard on monitors or

televisions. At the same time, video and audio from cameras and microphones at the received location is sent back to the original location.

Benefits of Video Conferencing

Video conferencing saves travel time and money. Participants can see and hear all other participants and communicate both verbally and visually, creating a face- to- face experience. PowerPoint and other on screen graphic, as well as other cameras are also available presentation options. People downtime is reduced and productivity gains are achieved by removing the logistics of flight preparations, airport delays, hotel stays, and all the other inconveniences of business travel. In distance education, video conferencing provides quality access to students who could not travel to or could afford to relocate to a traditional campus. Video conferences can also be recorded and made available in a variety of ways. Besides distance education, other applications include meetings, dissertation and thesis defenses, tele-medical procedures, and online conferences.

People use video conferencing when:
- a live conversation is needed.
- visual information is an important component of the conversation.
- parties of the conversation can't physically come to the, same location.
- expense or time of travel is a consideration.
- examples of how video conferencing can benefit people around campus.
- guest lecturer invited into a class from another institution.
- researcher collaborates with colleagues at other institutions on a regular basis.
- thesis defense at another institution.
- administrators from different parts of campus need to collaborate on administrator issues such as a campus strategic plan.
- researcher needs to meet with a review committee about a grant.
- student interviews with an employer in another city.

Conclusion

Every learner learns on his/her own unique way and strategy. The learning is taking place with an individual speed, depending on student's attitude and level of prerequisite knowledge. In designing the teaching process, teacher should take into consideration differences among the students in the target group. Enough of space must be provided for processing and memorizing the presented information. Combination of different teaching methods can produce quality in fulfilling all teaching functions.

Questions for Discussion and Reflection

1. Explain the teacher centered methods of teaching computer science
2. How will you integrate recent trends in teaching of computer science concepts?
3. Explain the importance of learner centered methods of teaching computer science.
4. Discuss the interactive methods of teaching computer science .
5. Explain the significance of video conferencing in education.

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Unit - V Resources for Teaching Computer science

Objectives:

After the completion of the unit, the learners will be able to:

1. explain the various types of resources for teaching Computer science.
2. adopt the community resources in the instructional process.
3. utilize the information and communication technology resources in teaching
4. identify the needs of resources in teaching Computer science.

Introduction

Teachers use a wide range of stimulating and exciting materials to teach the concepts outlined in the curriculum to ensure that students are actively involved in their learning. In time, students and parents witness a shift from textbook based to standards based instruction, bringing educational practices in line with the best school systems around the world. The power of the

learning environment to influence and promote learning is significant and the learning spaces and learning resources provide important opportunities for students to explore ideas and knowledge, collaborate, solve problems and develop knowledge and skills. Carefully selected digital technology resources are used to enable children to access global connections and resources while also encouraging new ways of thinking. The introduction of technology rich environments and multi-sensory resources can also be useful in reaching each student strengths and engaging students to become life-long learners.

Print Resources

Print resource refers to paper publications circulated in the form of physical editions of books, magazines, journals and newsletters. Print resource improves the students reading skills and vocabulary development. It is a good source of additional information for teachers. It helps the teacher for both lecture and Linguistic. Lecture approach - source of information for the teacher's lessons .Linguistic Approach - help to develop ones vocabulary and reading skills.

(i)News papers

Teachers are always looking for new ways to create student interest in current events. One of the best ways to do so is to utilize newspapers in the classroom. In the past teachers would deem newspaper reading as boring, and leave it to a once a month lesson. Using newspapers in the classroom is an effective classroom teaching tools for several reasons:

1. It makes learning fun.
2. It's an inexpensive way to educate.
3. It's adaptable for all grades and curriculum.
4. Provides good reading habits.
5. Has a section of interest for everyone like comics and sports.
6. Reinforce math concepts by challenging students to find and circle as many numbers as they can in the newspaper in two minutes. Then challenge them to find and circle as many math words as they can.
7. Make the students to solve the Sudokku and Puzzles.

Tips for Using the Newspaper in Class

1. Allow students time to read the paper.

2. Focus on one section at a time.

3. Introduce new vocabulary words first.

4. Explain the functions of a newspaper and how it works before you start a lesson.

5. Use the sports section to reinforce math concepts.

(ii)Journals

An academic or scholarly journal is a periodical publication in which scholarship relating to a particular academic discipline is published. Academic journals serve as permanent and transparent forums for the presentation, scrutiny and discussion of research. They are usually peer-reviewed or refereed. It is a daily record of news and events of a personal nature. Newspaper or magazine that deals with a particular subject or professional activity. Some of the Computer science journals are:

(iii) Encyclopedia

An encyclopedia is a type of reference work holding a comprehensive summary of information from either all branches of knowledge or a particular branch of knowledge. Encyclopedias are divided into articles or entries, which are usually accessed alphabetically by article name. Encyclopedia entries are longer and more detailed than those in most dictionaries Generally speaking, unlike dictionary entries, which focus on linguistic information about words encyclopedia articles focus on factual information concerning the subject.Some of the Computer science encyclopedia are the Encyclopedia of Computer science (also EOM and formerly Encyclopedia of Computer science) is a large reference work in computer science and Britannica encyclopedia for the history of Computer science

Audio Visual Resources

Audio visual aids are important tools for teaching learning process. It helps the teacher to present the lesson effectively and students learn and retain the concepts better and for longer duration. Use of audio visual aids improves students' critical and analytical thinking. It helps to remove abstract concepts through visual presentation. However, improper and unplanned use of these aids can have negative effect on the learning outcome. It develops the students listening skills as well as make learning more effective. In this approach students think deeply with these learning materials.

Audio resources:

(i) Radio talk

It is a radio formatcontaining discussion about topical issues. Most shows are regularly hosted by a single individual, and often feature interviews with a number of different guests. Talk radio typically includes an element of listener participation, usually by broadcasting live conversations between the host and listeners who "call in" (usually via telephone) to the show. Listener contributions are usually screened by a show's producer(s) in order to maximize audience interest and, in the case of commercial talk radio, attract advertisers. Generally, the shows are organized into segments, each separated by a pause for advertisements; however, in public or non-commercial radio, music is sometimes played in place of commercials to separate the program segments. Variations of talk radio include conservative talk, hot talk, liberal talk (increasingly known as Progressive talk) and sports talk.

(ii) Audio tapes

Audio tapes support students learning in the following ways. It

1. provides diverse teaching techniques for learning
2. gives the teacher a voice– this can reduce the feeling of isolation for cloud based students, but also helps located students feel connected
3. can be used to simplify and explain complex problems
4. can allow students to access the learning materials as often as required
5. allows students to learn at their own pace, with instant playback, rewind and pause
6. reduces frequently asked questions from students
7. can be re-used

(iii) DVDs and CDs

The introduction of educational CDs and DVDs for school children has made studies very interesting for students as well as parents. These tools provide children with real life examples helping them to easily understand what is being conveyed to them. These CDs and DVDs help the children in their overall development by familiarizing them with technology and their uses.

Today there is a wide range of educational CDs and DVDs for school children of all ages, available in various stores as well as online. They help in transforming our passive system of learning into an interactive one with the help of high quality graphics and videos along with text that help children retain things in their memory for a long time.

The benefits of learning through educational CDs and DVDs are:

1. They provide a good overall experience for children.

2. Preschooler can easily learn reading skill with the help of these digital tool.

3. School giving children can easily understand the concepts through various graphical representation and illustrations.

4. Practice session using the tools can enhance their knowledge considerably on various topics.

Visual Resources:

(i) Pictures

Pictures make concepts memorable and employable. When someone views the image, they rapidly associate it with the principle. This enables imagery to play a primary role in creating culture in an organization because every culture speaks a language. A set of images can quite literally represent an entire value system. There is significant impact on the learner when a visual aid is connected to a verbal explanation. It actually speeds up the learning process.

(ii) Charts

The primary advantage of using a chart in a presentation is that they help the audience to visualize the point of the presentation. It emphasize the main point, make the data more convincing, provide a compact way of presenting information and help audiences stay engaged. Disadvantages of using chart includes being time consuming to construct and costly to produce. They also require technology that some may lack.

(iii)Posters

Poster is the process of showing the content and the findings of a topic to an audience or a group of audiences at different times. It is often used to assess student learning in group research projects. Peer and tutor assessment can be used as part of the grading process.Poster assessment encourages creativity.Poster assessment is short and succinct. This would require the students to thinkdistinctively and select the important factors that need to be shown. The ability to summarize is important.Poster assessment can be assessed by peers at different times even without the presence of the creator.

(iv)Photographs

A Photograph is worth a thousand words through which a complex idea can be conveyed with just a single still image. Pictures make it possible to absorb large amounts of data quickly. Using photographs for explaining complex phenomena is one of the teaching aids of modern education system all over the world. As the world is changing day by day so are the methods of instructions as the modern curriculum requires conceptual elaborations. Visual aids have the tendency to materialize the thoughts of students in the form of graphics to give thoughts a concrete

frame of reference. Use of photographs is important for students because they are more likely to believe findings when the findings are paired with colored images describing complex situations during learning as opposed to other representational data such as complex book text.

(v) Flash cards

There are many ways to help children learn math facts. Flash cards can be effective if it is used at right time.It is important to help children build a conceptual understanding of facts so that one can transfer knowledge across contexts. After conceptually understanding facts, flash cards can helps to improve math fact fluency by isolating individual concepts, encouraging to focus attention and effort on specific components of complex computer science problems.

A flashcard or flash card is a set of cards bearing information, as words or numbers, on either or both sides, used in classroom drills or in private study. One writes a question on a card and an answer overleaf. Flashcards can bear vocabulary, historical dates, functions or any subject matter that can be learned via a question-and-answer format. Flashcards are widely used as a learning drill to aid memorization by way of spaced repetition.

ICT Resources

(i)Radio

Radio has been used in different formats for educational purposes the world round. Radio technology was first developed during the late nineteenth century and came into popularity as an educational medium during the early twentieth century. Although often overshadowed as educational medium vis-à-vis other technologies such as television, radio remains a viable medium that has proven educational worth in terms of both pedagogical importance and geographical reach. Radio is capable of delivering high quality educational programming to highly diversified audiences located across broad geographical expanses – all at a low per unit production cost. Three main advantages of radio: (1) improved educational quality and relevance; (2) lowered per student educational costs; and (3) improved access to education, particularly for disadvantaged groups.

(ii) TV

When teachers use educational television programs during class, the relationship between them and their students changes. Usually the status quo of the classroom is the teacher imparts knowledge while students absorb the information. Educational programs change the status quo by, in

a way, making the educator and children peers who can share and discuss the viewing experience. Teachers can take advantage of this shift in roles by encouraging small group discussions after watching the show. Educators can set specific goals or activities for students in these small groups, which allows them to explore their own questions and share their ideas on the given topic with their classmates. The instructor can then ask one member of the small group to share their team's insights with the rest of the class, strengthening the absorption of knowledge.

(iii)Internet

The internet has a lot to offer the teacher. There are authentic resources and materials, places where you can find prepared lesson plans, ideas and worksheets. The advantages of the internet to teachers include

- The incredible expanse of the internet means the teacher has the ability to tailor lessons very specifically to students' needs and interests. Learners tend to respond better when they feel involved and engaged in the subject and the extent of the web means that if you can find out what the students are interested in, you can find it on the web.

- Much material is modern and up to date, which helps motivate students. Good web sites continually update their material.

- Students enjoy using the net in their free time, and will appreciate its use in class

- It's a dynamic medium involving movement from site to site, promoting decision-making and learner independence.

The internet contains a lot of resources that teachers can access and use to prepare teaching materials. These range from sites specifically designed for teachers and learners to sites from national and international newspapers, museums, galleries and so on. Teachers can use these materials much the same way as they would other print-based resources, to create worksheets. But if teachers are fortunate enough to have access to a computer room in their school then it is possible to use the internet with students during a class, exploiting the net as a dynamic medium.

Using the internet brings the 'real world' into the classroom and gives the students an opportunity to explore learning in a different way. However, having students facing a computer rather than the teacher, means teachers of internet lessons do need to be vigilant.

(iv) Multimedia

One of the techniques to improving the students' meets the academic needs and helps them developing mathematical skills is providing multimedia during the process of teaching and learning in the classroom. *It* means the use of electronic media to store and experience *multimedia* content. *Multimedia* means that computer info can be represented through audio, graphics, image, video and animation in addition to traditional media. Multimedia classroom provide the students chances for interacting with diverse texts. The writing aims to find out some advantages of the use of multimedia in the classroom. Through the media the teacher could give more opportunity to students to express their opinions and enjoy during the course. The highly presence and motivation also bring positive aspects to students so that they can improve their skills.

(v) Interactive white board

We connect the white board to a computer and share documents, websites and even play games. With a large touch screen, students will be excited to come up to the white board to help complete notes, do examples or take part in one of the many interactive games and demonstrations that can be used.

Community Resources

Community experiences can enrich social studies in instructions in ways more than one. To achieve the purposes of social studies, the child must, become a real part of the community in which he lives, interact with it and contribute to it. To become an effective citizen, the child must become a responsible member of community with civic attitudes and ideals compatible with the spirit of democracy. There is no more effective way of becoming this kind of person than through practicing what such a person will do.

A variety of community experiences offer the child the laboratory in which he may experiment with life in the community and begin to find his place in it.It is good to note that it is impossible to separate the school from the community. They are glued together the aspirations of the community are the manifestations of the school system. The idea of making the community the best of the school and the school the best of the community represents a fruitful and essential extension of accepted educational thinking and practice. In order to nourish and invigorate democracy, community study and service through school education must be made essential. This movement is the most significant single development of its kind in our generation, and it seem destined to grow greatly with continuing sound experimentation at all school levels, in all teaching field, with all

types of students, and in all community areas – local, regional, national and international. The most important community resources for teaching Computer science areField trips, Computer science Exhibition, Computer science Lab, Computer science Resource Centre and Computer science Club.

(i) Field Trips

Field trips is undertaken for securing information, changing attitudes, awakening interest, developing appreciation, promoting ideals, enjoying new experiences. They can initiate a unit of study, they can be a part of the core of it or they can give it the finishing touch. They are a very good means of getting knowledge first hand of confirming and supplementing second hand knowledge. They are a means for sharpening observation, testing principles and doing everything.

Field trips are useful for educational purposes in many ways:

(i)They stimulate imagination and learning by providing sensory perceptions

(ii) They integrate classroom instruction by exposing the artificially of traditional subject matter divisions and enable the pupils to view facts and forces as they exist in their everyday relationship in living communities.

(iii)Through the filled trips, the students may come to realize community in ways which bookish learning cannot by its very nature allow.

(iv)They enable the pupils to learn the art of living with others such as travelling in the same conveyances, sharing rooms, sitting at the same table.

(v)They expand emotional and intellectual horizons by making them acquainted with people whose manner, customs, living standards, outlook and interests may be quite different from their own.

Qualities of a Computer science Textbook

The qualities of a good textbook in computer science can be broadly classified under Physical features, Author, Content, Organization and presentations, Language, Exercise and illustration.

(i) Physical features:

1. Paper: the paper used in the textbook should be of superior quality
2. Binding: it should have quality strong and durable binding
3. Printing: it should have quality printing, bold font and easily readable font.
4. Size: bulky and thick. It should be handy
5. Cover: it should have an appealing and attractive cover page.

(ii)Author

1. Qualified author should write it
2. Experienced teacher should write it

3. Competent teachers should write it

4. It should be written by committee of experts constituted by the state government

5. For the authors, certain minimum academic and professional qualifications may be prescribed.

(iii)Content

1. It should be child centered

2. The subject matter should be arranged from simple to complex and concrete to abstracts.

3. The subject matter should create interest in the pupil.

4. It should be objective oriented

5. It should be written according to prescribed syllabus

6. It should satisfy the demands of examination

7. The answers given at the end of each section should be correct

8. It should include the recent developments in the computer science relating to the content dealt with.

9. Oral computer science should fine its due place in the textbook.

(iv) Organization and presentation

1. It should provide for individual differences.

2. There should be sufficient provision for revision, practice and review.

3. It should stimulate the initiative and originality of the students

4. It should offer suggestion to improve study habits.

5. It should facilitate the use of analytic, synthetic, inductive, deductive, problem solving and heuristic approaches to teaching.

6. Content should be organize in a psychological consideration.

7. Content should be organize in a logical way.

8. It should suggesting project work, fieldwork and laboratory work.

(v)Language

1. The language used in the textbook should be simple and easily understandable and within the grasp of the pupils

2. The style and vocabulary used should be suitable to the age group of student for whom the book is written.

3. The term and symbols used must be those, which are popular and internationally accepted

4. It should be written in lucid, simple, precise and scientific language.

(vi)Exercise and Illustrations:

1. The illustrations should be accurate
2. The illustrations should be clear and appropriate
3. It should contain some difficult problems
4. It should contain exercises to challenge the mathematically gifted students.
5. There should be well-graded exercises given at the end of every topic.
6. The exercise should develop thinking and reasoning power of the pupils.

Qualities of computer science Teacher

1. Motivate and engage the students.
2. convey the beauty of the subject.
3. encourage their students to go beyond the classroom with their learning.
4. help them feel confident in their mathematical abilities.
5. have sound subject knowledge.

6. make the subject easier by adopting suitable strategy.
7. provide guidance and support to the students while solving the problem.
8. provide alternate strategies to help struggling students grasp difficult concepts.
9. have good attitude and actions.

Conclusion

Imagination and creativity in using community resources can help students connect school science and computer science with applications in the community, as well as helping students better learn basic concepts. Children learn science and computer science from many sources, in a range of different ways, and for a variety of purposes. Taking students out onto the school grounds, exposing them to innovative materials, or inviting guests who can give unique insights are a few ways to increase their learning experiences. Teachers should be well trained through in-service training to

maximize the benefits of using these aids. The curriculum should be designed such that there are options to activity based learning through audio-visual aids. In addition, government should fund resources to purchase audio-visual aids in schools.

Questions for Discussion and Reflection

1. Discuss the effect of ICT resources for teaching Computer science.
2. What are print resources? Explain the need of print resources for teaching Computer science.
3. Analyse the various types of resources in teaching Computer science.
4. Bring out the need for community resources in the Mathematical instructional process.
5. Explain the different types of audio and video resources with examples.

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