CHAPTER - VII

METHODS OF TEACHING MATHEMATICS IN CENTRAL SCHOOLS

Section - I : METHODS COMMONLY USED IN TEACHING MATHEMATICS

Section - II : COMPARATIVE STUDY OF ANALYTIC AND SYNTHETIC METHODS
SECTION - I

METHODS COMMONLY USED IN TEACHING MATHEMATICS
7.1.1. WHAT IS TEACHING?

Teaching is an attempt to help someone acquire some skill, attitude, knowledge, ideal or appreciation. In other words, the teacher's task is to create or influence desirable changes in behaviour. Teaching can be measured in terms of pupil behaviour. If taught, a pupil must show some increase in knowledge.

Clark and Starr remarked:

"The goal of teaching is to bring about the desired learning in the pupils. Therefore it is said, the only valid criterion of success in teaching is the degree to which the teacher has been able to achieve the desired learning in his pupils".

The purpose of teaching is to enhance learning. According to Ausubel "The facilitation of learning is the only proper end of teaching". Teaching obviously includes transmission of information and creating appropriate situations and conditions and proposing activities designed to facilitate learning.

There is a controversy whether teaching is an art or a science. Height writes:

"I believe that teaching is an art, not a science. Teaching is not like inducing a chemical reaction, it is much more like painting a picture or making a piece of music or on a lower level like planting a garden or writing a friendly letter".
Gore argues:

"Although teaching requires artistry, it can be subjected to scientific scrutiny. The power to explain, predict and control that may result from such scrutiny will not dehumanize teaching."

In an attempt to resolve the controversy, Gage (1978) distinguishes between a science of teaching and a scientific basis for the art of teaching in the following words:

"A science of teaching implies that teaching will some day be attainable by closely vigorous laws that yield high predictability and control... a scientific basis consists of knowledge of regular non-chance relationships in the realm of events with which the practice is concerned."

Teaching is a type of interaction between two persons in which one person gains some knowledge from the other and reflects it in his behaviour.

According to Gage:

"By teaching we mean... any interpersonal influence aimed at changing the ways in which other person can or will behave. The influence has to impinge on the other person through his perceptual and cognitive processes."

Teaching is an activity in which the teacher creatively and imaginatively uses his knowledge in order to promote learning in his students.
The teacher has to take pain, apply his intelligence to facilitate learning among his students.

Hough and Duncon had commented:

"Teaching is an activity - an unique professional rational and human activity in which one creatively and imaginatively uses himself and his knowledge to promote the learning and welfare of others"7

Some define teaching as an art, a beautiful way of expressing some action which showed to others to let how things can be done or how it occurs.

In the words of Smith:

"Teaching consists of a succession of acts by an individual whose purpose is either to show other persons how to do something or inform them that something is the case"8

Teaching is an interaction process in which both the teacher and the students are involved and the mysteries of the world are revealed in the class.

According to Joyce and Weil:

"We think of teaching as a process by which teacher and students create a shared environment including sets of values and beliefs which in turn color their views or reality"9
In brief, the above definitions lead to the following conclusions that:

1. Teaching is an ordered set of teacher behaviours,

2. Ordering of this set is purposeful,

3. Teaching aims at bringing about change in the learner,

4. The change occurs through perceptual and cognitive processes of the learner,

5. The change manifests itself chiefly in the form of cognitive reorganization.

7.1.2 METHODS OF TEACHING

There is discernible dissatisfaction with mathematics teaching of today. It is necessary to recognize, even if only with uneasiness, that an increasing number of students do not feel sufficiently motivated to work with abstract mathematical topics.

It is essential to develop appropriate teaching methods in mathematics which can facilitate pupils to acquire the wider range of skills, knowledge and experience to use mathematics effectively in tackling real problems of life. These developments in teaching constrains the teacher to go beyond the traditional approach and search for effective alternatives.
Therefore, J Fletcher, Staff Inspector of Durham, England, in his article "The Mathematical Preparation of Secondary Teachers - Content and Method" had stated:

"Pupils' needs, capabilities and expectations require analysis and methods of presenting the subject matter require reappraisal"10

Methods of teaching mathematics should be enriched through a lively interaction of developments in the fields of mathematics and pedagogy. The following remarks of Erich Wittman are apposite:

"Mathematics education is a discipline between mathematics, psychology, philosophy and practice. Therefore it is natural that mathematical educators adopt results and methods from these related areas for their own use, thus enriching the variety of specific didactical approaches"11

A 'method of teaching' may be defined in a variety ways, but all definitions cover, more or less, the same ground and convey the same message.

According to Broudy and Palmer:

"Method refers to a set of procedures that are carried out according to some rule"12

Smith pointed out:

"By method is generally meant a particular order imposed upon teaching activity. It is a construction of how teaching is to be done"13
Henderton says:

"The pattern, that is set of common properties, that a set of behaviour sequence manifest will be called a method".

From these definitions, it is evident that a 'methodology' is a type of regulated behaviour; and is based upon certain sound theoretical foundations.

Thus, a behaviour sequence formulated on the basis of analysis is known as Analytic Method and that developed on the basis of synthesis is known as Synthetic Method.

In a class room, children of varying interests, aptitudes, intelligence and mental capabilities are found. Therefore, a teacher has to adopt the different methods of teaching to suit the individual needs.

It is rightly remarked:

"Teachers teaching mixed ability classes have been forced to work together more closely, enabling strengths to be utilised, weakness to be supported, interest developed".

Even an excellent curriculum would remain ineffective unless it is implemented through appropriate methods of teaching. A curricular programme is actualized only through appropriate instructional strategies. Practising teachers try out a variety of combinations and permutations of different teaching techniques to hit upon the right course.
7.1.3 RESEARCH CONDUCTED ON METHODS OF TEACHING MATHEMATICS

In 1982, Ghosh studied scholastic backwardness in the basic process in Arithmetic. Gupta (1979) compared the analytic - synthetic (A-S) method with narration-explanation (N-E) method of teaching Geometry and found that the A-S method was significantly more effective in terms of overall Geometry achievement than N-E method in Class IX. Mohammad Miyan (1982) examined the effectiveness of three methods of teaching mathematics, viz. tell and do, guided discovery and pure discovery. In developing mathematical creativity, it was found that the guided discovery method was the most effective method in enhancing originality as compared to the other two methods.

7.1.4 DIFFERENT SPECIFIC METHODS

Appropriate sequencing of teaching acts is the method. There are many methods of teaching mathematics. From among them, some of the methods commonly adopted by teachers, most of the time, are:

1. The Analytic-Synthetic Method
2. The Inductive-Deductive Method
3. The Lecture Method
4. The Problem-Solving Method

1. Analytic Method

The teacher is to adopt serious, systematic procedures for effective presentation of mathematics. One of them is Analytic method. According to Thorndike:
"The minds most intellectual act is to connect one thing with the other, but its highest performance is to think apart to its elements"16

Evidently, analysis is the highest intellectual performance of the mind.

Analysis means to resolve a whole into its elements or to separate into component parts; whereas synthesis implies composition or the putting of two or more things together.

According to Dr. S. Packiam,

"Analysis is often identified with induction and synthesis with deduction. The method of Analysis is the method of discovering the solution of a problem and heuristic attitude is implicit in it. Synthesis is the method of formulating recording and presenting concisely the discovered solution omitting the trials and errors"17

According to Kulbir Singh Sidhu,

"Analysis means 'breaking up' of the problem in hand so that it ultimately gets connected with something obvious or already known. It is the process of unfolding of the problem or of conducting its operation to know its hidden aspects. Start with what is to be found out. Then think of further steps and possibilities which may connect the unknown with the known and find out the desired result"18

It is the process of unfolding of a problem. The teacher tries to clarify the hidden aspects of a problem. The teacher has to start with what
is to be found out. The next question is how to find out. In this way the teacher goes on questioning at each and every step till he gets the solution. The teacher tries to enable the students discover the solution by themselves. Gradually, in answering the questions the students are able to find the solution of the problem. It can be labelled as 'the question - answer method'. The teacher's question should be framed carefully. The teacher has to frame a series of questions in order to elicit a single answer which leads to the solution. This method promotes conceptual clarity among the students.

The eminent American Psychologist, R.L. Thorndike remarked that the highest intellectual performance of the mind is analysis. If the student forgets the solution of a problem, it would be much easier for him to get the solution through the analytic method.

The detailed procedure of a mathematics lesson based on the Analytic Method has been provided below as an illustrative example.

**Sample Lesson through the Analytic Method**

**Example**: The line that joins the vertices of two isosceles triangles having a common base is perpendicular to the common base.
Teacher's Question (T.Q) : What do we need to find out ?

Student's answer (S.A) : We have to prove $AD \perp BC$

T.Q : How can we prove that $AD \perp BC$ ?

S.A : If we can prove either $\angle BDA = 90^\circ$ or $\angle CDA = 90^\circ$

T.Q : If $\angle BDA = 90^\circ$ and $\angle CDA = 90^\circ$, what is the relation between the two angles ?

S.A : They are equal, that is $\angle BDA = \angle CDA$

T.Q : How to prove that $\angle BDA = \angle CDA$ ?

S.A : If we can prove that triangles containing $\angle BDA$ and $\angle CDA$ are congruent.

T.Q : How to prove that $\triangle ABD \cong \triangle ACD$ ?

S.A : By applying any of the four rules of congruence.

T.Q : Which congruency rule is applicable here ?

S.A : We cannot find any of the four rules applicable here.

T.Q : What is falling short in order to apply a congruency rule ?

S.A : If we can prove $\angle BAD = \angle CAD$, we shall get the proof.

T.Q : How can we prove equality of two angles ?

S.A : By providing the congruency of two triangles containing them other than the required triangles. That is by proving $\triangle ABE \cong \triangle ACE$
T.Q : How to prove $\triangle ABE \cong \triangle ACE$?

S.A : By SSS congruency rule.

Then the conclusion follows like this

$\triangle ABE \cong \triangle ACE$ (SSS Rule)

\[ \therefore \angle BAE = \angle CAE \]
\[ \Rightarrow \angle BAD = \angle CAD \]

Now in triangles $\triangle BAD$ and $\triangle CAD$, we have

$AB = AC$

$AD = AD$ (common)

$\angle BAD = \angle CAD$

\[ \therefore \triangle BAD \cong \triangle CAD \text{ (SAS Rule)} \]

\[ \therefore \angle BDA = \angle CDA = 90^\circ \]

\[ \therefore AD \perp BC \text{ (proved)} \]

The teacher need not tell the conclusion as stated above. Because after discovering the clue, the children can write the conclusion by themselves.

It is evident from the foregoing example that analysis starts from the result and proceeds backwards.

According to Dr. S. Packiam,

At the secondary school level, the method of analysis mainly consists of:

(i) Clarification of the data and the result

(ii) Recall of known principles relevant to the data or to the result of the both and discriminating between those relevant to the issue and those irrelevant
iii) Recall of relevant process involved

(iv) Recognition of the connection between the start and finish

In complex problems where this is difficult, the analysis extends to stages of procedure in the complex problem with a main analysis of the difficult stages and the sub-analysis of steps in each stage. Evidently, this method has the following steps:

(a) What is required in this problem?
(b) How to prove this?
(c) What are required to prove this?

(ii) **Synthetic Method**

The reverse process of the Analytic Method is known as Synthetic Method.

According to Arthur Schultze:

"Analysis is the method of discovery, synthesis is the method of concise and elegant presentation"19

In this connection, K.S.Sidhu opined:

"To synthesise is to place together things that are apart. It starts with something already known and connects that with the unknown part of the statement. It starts with the data available or known and connects the same with the conclusion"20
About Synthetic Method, Dr. S. Packiam stated:

"It is the complement and the finishing part of every analysis. This is written method of solution of a problem which is determined by analysis. Without synthesis, the solution is imperfect."21

Further he reiterated:

"when analysis is done by the teacher and only the synthetic method is used, mathematics loses its grip over the pupil and it becomes dull and mathematical, though neat and requisite. No power is developed in pupils and originality is destroyed."22

In this method, the teacher starts the proof directly. There is no question of enquiring the proof. In the beginning, there is no justification for the process. But at the end, the pupils are able to know the justification of the process. Pupils have to remember the process. Once forgotten it is very difficult to recall the process of arriving at the solution. But it is a short-cut method. It does not take much time. It facilitates exercising memory. Those who are deficient in memorization cannot achieve success through this method. The teacher provides the clues to the solution in a straightforward manner. There is too little questioning in this method. This is also called the "Expository Approach" of teaching.

This method can be best understood from the following example.
Sample Lesson Through the Synthetic Method

Example-1: The line that joins the vertices of two isosceles triangles having a common base is perpendicular to the common base.

Synthetic Proof

In triangles ABE and ACE:

We have
- $AB = AC$ (given)
- $AE = AE$ (common)
- $BE = CE$ (given)

$\triangle ABE \cong \triangle ACE$

$\therefore \angle ABE = \angle CAE$

Now in triangles ABD and ACD

We have
- $AB = AC$ (given)
- $AD = AD$ (common)
- $\angle BAE = \angle CAE$ (proved)

$\therefore \triangle ABD \cong \triangle ACD$

$\therefore \angle ADB = \angle ADC = 90^\circ$

Example-2: If $a = \frac{c}{b}$ prove that

$\frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d}$


Synthetic Proof:

\[
\frac{a}{b} = \frac{c}{d} \quad \text{(It is known and hence the starting point)}
\]

Subtract \(\frac{2b}{c}\) on both sides? (But why and how should the child remember to subtract \(\frac{2b}{c}\) and not any other quantity).

\[
\frac{a}{b} - \frac{2b}{c} = \frac{c}{d} - \frac{2b}{c}
\]

or

\[
\frac{ac - 2b^2}{bc} = \frac{c^2 - 2bd}{cd}
\]

or \(\frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d}\) (cancelling 1 on both sides) .. (Proved)

Synthetic Method of proof leaves many doubts. Students are not able to understand the underlying logic properly. There is no scope for discovery.

(iii) **Inductive Method**

Inductive method is one of the best method of teaching mathematics especially in junior level. It leads from particular to general and from concrete examples to generalised theory. It is the method of constructing a formula with the help of adequate number of concrete examples. It is based on induction which means proving a universal truth by showing that if it is true for a particular case and is further true of a reasonably adequate number of cases, it can be generalised that it is true for all such cases. This can be best understood from the given example.
Example: Students are asked to draw a triangle and then to measure the three angles. Then they are asked to add the measure of the angles which will be equal to 180°. Next they will be asked to draw some more triangles and repeat the procedure. They will find the sum equal to 180° in each case, which can be taken as a generalisation. Different mathematicians expressed the same fact in different languages.

According to Dr. S. Packiam,

"Induction is the method by which general laws are derived from particular examples. When a general statement is made from a series of particular cases, knowledge is born. Sometimes a large number of cases have to be seen before any general law can be stated. In either case, the derived law must be applied in other cases to verify the truth of the law. This is the last phase of the inductive method.""23

Hence induction and deduction refer to the order of development of the learning process and the way knowledge is developed. The two methods aim at establishing the validity of the thought process. But deduction can only give us formal validity because the premises are taken for granted. This formal validity may be misleading if the general statement is wrong. It is only the deduction which tests the material validity, i.e. whether the applications of deduction are actually dealt or not. There is always a need for induction to supplement deduction.

In the Indian classroom situations, in the actual teaching procedures inductive method is generally preferred. It is easy to adopt because here one proceeds from particular to general, from concrete cases to abstract
rules from the known to the unknown, from the observed to the unobserved and from the empirical to the rational. New teaching always starts with induction and ends in deduction, where the knowledge learnt is applied, verified and established.

The following example illustrates the definition of inductive method: we can arrive at a rule for telling by inspection whether a number is divisible by twenty five. Numbers not ending with 5 or 0 are eliminated very easily on the basis of previous knowledge. So we actually multiply number ending with 1, 2,... and so on, by 25 and tabulate the products. It is known that the ending figure of the multiplicands cannot be any other. Observing the products, the pupils will see that the last two figures in each are 00, 25, 50, or 75. As a rule this is applied and numbers with such endings are found to be divisible by 25. Thus the rule is verified. Here the particular cases are those that each is a case of multiplication by 25. The particular facts are the products, the peculiarity of which is brought under the end figures in the last two digits. A working rule is generalised and applied in fresh cases. This is the technique of induction utilising to arithmetical computation. The following are similar examples where the deductive method is adopted.

1. In the topic relating to the property of triangles, a series of triangles of varied shapes and sizes are drawn and their angles measured.

2. In a rhombus, the diagonals are at right angle and bisect each other.
According to Gerhard Holland\textsuperscript{24} of West Germany, this well known and often used method consists of two phases: first a hypothesis is formed and tested by experimentation (drawing and measuring). Subsequently the hypothesis is proved. But not every theorem is accessible to this strategy. The preconditions for the application of the inductive method strategy of guided discovery learning to a special theorem are:

(a) The teacher has to find an appropriate formulation of the presented problem to initiate the empirical investigation. If the question is too wide, it will be difficult or impossible for the student to find the unknown relationship. If on the other hand, it is too narrow it may look very artificial.

(b) The proof of the generalization should be accessible by the application of the usual heuristic strategies. A theorem for which only a tricky proof is known is, for this reason, unsuitable for the inductive method.

The inductive method contributes to the realization of such process objectives as:

- The ability to generate examples,
- The ability to find and formulate a generalization
- The ability to solve a proof problem.
(iv) **Deductive Method**

It is the reverse process of the inductive method. Here the learner proceeds from general to particular, abstract to concrete, and formula to examples. A pre-constructed formula is told to the students and they are asked to solve the relevant problems with the help of that formula. Students accept the formula as an established truth. They do not understand how to construct that formula. Once they forget the formula, they can not work out the sums. Children having good memory power can do well with this method.

Deduction is the logical process of deducting a law from known principles and facts. In deduction, a system of reasoning is implicit.

In mathematics, as in life, deduction and induction, are complementary and not contradictory, whereas by nature one is the antithesis of the other. Awareness of a truth of a general nature or of a principle from a number of particular cases constitutes the starting point. Once the law is known, attempts are made to deduce the law by reasoning from the known laws. When the same method is applied, teaching of mathematics becomes an exhilarating exercise for the mind.

According to Dr. S. Packiam:

"In providing simple principles and elementary ideas, it is sinful to waste valuable time by using deduction. Deduction is more interesting to the pupil. As the level of the pupil rises, more and more of deduction takes the place of induction. In the early stages, induction predominates all phases of teaching and in higher mathematics deduction predominates."25.
Sample Lesson through the Deductive Method

The following illustration explains the process of deductive method.

If $a^3 + b^3 + c^3 = 3abc$, then $a + b + c = 0$ or $a = b = c$

Here $a^3 + b^3 + c^3 = 3abc$ (Hypothesis)

$a^3 + b^3 + c^3 - 3abc = 0$ (Axiom)

i.e. $(a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca) = 0$ (known fact)

i.e. $(a+b+c) x \frac{1}{2} [(a-b)^2 + (b-c)^2 + (c-a)^2] = 0$ (known fact)

$(a+b+c) [(a-b)^2 + (b-c)^2 + (c-a)^2] = 0$ (self evident)

$a + b + c = 0$ (conclusion)

$[(a-b)^2 + (b-c)^2 + (c-a)^2] = 0$ (known fact)

This is the sum of three perfect squares, each of which is positive.

The sum cannot be equal to zero unless each is equal to zero.

$(a-b)^2 = 0, a-b = 0, a = b$

Similarly $b = c$ and $c = a$ (law of similarity)

$a = b = c$. (conclusion)

(v) Lecture Method

It is the method of presenting a topic through lecture. Teacher talks and students listen in this method. Sometimes students may ask question to clarify their doubts. The teacher again explains the points that the students had failed to understand. Teacher is active and students again remain passive.

In mathematics, this method can be used with advantage during the introduction, explanation of very difficult ideas, framing the logical arrangement and in consolidating ideas.
The teacher has to prepare thoroughly before going to the class and should be prepared to face any kind of question at any time during his lecture.

A well prepared teacher with the powers of lucid exposition, succeeds with this method.

It is good to keep his talk to a minimum. A teacher should be vigilant as regards the attentivity of the students, and should change his method of instruction once their attention flags. Many pupils make a pretence of listening when they are not doing so.

This method is not psychological except at times, and is to be used sparingly. It is tiring and pupil's attention may wander. Proper participation of pupils is difficult and no teacher can adjust his argument to the level of each of his points. The Indian Education Commission (1966) rightly remarked "If Science is poorly taught and badly learnt, it is little more than burdening in mind with dead information, and it could degenerate even into a new superstition."  

(vi) Problem Solving Method

It is a research like method. It involves scientific thinking as a process of learning. Different steps involved in this method are:

1. Sensing the problem,
2. Organising information.
3. Framing solutions,
4. Elimination and verification
Example: Finding volume of a cylinder

Solution: Its formula can be found out by using the formula to find out the volume of a cuboid. While analysing the problem, it comes to mind that volume of any solid object can be found out by multiplying the area of the base with the height. The area of a base can be found out by already known formula and known method. Then area of the base can be multiplied with the height of the cylinder to get the volume of the cylinder.

For the purpose of verification, it is applied to a number of similar situations and the results are checked.

The solution comes from the students. Teacher remains in the background and directs the student activity.

Besides the above mentioned methods, there are other methods also, but not commonly used in classroom teaching. There is many a difference between the theory and practical. Therefore it is not always possible to follow exactly the methods mentioned in theory. Sometimes teachers do innovate new ideas and methods of teaching. Sometimes a method suitable to teach one particular topic may not found suitable to teach another topic. Similar is the case when classes vary in age, standard or grasping power. Practising teachers opinion throws light in this regard.

7.1.5 STUDY FINDING RELATING TO THE METHODS ACTUALLY ADOPTED IN THE CLASS-ROOMS

It is interesting to know about the methods followed by teachers in teaching. Table No.7.1 reveals whether teachers follow methods and how often.
Table No. 7.1
DO TEACHERS ADOPT METHODS TO TEACH MATHEMATICS

<table>
<thead>
<tr>
<th>How often</th>
<th>How many</th>
</tr>
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<tbody>
<tr>
<td>Always</td>
<td>15</td>
</tr>
<tr>
<td>Sometimes</td>
<td>90</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No.1 of Section II(a) of T.Q)

Table No. 7.1 reveals that only 15 teachers out of 105 teachers followed suitable methods of teaching always. But 90 teachers out of 105 did not follow the methods always. The reason for their not following methods has been presented in Table No. 7.2.

Table No. 7.2
REASONS FOR NOT FOLLOWING METHODS

<table>
<thead>
<tr>
<th>Reasons</th>
<th>No. of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of motivation</td>
<td>-</td>
</tr>
<tr>
<td>Lack of time</td>
<td>70</td>
</tr>
<tr>
<td>Unsuitable topic</td>
<td>8</td>
</tr>
<tr>
<td>Lack of student participation</td>
<td>6</td>
</tr>
<tr>
<td>Constraints of examination</td>
<td>10</td>
</tr>
<tr>
<td>Lack of ancillary facilities</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No.2 of Section II(a) of T.Q)
Table No. 7.2 reveals that most of the teachers (70 out of 105) either did not or could not adopt appropriate methods of teaching always due to lack of time. A few teachers mentioned that the topic was unsuitable. 6 out of the 105 teachers opined that students did not participate in the class. Ten teachers highlighted the constraints of the examination which did not permit them to follow the right methods always. Eleven teachers stated that due to lack of ancillary facilities, they could not follow methods always. In addition to these reasons some highly experienced teachers opined that there is no difficulty in preparing for teaching methodically if one is motivated. One of the teachers opined that teaching according to certain set methods was too cumbersome.

The teachers were asked to suggest suitable methods for teaching different topics. The opinion obtained is depicted in Table No. 7.3.

**Table No. 7.3**

**DIFFERENT METHODS SUITABLE TO TEACH DIFFERENT TOPICS**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the topic</th>
<th>A</th>
<th>S</th>
<th>I</th>
<th>D</th>
<th>L</th>
<th>P</th>
<th>E</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Real Numbers</td>
<td>56</td>
<td>36</td>
<td>-</td>
<td>12</td>
<td>4</td>
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<td>14</td>
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<td>Function and graph</td>
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<td>14</td>
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<td>3</td>
<td>Angle relation</td>
<td>32</td>
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<td>20</td>
<td>2</td>
<td>8</td>
<td>10</td>
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<td>14</td>
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<td>26</td>
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<td>6</td>
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<td>8</td>
<td>Factoring &amp; Polynomial</td>
<td>24</td>
<td>16</td>
<td>16</td>
<td>28</td>
<td>10</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Name of the topic</td>
<td>No. of teachers suggesting method</td>
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<td>S</td>
<td>I</td>
<td>D</td>
<td>L</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>9</td>
<td>Linear Equations in one variables</td>
<td>22</td>
<td>12</td>
<td>22</td>
<td>12</td>
<td>6</td>
<td>28</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Loci and concurrency theorem</td>
<td>26</td>
<td>22</td>
<td>10</td>
<td>28</td>
<td>10</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Logarithm</td>
<td>20</td>
<td>12</td>
<td>22</td>
<td>26</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>Area</td>
<td>38</td>
<td>12</td>
<td>18</td>
<td>16</td>
<td>6</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>Geometrical construction</td>
<td>34</td>
<td>34</td>
<td>8</td>
<td>18</td>
<td>0</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Trigonometry</td>
<td>28</td>
<td>22</td>
<td>10</td>
<td>14</td>
<td>10</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>Computing</td>
<td>20</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>12</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>Statistics</td>
<td>18</td>
<td>20</td>
<td>8</td>
<td>16</td>
<td>12</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>Mensuration</td>
<td>26</td>
<td>18</td>
<td>8</td>
<td>26</td>
<td>6</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Circle</td>
<td>30</td>
<td>24</td>
<td>12</td>
<td>36</td>
<td>10</td>
<td>16</td>
<td>6</td>
</tr>
</tbody>
</table>

(vide Section II(b) of T.Q)

Table No. 7.3 depicts that:

(i) Analytic method of teaching had maximum utilization,

(ii) Almost all the topics can be taught by every method except 'Geometrical construction'

(iii) Lecture method had least utilization

**Advantages and Drawbacks of Inductive Method of Teaching**

Attempt has been made to collect opinion about application of inductive method of teaching. First few questions are meant to inform what is inductive method of teaching and to know whether they follow this method in teaching or not. Question No. 1, 2 and 3 of Section-III(a) reveals that 92
teachers out of 105 followed Inductive method of teaching whereas 13 teachers did not follow.

School syllabus consists of limited number of chapters for different branches of mathematics. Table No. 7.4 depicts a picture of suitability of inductive method of teaching different branches of mathematics.

Table No. 7.4

SUITABILITY OF INDUCTIVE METHOD

<table>
<thead>
<tr>
<th>Branches of Mathematics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>To teach Algebra</td>
<td>87</td>
</tr>
<tr>
<td>To teach Geometry</td>
<td>36</td>
</tr>
<tr>
<td>Modern Algebra</td>
<td>38</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>28</td>
</tr>
<tr>
<td>Commercial Mathematics</td>
<td>27</td>
</tr>
<tr>
<td>Statistics</td>
<td>26</td>
</tr>
</tbody>
</table>

(vide Q.No.4 of Section-III(a) of T.Q)

Table No. 7.4 reveals that almost all the branches can be taught by inductive method of teaching.

Advantages of inductive method of teaching as opined by the sample teachers are presented in Table No. 7.5.
### Table No. 7.5
**ADVANTAGES OF INDUCTIVE METHOD OF TEACHING**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It involves better student participation</td>
</tr>
<tr>
<td>2</td>
<td>It is useful in arriving at the formula</td>
</tr>
<tr>
<td>3</td>
<td>It increases the retentive power</td>
</tr>
<tr>
<td>4</td>
<td>It dispels fear complex</td>
</tr>
<tr>
<td>5</td>
<td>Pupils can establish the formula by themselves</td>
</tr>
<tr>
<td>6</td>
<td>It is suitable at the initial stages</td>
</tr>
<tr>
<td>7</td>
<td>It reinforces confidence among students</td>
</tr>
<tr>
<td>8</td>
<td>It fosters better understanding</td>
</tr>
<tr>
<td>9</td>
<td>It requires less drilling</td>
</tr>
<tr>
<td>10</td>
<td>The result can be generalised from facts with some reasoning</td>
</tr>
<tr>
<td>11</td>
<td>In Small classes, this is an easy and appropriate method for teaching</td>
</tr>
</tbody>
</table>

*vide Q.No.6, Section-III(a) of T.Q*

Although Inductive method is advantageous, it has some drawbacks which are mentioned in Table No. 7.6.

### Table No. 7.6
**DRAWBACKS OF INDUCTIVE METHOD OF TEACHING**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ample opportunity is not provided to develop thinking power</td>
</tr>
<tr>
<td>2</td>
<td>It is a time consuming method</td>
</tr>
<tr>
<td>3</td>
<td>It is not applicable for all topics</td>
</tr>
</tbody>
</table>
It is based on hypothetical consideration

Students cognitive thinking are likely to be reduced

It is a lengthy process

Inductive reasoning is not absolutely conclusive. It only establishes a certain degree of probability

(vide Q.No.7 of Section-III(a) of T.Q)

All the statements in Table No. 7.6 are well accepted by the teachers.

Table No. 7.7 depicts a picture of application of inductive method.

Table No. 7.7

FREQUENCY OF APPLICATION OF INDUCTIVE METHOD IN TEACHING

<table>
<thead>
<tr>
<th>Frequency of application</th>
<th>Number of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>72</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No.8 of Section-III(a) of T.Q)

Out of 105 teachers, only 80 teachers responded. Out of 80 teachers, 8 teachers used this method always but 72 teaches used sometimes. Practically it may not be possible to teach each and every topic by this method. Some teachers expressed they used this method depending upon the suitability of the topic.
Deductive Method of Teaching

Table No. 7.8
DEDUCTIVE METHOD OF TEACHING UNDERSTOOD BY TEACHERS

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>No. of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No.of teachers understood</td>
<td>86</td>
</tr>
<tr>
<td>2</td>
<td>No.of teachers did not understand</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>No response</td>
<td>11</td>
</tr>
</tbody>
</table>

Total 105

(vide Q.No.1,2,3 & 4 of Section-III(b) of T.Q)

From the first few questions of Section-III(b) it can be concluded that 86 teachers had knowledge about deductive method of teaching. Eight teachers did not have knowledge about this method of teaching. Eleven teachers did not respond which indicates that either they did not know about this method or did not follow this method of teaching.

Table No. 7.9
FREQUENCY OF APPLICATION OF DEDUCTIVE METHOD

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>No.of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teachers adopt deductive method</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>Teachers who did not adopt deductive method</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>No response</td>
<td>21</td>
</tr>
</tbody>
</table>

Total 105

(vide Q.No.5, Section-III(b) of T.Q)
Table No. 7.9 reveals that 70 teachers out of 105 adopted deductive method of teaching. While 14 teachers did not adopt and 21 teachers did not respond. Although deductive method of teaching is highly useful in teaching secondary school mathematics, it is not adopted by all the teachers in the sample. May be the teachers who did not adopt this method lack of knowledge or forgotten about this method.

Table No. 7.10

<table>
<thead>
<tr>
<th>Branch of Mathematics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra</td>
<td>54</td>
</tr>
<tr>
<td>Geometry</td>
<td>38</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>52</td>
</tr>
<tr>
<td>Modern Algebra</td>
<td>42</td>
</tr>
<tr>
<td>Commercial Mathematics</td>
<td>54</td>
</tr>
<tr>
<td>Statistics</td>
<td>50</td>
</tr>
</tbody>
</table>

(vide Q.No.6, Section-III(b) of T.Q)

Table No. 7.10 reveals that this method is useful in teaching all the branches of Mathematics. It is more useful in teaching algebra, commercial mathematics. It is equally useful in teaching arithmetic and statistics. It is comparatively less useful in geometry.
Table No. 7.11
ADOPTION OF DEDUCTIVE METHOD OF TEACHING IN DIFFERENT CLASSES

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency of suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII</td>
<td>32</td>
</tr>
<tr>
<td>VIII</td>
<td>52</td>
</tr>
<tr>
<td>IX</td>
<td>62</td>
</tr>
<tr>
<td>X</td>
<td>56</td>
</tr>
</tbody>
</table>

(vide Q.No.7, Section-III(b) of T.Q)

Table No. 7.11 reveals that deductive method of teaching is most useful in Class-IX. According to 62 teachers' opinion, it is used in class-IX. According to 56 teachers, it is useful in Class-X. 52 teachers opined that it is used in Class-VII. It is least used in Class-VII and mostly used in Class-IX.

Table No. 7.12
DRAWBACKS OF THE DEDUCTIVE METHOD OF TEACHING

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It creates boredom and forgetfulness</td>
</tr>
<tr>
<td>2</td>
<td>It tends to destroy originality</td>
</tr>
<tr>
<td>3</td>
<td>Learner becomes inactive and passive</td>
</tr>
<tr>
<td>4</td>
<td>Demands too much of memorization</td>
</tr>
<tr>
<td>5</td>
<td>Not suitable for the lower classes</td>
</tr>
</tbody>
</table>
It fails to reinforce confidence
7 Not suitable for developing all mathematical concepts
8 Axiomatic approach promotes convergent thinking and adversely affects creativity in mathematics
9 Lack of clarity of understanding is discernible

(vide Q.No.8, Section-III(b) of T.Q)

Table No. 7.12 reveals that this method has serious drawbacks and this method cannot be helpful in teaching lower classes, while adopting this method of teaching a teacher must consider these drawbacks.

Table No. 7.13
ADVANTAGES OF DEDUCTIVE METHOD OF TEACHING

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>An easy method to teach, the teacher is comparatively less taxed</td>
</tr>
<tr>
<td>2</td>
<td>Suitable for the brilliant students as they can understand quickly. They need not beat around the bush</td>
</tr>
<tr>
<td>3</td>
<td>It is short and direct</td>
</tr>
<tr>
<td>4</td>
<td>It is a time-saving method</td>
</tr>
<tr>
<td>5</td>
<td>It has wide applications</td>
</tr>
<tr>
<td>6</td>
<td>Conclusion brings satisfaction and understanding</td>
</tr>
<tr>
<td>7</td>
<td>It proceeds from general to particular</td>
</tr>
</tbody>
</table>

(vide Q.No.9, Section-III(b) of T.Q)
Table No. 7.13 depicts some advantages of deductive method of teaching as mentioned by some teachers from the sample.

**Analytic Method**

Questions Nos. 1-7 of Section-III(c) of Teacher's Questionnaire are based on procedures of Analytic Method of teaching. Those who understood this method, followed this method they answered correctly. Those who did not understand this method, they did not respond to these questions or responded wrongly.

**Table No. 7.14**

ANALYTIC METHOD OF TEACHING

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No. of teachers understood 88</td>
</tr>
<tr>
<td>2</td>
<td>No. of teachers did not understand 6</td>
</tr>
<tr>
<td>3</td>
<td>No. of teachers did not respond 11</td>
</tr>
<tr>
<td></td>
<td>Total 105</td>
</tr>
</tbody>
</table>

(vide Q.No.1-7, Section-III(c) of T.Q)

Table No. 7.14 depicts the picture of teachers' knowledge of Analytic Method. Out of 105, 88 teachers had knowledge of this method. Six teachers did not have knowledge of this method. Eleven teachers did not respond what is Analytic method or they did not follow this method.

Question No.8 of Section-III(c) depicts a picture of teachers opinion
about possibility of teaching all topics through this method. Only 24 teach­
ers responded in favour of this and 68 teachers responded against it. Where­as 13 teachers did not respond.

Table No. 7.15

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It is good provided questions framed by the teacher are properly framed and graduated</td>
</tr>
<tr>
<td>2</td>
<td>It is one of the good method for teaching mathematics</td>
</tr>
<tr>
<td>3</td>
<td>Analysis promotes original thinking and reasoning</td>
</tr>
<tr>
<td>4</td>
<td>It is an appropriate method to promote proper understanding of the mathematical concepts</td>
</tr>
<tr>
<td>5</td>
<td>It is helpful in explaining</td>
</tr>
<tr>
<td>6</td>
<td>It is a suitable method to seek the solution of problems</td>
</tr>
<tr>
<td>7</td>
<td>It is a good method for promoting the understanding, but is difficult to apply for all the topics</td>
</tr>
<tr>
<td>8</td>
<td>A systematic method</td>
</tr>
<tr>
<td>9</td>
<td>Appropriate for quick learners and is boring for the slow learners</td>
</tr>
<tr>
<td>10</td>
<td>Students can understand properly and remember the principles so learnt for a longer period.</td>
</tr>
<tr>
<td>11</td>
<td>It is interesting and logical</td>
</tr>
<tr>
<td>12</td>
<td>It is time consuming</td>
</tr>
<tr>
<td>13</td>
<td>It is not good for all types of students</td>
</tr>
<tr>
<td>14</td>
<td>Not applicable for all topics, but is a useful method</td>
</tr>
<tr>
<td>15</td>
<td>It generates interest among students</td>
</tr>
<tr>
<td>16</td>
<td>It is a method of discovery and demands originality</td>
</tr>
<tr>
<td>17</td>
<td>The approach is exploratory</td>
</tr>
</tbody>
</table>
Table No. 7.15 depicts the advantages of Analytic Method of teaching. This method has maximum advantage in comparison to other methods of teaching. Time factor in Analytic Method of teaching as responded to question No.10, Section-III(c) of Teachers Questionnaire need to be considered by aspiring teachers.

Out of 105 teachers, 72 teachers viewed it as a time consuming method, 8 teachers viewed it as not a time consuming method. 25 teachers did not respond. Analysis involves graduated and logical thinking which requires time. The solution comes from the students. Teacher has to prompt and guide. Of course, intelligent students are quick to grasp and discover the solution rather quickly. But the average and below average students need to be prodded and prompted. Students are of mixed
abilities and the teacher has to look after the progress of each and every student. Therefore, this method is time consuming in comparison to the other methods.

Table No. 7.16
FREQUENCY OF APPLICATION OF ANALYTIC METHOD

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>-</td>
</tr>
<tr>
<td>Most of the time</td>
<td>40</td>
</tr>
<tr>
<td>Sometimes</td>
<td>44</td>
</tr>
<tr>
<td>Occasionally</td>
<td>14</td>
</tr>
<tr>
<td>Never</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No. 11 of Section-III(c) of T.Q)

Table No. 7.17
APPLICATION OF ANALYTIC METHOD OF TEACHING IN DIFFERENT BRANCHES

<table>
<thead>
<tr>
<th>Branch of Mathematics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometry</td>
<td>40</td>
</tr>
<tr>
<td>Algebra</td>
<td>10</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>10</td>
</tr>
<tr>
<td>All branches</td>
<td>4</td>
</tr>
<tr>
<td>No response</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No.12, Section- III(c))
Table No. 7.17 depicts that this method is mostly used in Geometry as it is supported by 40 teachers out of 105. In Algebra and Arithmetic, it is less than frequently used. Only 4 teachers opined, it is used in all branches of mathematics.

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII</td>
<td>18</td>
</tr>
<tr>
<td>VIII</td>
<td>26</td>
</tr>
<tr>
<td>IX</td>
<td>52</td>
</tr>
<tr>
<td>X</td>
<td>48</td>
</tr>
</tbody>
</table>

(Table No. 7.18
APPLICATION OF ANALYTIC METHOD OF TEACHING IN DIFFERENT CLASSES)

(vide Q.No.12, Section-III(c) of T.Q)

Table No.7.18 depicts that it is mostly used in Class IX. Less frequently in Class X, still less in Class VIII. It is least used in Class-VII.

**Synthetic Method**

Question No.1-7, Section-III(d) of Teachers Questionnaire were meant to test teacher's knowledge about synthetic method of teaching. It revealed that 80 teachers out of 105 had knowledge of synthetic method and 25 teachers did not have knowledge about this method.
Question No. 8 revealed that synthetic method is time consuming as opined by 50 teachers. 44 teachers viewed it as not time consuming. 11 teachers did not respond.

Question No. 9 elicited response about suitability of synthetic method of teaching different topics. It revealed that 28 teachers agreed that all topics can be taught through this method, but 58 teachers did not agree. 11 teachers did not respond.

Table No. 7.19

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic</td>
<td>38</td>
</tr>
<tr>
<td>Synthetic</td>
<td>4</td>
</tr>
<tr>
<td>Inductive</td>
<td>2</td>
</tr>
<tr>
<td>Deductive</td>
<td>2</td>
</tr>
<tr>
<td>Problem solving</td>
<td>2</td>
</tr>
<tr>
<td>Analytic followed by synthetic</td>
<td>8</td>
</tr>
<tr>
<td>Inductive followed by Deductive</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

(vide Q.No.10, Section-III(d) of T.Q)
Table No. 7.19 reveals that analytic method is the best method of teaching according to the opinion of 38 teachers. 8 teachers viewed analytic followed by synthetic is the best method of teaching. Some teachers opined that no definite method is best. It depends upon the class and topic to decide which method would suit best.

Question No. 11 of Section-III(d) of Teachers Questionnaire revealed that teachers got hint of teaching method from the worked out sums in the text book as opined by 62 teachers. 22 teachers expressed that they did not get any hint from the text book. 21 teachers did not respond.
SECTION II

COMPARATIVE STUDY OF

ANALYTIC AND SYNTHETIC METHODS
COMPARATIVE RESULT OF ANALYTIC METHOD OF TEACHING
AND SYNTHETIC METHOD OF TEACHING

Tests were conducted with the purpose of finding out comparative effectiveness of analytic method of teaching and synthetic method of teaching. A particular group of students were taught a topic in analytic method of teaching in one class period. In the next class period, a test of 20 marks and 25 minutes time duration was conducted. Test papers were scored. The process was repeated with synthetic method of teaching. Test papers were scored and recorded. This process of analytic method of teaching and synthetic method of teaching was repeated and tests were conducted after each method of teaching. After completing six rounds of test results were compared. Table No. 7.20 depicts a picture of different mean scores obtained in different tests.

Table No. 7.20
MEAN TEST SCORES

<table>
<thead>
<tr>
<th></th>
<th>M₁</th>
<th>M₂</th>
<th>M₃</th>
<th>M₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results of Analytic Method of teaching</td>
<td>13.2</td>
<td>11.936</td>
<td>11.73</td>
<td>12.29</td>
</tr>
<tr>
<td>Results of Synthetic method</td>
<td>5.63</td>
<td>7.93</td>
<td>10.36</td>
<td>7.97</td>
</tr>
</tbody>
</table>

(vide Appendix-II-VI)

Upper M₁ = Mean score in 1st test, topic taught in Analytic Method

Lower M₁ = Mean score in 2nd test, topic taught in Synthetic Method
Upper $M_2$ = Mean score in 3rd test, topic taught in Analytic Method

Lower $M_2$ = Mean score in 4th test, topic taught in Synthetic Method

Upper $M_3$ = Mean score in 5th test, topic taught in Analytic Method

Lower $M_3$ = Mean score in 6th test, topic taught in Synthetic Method

Upper $M_4$ = Mean score of all the scores obtained in the Test conducted after analytic method of teaching

Lower $M_4$ = Mean score of all the scores obtained in the test conducted after synthetic method of teaching

Good method of teaching resulted in good understanding and students got comparatively better score in the test. Table No. 7.21 depicts that upper $M_1$ is greater than lower $M_1$ indicating that analytic method of teaching resulted in better score than the scores obtained after synthetic method of teaching. Similarly it has been noticed:

Upper $M_2$ > Lower $M_2$

Upper $M_3$ > Lower $M_3$

Upper $M_4$ > Lower $M_4$

Coefficient of correlation was found out between the scores obtained after each round of analytic and synthetic methods of teaching. Coefficient of correlations were presented in Table No. 7.21
Table No. 7.21

COEFFICIENT OF CORRELATION BETWEEN THE SCORES OBTAINED AFTERTeaching in ANALYTIC AND SYNTHETIC METHODS

<table>
<thead>
<tr>
<th>Round of test scores</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st round test</td>
<td>$\gamma_1 = 0.958$</td>
</tr>
<tr>
<td>2nd round test</td>
<td>$\gamma_2 = 0.935$</td>
</tr>
<tr>
<td>3rd round test</td>
<td>$\gamma_3 = 0.983$</td>
</tr>
<tr>
<td>Mean of all the three round tests</td>
<td>$\gamma_4 = 0.944$</td>
</tr>
</tbody>
</table>

$\gamma_1$ = Coefficient of correlation between the scores of 1st test followed after analytic method and 2nd test followed after synthetic method of teaching

$\gamma_2$ = Coefficient of correlation between 3rd test followed after analytic method and the 4th test followed after synthetic method of teaching

$\gamma_3$ = Coefficient of correlation between 5th test followed after analytic method and 6th test followed after synthetic method of teaching

$\gamma_4$ = Coefficient of correlation between the total scores obtained in all the tests followed by analytic method and total scores obtained in all the tests followed by synthetic method of teaching

In all the cases, it is obtained that the coefficient of correlation is very high. Analytic and synthetic methods of teaching are highly correlated, although synthetic method of teaching is the reverse way of analytic method of teaching.

From Tables No. 7.20 and 7.21, it can be observed that analytic method of teaching produced better result than synthetic
method of teaching in each round of test. Synthetic method of teaching is effective but the effectiveness is less than analytic method of teaching.

It is noticeable that the result after analytic method of teaching becomes less encouraging. Mean test scores after each analytic method of teaching are:

\[
\begin{align*}
M_1 &= 13.2 \\
M_2 &= 11.936 \\
M_3 &= 11.73 \\
\end{align*}
\]

But mean test scores after each synthetic method of teaching are:

\[
\begin{align*}
M_1 &= 5.63 \\
M_2 &= 7.93 \\
M_3 &= 10.36 \\
\end{align*}
\]

Results of analytic method of teaching are \(M_1 > M_2 > M_3\)

Results of synthetic method of teaching are \(M_3 > M_2 > M_1\)

In analytic method of teaching, students showed better performance in the beginning but it decreased gradually.

In synthetic method of teaching, students showed poor
performance in the beginning but their performance improved gradually.

This indicates that students improved after they tuned themselves with synthetic method of teaching.

Analytic method of teaching demands good thinking power whereas synthetic method demands good memory power.

Students who have less memory power can succeed in synthetic method of teaching by doing extra labour. But students who do not have thinking power cannot improve easily in analytic method of teaching.

This indicates that in present examination oriented educational system, students improve if they can enhance their memory power. Analytical way of thinking puts stress on mind. Understanding in analytical method of teaching is time taking.

Instead of going into deep thinking, students preferred to remember things without proper understanding by drill master's technique. But drill master's technique is not applicable to all topics. There are topics where deep thinking and analysis is involved. In those topics, analytic method proved better.
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