Lesson Planning

Meaning :- Preparing and planning for the lesson the teacher has to teach in class.

What lesson plan contains :-

→ What am I teaching? কি পড়া "
→ How will I teach? কেমনভাবে "
→ Whom will I teach? কাকে "
→ How will I check student?

★ According to Lester B. Stands, "A lesson plan is actually a plan of action". ~~It therefore~~

★ Carter V. Good defines a lesson plan as "a teaching outline of the important points of a lesson arranged in order in which they are to be presented. It may include objectives, points to be asked, references to materials, assignments, etc."

Characteristics :-

1. Pre planned plan
2. Creates T-L environment / effective.
3. Helps to achieve instructional objectives
4. Carries Teaching in systematic order
5. Makes TL process effective

Aims & Objectives

1. Shape the teaching work
2. Ensure continuity in TLP
3. Save time and energy
4. Develop self confidence in teacher
5. Select appropriate teaching method
6. Formulate questions for recapitulation
7. Frame assignments / HW for students
8. Ensure pupil participation
9. Arrange T materials eg. models, charts
10. Framed evaluation program.

STEPS INVOLVED IN LESSON PLAN (HERBARTIAN STEPS)

a) Preparation ~~or Introduction~~ (Pre teaching phase)
b) Presentation / Introduction
c) Association or Comparison
d) Generalisation
e) Application
f) Recapitulation / (Revision)
Summary
Questioning
H.W

Nature & kinds of Proofs :-

Proofs (Statement, assumption, postulates) helps in proofing

Meaning:- Presentation of logical arguments that explain the truth of a particular statement by starting with things that are assumed to be true and then ending with the statement we are trying to prove

Kinds of Proof :-

① **Direct Proof :-** To show that $\forall x \in S$, ~~P(x)~~ = $P(x) \rightarrow Q(x)$ is true, we must demonstrate that $P(x) \rightarrow Q(x)$ is true for every element $x \in S$

assumes that hypothesis is true

Step
1) P is true
2) Then we prove that q is true $P \Rightarrow Q$

Eg :- Sum of any two odd integers is even

Proof. Assume that m & n are two odd integers

$m = 2a+1$ & $n = 2b+1$ for some integers

This follows,

$$m+n = 2a+1 + 2b+1$$
$$= 2a + 2b + 2$$
$$= 2(a+b+1)$$
$$= 2k \quad \text{(even integer)}$$

kinds of proofs

(i) Direct proof / deductial

This is the process of starting with facts that you know to be true and following logical steps to prove the statement

eg

(i) Statement :- If x is even, x^2 is even

Proof If x is even, $x = 2k$ $(k \to \mathbb{Z})$

$x^2 = 4k^2$

$= 2(2k^2)$

* A multiple of 2 is by defn an even no.

$\therefore$ If x is even, x^2 is even

(2) Statement :- sum of any two odd integers is even

Assume the 2 odd integers to be m & n respectively

$\therefore$ $m = 2a+1$
$n = 2b+1$

This follows $m+n = 2a+1 + 2b+1$

$= 2a + 2b + 2$

$= 2(a+b+1)$

$= 2k$ even

② Mathematical induction :- It is a mathematical technique which is used to prove a statement, a formula, or a theorem is true for every natural number.

Eg

① $3^n - 1$ is a multiple of 2 for $n = 1, 2, 3 \ldots$

Step : $P(n) : 3^n - 1$

Step 1 : for $n = 1$, $3^1 - 1 = 2$.

Step 2 : Assume for $P(k) : 3^k - 1$ is true for $n = k$

Step 3 : Prove $P(k+1)$ is true

$P(k+1) : 3^{k+1} - 1$

$= 3 \cdot 3^k - 1$

$= (2+1) 3^k - 1$

$= 2 \cdot 3^k + \underbrace{3^k - 1}$

(2) Prove that $f(n) = n^3 - n$ is divisible by 3 for all $n \in Z^+$

(1) Verify for $n = 1$, $1 - 1 = 0$

(2) Assume true for $n = k$ i.e $k^3 - k$ is true

(3) for $n = k+1$

$$f(k+1) = (k+1)^3 - (k+1)$$

$$= k^3 + 3k^2 + 3k + \cancel{1} - k - \cancel{1}$$

$$= k^3 + 3k^2 + 3k - k$$

$$= 3k^2 + 3k + \underbrace{k^3 - k}_{\text{True}}$$

$$\cancel{f(k+1)} = \cancel{3}(k^2 + k) + \text{True}$$

$f(k+1)$ is also true

$\therefore$ $f(n) = n^3 - n$ is divisible by 3. for all $n \in Z^+$

③ Proof by contradiction

This technique involves ~~that~~ assuming that the statement is not true (negation)

Eg

① If n^2 is even then n is even

→ Start with the negation of original ~~sentence~~ statement

Assume that n^2 is even ~~but~~ & n is odd

n is odd so $n = 2k+1$

$$\therefore n^2 = (2k+1)^2$$
$$= 4k^2 + 4k + 1$$
$$= 2\underbrace{(2k^2 + 2k)}_{\text{even}} + 1$$

$$n^2 = \text{odd}$$

So n^2 is odd this contradicts that n^2 is even

$\therefore$ If n^2 is even than n must be even.

(2) If $3n+2$ is odd then n is odd

Assume that n is not odd i.e

n is even which means $n = 2k$ $(k \to I)$

$3n+2 = 3(2k) + 2$

$= 6k+2$

$= 2(3k+1)$

$=$ even

So. $3n+2$ is even, this contradicts that $3n+2$ is odd.

$\therefore$ If $3n+2$ is odd then n must be odd.

(4) **Proof by cases**

$n^2 + 3n + 5$ is an odd integer for $n \in \mathbb{Z}$

Case 1) n is even

let, $n = 2k$ for $k \in \mathbb{Z}$

then, $n^2 + 3n + 5$

$= (2k)^2 + 3(2k) + 5$

$= 4k^2 + 6k + 5$

$= 4k^2 + 6k + 4 + 1$

$= 2(\ldots$

Case 2 n is odd

$n = 2k+1$

then, $n^2 + 3n + 5$

$= (2k+1)^2 + 3(2k+1) + 5$

$= 4k^2 + 4k + 1 + 6k + 3 + 5$

$= 4k^2 + 10k + 9$

$= 4k^2 + 10k + 8 + 1$

$= 2(2k^2 + 5k + 4) + 1$

$=$ odd

5. Proof by contrapositive

: If $p \to q$

then $\sim p \to \sim q$

Eg If $3n+2$ is an odd integer, then n is odd

Proof :- ~~than~~ Assume that n is even

$\Rightarrow n = 2k \quad (k \to I)$

then $3n+2$

$= 3(2k)+2$

$= 6k+2$

$= 2(3k+1)$

$=$ even.

Eg

If n is odd then n^2 is odd

Assume that n is even

$\therefore n = 2k$

$\Rightarrow n^2 = (2k)^2$

$= 4k^2$

$= 2(2k^2)$

$=$ even

Disproof by counterexample

It is the technique in mathematics where a statement is shown to be wrong by finding a single example for when it is not satisfied.

Disproof is the opp. of proof so instead of showing that something is true, we must show that it is false.

Problem

"If m is an integer and m^2 is divisible by 4, then m is divisible by 4". Prove or disprove this claim.

→ A/t the statement, if a sq. of a number is divisible by 4, then it is also divisible by 4

Here we can consider 4, 16, 36

As these are perfect sq., can be written as

$m^2 = 4$

Here, we get the value of ~~two~~ m as $+2, -2$

If n is prime, then $n+2$ also be prime & $n > 2$.

Prove or disprove

Case I

$n > 2$

prime no. greater than 2 are 3, 5, 7, 11, 13

Now applying the statement, which i.e. $n+2$

For, $n = 3$

$$n+2 = 3+2 = 5$$

For $n = 5$

$$n+2 = 5+2 = 7$$

For $n = 7$

$$n+2 = 7+2 = 9$$

For $n = 11$

$$n+2 = 11+2 = 13$$

→ This is our counterexample to disprove the statement

Disprove the statement :

" $n^2 - n + 41$ is prime for all integers n"

$n = 1$, $1 - 1 + 41 = 41$

$n = 41$, $41^2 - 41 + 41 = 41^2$

Q. For every prime no. p , $2p+1$ is also prime

$p = \underbrace{2, 3, 5, 7, 11}, 13, 17, 19$

23, 29, 31, 37, 41, 53,

59, 61, 67, 71,

73, 79, 83, 89, 97

$2p+1$

$2 \cdot 1 + 1 = 3$

$2 \cdot 3 + 1 = 7$

$2 \cdot 5 + 1 = 11$

$2 \cdot 7 + 1 = 15$

$2 \cdot 11 + 1 = 23$

$2 \cdot 13 + 1 = 27$

$2 \cdot 17 + 1 = 35$

$2 \cdot 19 + 1$

$17 \times 2 = 34$