CHAPTER IV

SECTION I : EFFECTIVENESS OF TEACHER

SECTION II : EFFECTIVENESS OF MATHEMATICS TEACHER
SECTION - I

EFFECTIVENESS OF TEACHER
Effectiveness determines the level of functionality in every walk of life. Concerted efforts are afoot to maximise effectiveness. The pathological degeneration of every system and every action is due to lack of effectiveness. High standards and high effectiveness go together.

Teachers have been playing their trade from times immemorial. Tradition and the rule of the thumb have been the two traditional sheet anchors of this profession. Industrialisation had its impact on education. Mass production and quality control affected it. Schools lost their autonomy and they were no longer free to teach anything in any way. Affiliation, accreditation and academic standards emerged as common features of a well articulated educational system. Net working and interchanging necessitated the maintenance of standards. This compelled educationists to carefully study the different aspects of the educational system to diagnose the existing defects to remedy them. Teacher effectiveness is a major factor of a healthy educational system. It has engaged the attention of many researchers. Evaluation of teacher effectiveness is not a one-time affair. It is an on-going process to evaluate the optimal functionality of teachers. As such studies in the field of teacher effectiveness have a permanent place in the educational research scenario.

Mathematization promotes quantitative thinking. Mathematics due to its very intrinsic nature, is highly abstract and theoretical. It is not everybody's cup of tea. Ineffectiveness in mathematics may be due to a variety of reasons including the lack of teacher effectiveness in this field. Though a lot has been written and said about teaching effectiveness, even today
this term continues to evade precise definition. There are as many views of teacher effectiveness as there are researchers.

Barr summarised a massive amount of American research relating to teacher effectiveness and concluded:

"Some teachers were preferred by administrators, some were liked by the pupils and some taught in classes where there were substantial pupil gains and generally speaking these were not the same teachers."1

A close study of the above conclusion highlights the inherent dangers and pitfalls in evaluating the effectiveness of teachers. Evaluation is the criterion reference; and differential criteria yield differential results. The refraction in perception of school administrators, school Heads, peers, pupils and public are expectedly at variance. These have amply been reflected in the various studies. Studies relating to teacher effectiveness are always culture bound. A culture fair teacher effectiveness test continues to be elusive. On this point, Barr adverted:

"There is plenty of evidence to indicate that different practitioners observing the same teacher teach or studying data about her, may arrive at very different evaluation of her. This observation is equally true of the evaluation experts, starting with different approaches and using different data gathering devices. They too arrive at very different evaluations"2

At this point, it is appropriate to consider the views of some eminent researchers of this field. Their perceptions are likely to facilitate a better understanding as to what Teacher Effectiveness is.
According to Ryans (1950):

"Teaching is effective to the extent that the teacher acts in ways that are favourable to the development of basic skills, understanding, work habits, desirable attitudes, value judgements and adequate personal adjustment of the pupils."

Evan (1951) concluded that the best criterion of effectiveness would be a composite measure based on pupil gains in information ratings by competent observers, and a rating based upon opinions of pupils.

Barr (1952) explains teacher effectiveness as a relationship between teachers, pupils and other persons concerned with the educational undertaking all affected by limiting and facilitating aspects of the immediate situations.

According to Remmers (1952):

"Effectiveness is a degree to which an agent produces effects." The question immediately arises: "What effects on what?" Usually, these categories of effects in terms of the object effected are (a) pupils (b) school operation (c) the school community.

Jones (1956) in his investigations distinguished between 'good' and 'poor' teachers by making students list characteristics of least liked and best liked teachers, measuring characteristics of teachers under training and correlating these measures with estimates of their success in actual teaching; studying teachers judged 'good' and 'poor' to discover factors and qualities in successful teaching.

According to the study reported by Stern, Stein and Bloom (1956):
"Effectiveness is rather a standard of performance in a specific work situation that some individuals are said to manifest." 

According to Combs (1961), a good teacher is a person who has learned to use himself as an effective instrument. He has defined the effective teacher as,

"...a unique human being who has learned to use himself effectively and efficiently for carrying out his own and society's purposes." 

Torrance (1966) reported that teacher effectiveness had a positive effect on student attitudes towards teaching methods and overall school climate.

Similar attempts to explain effective teaching behaviour have been made by Filson (1957), Medley (1959), Flanders (1960), Bowers (1961), Smith (1961), Ober, Bentley and Miller (1971) and many other researchers. These attempts to examine the more global aspects of discriminating between good and poor teaching.

According to Gerald Cortis (1977):

"Effective teaching is a matter of the teacher finding the right 'niche' i.e. the appropriate situation in which to operate. So if there is a mismatch between the personal factors and the situation - effective and happy teaching relations are unlikely to prosper."

According to Dickson (1980):
"Teaching effectiveness is a demonstrated repertoire of competencies involved with (1) teaching plans and materials (2) classroom procedures (3) inter-personal skills and (4) learners reinforcement - involvement reflected in teacher behaviour."12

Gupta and Kapoor (1984) stated:

"Teacher effectiveness is a repertoire of efficacy exhibited by a teacher in (1) instructional strategies (2) classroom management (3) personal disposition, temperament and tendencies (4) evaluation and feedback (5) interpersonal relations (6) job involvement (7) initiative and enthusiasm (8) professional values and (9) innovativeness respectively in the everyday teaching-learning situations"13

Kaul (1972) states:

"the effectiveness of popular teachers was with respect to attitudes towards teaching, public examination results of their students and the appraisal of their work as teachers respectively."14

Chhaya (1974) stated,

"effective teachers had significantly better personality adjustment and favourable attitudes towards teaching. They were less interested in teaching than ineffective teachers, emotionally stable, more authoritarian and extrovert, she found that sex and age of a teacher were significantly related to his or her effectiveness."15

Teacher Competence and Teacher Effectiveness

Study of teacher effectiveness leads to the study of teacher competence. Effective teachers are always competent. Competency and effectiveness go side by side.
According to Arun Kumar Gupta, there are four types of competencies upon which teacher effectiveness is based. They are:

1. Competency in teaching plans and materials
2. Competency in classroom procedures
3. Competency in interpersonal skills
4. Competency in professional standards

Competency is an individual's ability to produce satisfactory results. A factory worker is competent if he can perform manipulative tasks rapidly and without errors. A teacher can demonstrate this competence through better student performance.

Criteria of Teacher Effectiveness

Although many researches have been conducted regarding teacher effectiveness, no definite rules or criteria of teacher effectiveness have been found. As stated by Dr Arun Gupta, among various criteria of judging success in teaching, the more frequently used are:

(i) Presage Criteria
In this criterion, teachers' age, sex, socio-economic status are included. Teacher effectiveness is dependent on these variables.

(ii) Process Criteria
In this criterion, teachers' behaviour, interaction with students, classroom teaching, methods of teaching are included.
Teacher's knowledge, academic achievement are also included.

(iii) **Product Criteria**

Pupil change, growth, bearing or gain are the most important criteria of teaching success as considered by Dr. Arun Kumar Gupta.

Travers (1953), Ryans (1953), Remmers (1952, 1953) and Robinowitz (1956) have all given convincing arguments in favour of assessing teacher effectiveness through such effects on students as student gains and student growth or involvement and change in student behaviour. Some of which can be legitimately attributed to the impact of individual teacher.

**Competency-Based Teacher Effectiveness**

Four competencies affect teacher effectiveness. They are:

1. Competency in teaching plans and materials
2. Competency in Classroom procedures
3. Competency in interpersonal skills
4. Competency in professional standards

**Factors Associated with Teacher Effectiveness**

(i) **Intelligence and Teacher Effectiveness**

There is significant correlation between these two factors as it is revealed by research studies.
(ii) Academic Achievement and Teacher Effectiveness

Relationship between these two factors is conflicting as it is revealed by research studies.

(iii) Personality Factor and Success in Teaching

It is felt that personality has great influence on teacher effectiveness. Reudiger and Strayer found that the personality of teachers was considered by the principals to have relatively high correlation with teaching success.

(iv) Teacher Attitude and Teaching Success

Survey of research reports indicates that teachers attitude have a positive relation with success in teaching.

Other Variables Related to Teacher Effectiveness are: Boyce (1912), Anderson (1954) and Ryans (1951) found no significant difference between teachers on the basis of sex and marital status. Concerning experience Ryans (1951) and Moriam (1900) found teachers with more than five years experience to be highly effective.

Profile of Effective and Ineffective Teachers based on Teacher Effectiveness Scale (Gupta and Kapoor 1981)

I. Instructional Strategies

<table>
<thead>
<tr>
<th>Effective Teachers</th>
<th>Ineffective Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear understanding of problems.</td>
<td>Lack of understanding of concepts.</td>
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</tbody>
</table>
Effective Teacher

Making the best use of time.
Adept in motivation planning of lesson.
Use of illustrative aids involving pupils in the lesson.
Aware of source material of knowledge and new techniques of teaching.

Ineffective Teacher

Wastage of time in gossip.
Poor motivation, poor lesson planning.
Neglect of teaching aids.
Ignorant of source material and new techniques of teaching.

II. Classroom Management

Management of classroom in democratic and free atmosphere
Rare chance of class conflicts
Pupils seek maximum help from teacher

Control over class with the help of rod.
More chance of class conflicts
Pupils reluctant to seek help from the teacher

III. Personal Disposition, Temperament and Tendencies

Emotionally stable
Cheerful
Energetic
Accept work willingly
Not perturbed by criticism
Face odd situation boldly

Emotionally unstable
Gloomy
Lethargic
Accept work grodgingly
Easily disturbed by criticism
Unable and incapable to solve problems
IV. Evaluation and Feedback

Effective Teachers

Check home tasks seriously.
Maintain student records.
Take tests periodically
Meet the needs of poor, meritorious and exceptional children.
Proper diagnosing of the problems and finding their solution

Ineffective Teachers

Home tasks checked irregularly and haphazardly.
Students records not maintained
Never bothers to take tests
Individual attention not considered.
Difficulty in the solution of problems.

V. Initiative and Enthusiasm

Encourage, boost and prepare pupils for competition
Accept challenge
Urge for reading, writing and experimentation
Participation in group discussion

Suggest short cut method for success.
Unwilling to accept challenge
No urge for reading and writing
Shirk from taking part in group discussion

VI. Professional Values

Objective
Sincere
Impartial

Subjective
Insincere
Partial
Effective Teachers

Strive hard to raise professional standard
Feel contented and satisfied
Take enjoyment in teaching

Ineffective Teachers

Least interested in raising professional standard
Feel dissatisfied with the profession.
Always in search of seeking other profession.

VII. Innovativeness

More interested in finding novel things, techniques and always in search of finding solution of the problems.
Suggest new changes and help in their introduction.

Least interested in new changes, take no initiative to bring about changes in techniques of teaching
Lay stress on conventional methods and practices.

VIII. Interpersonal Relations

No jealousy for other members of the staff.
Deep understanding
Cordial relations with head, staff and pupils.

Jealous of other members of the staff.
Lack of understanding with the authority.
Strained relations with head, staff and pupils.

IX. Job Involvement

Punctual
More serious and busy in profession

Irregular
Carefree and with least aptitude for this profession.
<table>
<thead>
<tr>
<th>Effective Teachers</th>
<th>Ineffective Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>High participation in curricular, cocurricular activities</td>
<td>Reluctant to participate in curricular and co-curricular activities.</td>
</tr>
<tr>
<td>Derive satisfaction from the profession.</td>
<td>Dissatisfied with the profession.</td>
</tr>
</tbody>
</table>
SECTION - II

THE EFFECTIVE MATHEMATICS TEACHER
3.2.1 Characteristics of Teacher

Teachers have always commanded respect in all societies. The great teachers like Socrates, Plato, Christ, Buddha and Drona are remembered even today as eminent teachers. These teachers were able to attract a large number of pupils from distant places and their fame was closely related to the achievement of their pupils.

The ancient scriptures and literature reveals the names of great disciples like Arjuna, Ekalavya, Karna etc. Whenever we think of Arjuna, the name of his teacher Dronacharya comes to our mind. Similarly Karna is related to his eminent teacher Parasuram. Teachers of eminence had been successful in bringing out the inner potential of their students.

"The teacher is not only a communicator but a model. Somebody who does not see anything beautiful or powerful about mathematics is not likely to ignite others with a sense of the intrinsic excitement of the subject. A teacher who will not or cannot give play to his own intuitiveness is not likely to be effective in encouraging intuition in his students." 16

A teacher inspires and encourages the students. The ancient Indian teachers were known as "Acharyas" - those whose behaviour being impeccable was worthy of close imitation by the students. They were great intellectuals with integrity of character, and acted as models for emulation. The often used term "Guru" for the Indian teacher signified his might in the intellectual realm. As a wealthy intellectual, he wielded tremendous influence over his pupils, and provided them with the right intellectual orientation.

"The teacher is also an immediately personal symbol of the educational process, a figure with whom students can identify and compare themselves." 17
A teacher's role is important in taking care of the students, moulding their behaviour and leading their interest and curiosity in bringing about a fruitful change in them.

Therefore, it is said that:

"A teacher is more like a gardener who tends each plant, gives water and sees that plenty of plant food is available in the soil so that the plant may take its own nourishment."18

The Secondary Education Commission (1952) remarked:

"The intelligent and awake teacher has numerous opportunities to kindle new interest to expand and strengthen existing ones and to satisfy their innate desire to touch life at many points. It is by exploring different avenues of interests and activities that he can truly discover himself and begin to specialise in due course."19

A teacher's role is important in fulfilling the needs of the students. In this regard, Dubisch felt that:

"A good teacher is a human and matured person who knows his subject thoroughly, has a keen interest in it, and tries to get it across to his students in a thought provoking fashion".20

Knowledge is an important aspect of a teacher. In order to impart the knowledge effectively, a teacher should know the important technique of instruction. Howard F. Fehr outlined the expected intellectual orientation of an effective teacher. He stated:
"We may include that a teacher's knowledge cannot possibly be limited to what he teaches, that it is not sufficient to have a good knowledge of his instructional subject and that he cannot know it really well unless he knows a good deal more that he shall never be called on to instruct."

With his knowledge and techniques, love and affection, sympathy and friendship, a teacher leads on the students from darkness to light; which the individual student recalls in his later life, when he is no more a student and bestows honour and respect by citing the example of the teacher and the pleasant memories of his school life. It is the students who spread the name and fame of the teachers who had toiled all their lives to enkindle enlightenment and enthusiasm through their effective teaching.

3.2.2 Characteristics of an Effective Mathematics Teacher

John C Egsgard of Twin Lakes Secondary School, Orillia, Canada, remarked:

"A professional teacher of mathematics is one who is a good teacher of mathematics. A good teacher of mathematics is one who uses his knowledge and love of mathematics as well as his love and respect for his students to lead these students to enjoy the study of mathematics."

"There are many ideas in mathematics that are difficult in themselves, but the good teacher of mathematics, the truly professional teacher is able to peel away the unnecessary complications and to present the core ideas so that these ideas can be understood. This is one of the key questions that the good mathematics teacher has that enables him to lead his students to the enjoyment of mathematics. A good mathematics teacher, through its questions and explanation, is able to help all his students to understand and successfully do mathematics."
This shows how a mathematics teacher can create interest and enable the students understand difficult ideas and concepts in mathematics.

The teacher's knowledge of mathematics sets the limit to his effectiveness:

"In general, as a minimum, a teacher of mathematics must know all of the material that he will need to teach as well as the place of this material in the spectrum of the mathematics curriculum."24

A mathematics teacher can enhance his knowledge by reading local and national mathematics journals and having a dialogue and conversation with his colleagues.

Gerald R. Rising of State University of New York Buffalo, New York, in his article "The making of a professional Mathematics Teacher", described the characteristics of an effective mathematics teacher as follows:

"In the best of all possible worlds we could certainly like to have classroom teachers who know mathematics in considerable depth, who are so well prepared academically that they are comfortable with the role of mathematics in society, who understand students and can communicate with them well, who can and will ably perform the tasks of the classroom .......... organizing and teaching lessons, correcting student papers, providing individual assistance etc..... who will lead students to the powerful goals of independence and self-esteem, who will provide moral and intellectual models for their students".25
Edith Biggs in her article "special assistance for the beginning teacher" states that the objectives a beginning mathematics teacher should have the following:

"1. All students should enjoy mathematics.

2. The students should be confident in their own ability to achieve success in the subject. This can be furthered by the teachers own positive approach ...... but the children themselves should be helped to master essential facts, including number facts.

3. Children should understand that mathematics is much more than number of facts. It is fundamentally concerned with pattern.

4. They should be able to talk about what they have done and to listen to their peers and compare the methods they have used.

5. They should appreciate the importance of mathematics in the electronic revolution and that it has transformed the way we think.

6. They should be able to use mathematics to deal with situations they encounter outside mathematics lessons, whether in other aspects of the curriculum or in every day life."26

Mathematics teacher is expected to promote and facilitate learning. The overwhelming scientific advances and the changed technological scenario necessitate the strengthening and updating of Mathematics teaching to meet the emerging needs of the times. Mathematics teacher should be careful in the methods adopted by him. In this regard, the International Commission on Mathematics Instruction (1966) remarked :

"The teaching of a modernized programme in mathematics makes quite different demands upon the teacher than construction in traditional programme. Not only
is there required a completely new orientation towards the nature of mathematics, but also a more global approach in methods of teaching the subject. In addition, the steady increase in mathematical knowledge at advanced levels, and with the increase a necessary shift in patterns of organization of the school content, both demand a teacher who is continuously a student of his field of endeavour."27

According to Roy Dubisch and W.E.Howert, the desirable traits of a good mathematics teacher are:

"There is widespread agreement among both teachers and students that a good teacher must know his subject and have an enthusiasm for it. In addition, however, he must have or develop the ability to:

1. Present material in a thought provoking way.
2. Explain clearly the reasoning needed to develop the subject and the technical skills necessary to apply this reasoning".28

The mathematics teacher has to deal with abstractions and generalizations which are not so numerous in other subjects. According to S.M.Aggarwal, an effective mathematics teacher should have:

"1. Proficiency in fundamental skills;
2. Comprehension of basic concepts;
3. Appreciation of significant meanings;
4. Development of desirable attitudes;
5. Efficiency in making sound applications;
6. Confidence in making intelligent and independent interpretations".29
Terezinha N Carraher et al. stated in their paper, 'Can Mathematics Teacher Teach Proportions?' that,

"The results indicate characteristic types of difficulties appearing in certain problems, some of which can be related to cognitive development. It is suggested that teacher's awareness of such difficulties may help to improve their teaching of the subject. For if Mathematics is to be useful to everyone, mathematics teachers must consider carefully issues related to the transfer of knowledge acquired in the classroom to other problem solving situations".

Levels of cognitive development, transfer of training and relevance to real life situations are important aspects of mathematics teaching. Piagetian psychology with its major emphasis on cognitive development at different age levels has tremendous importance for the mathematics teachers. The mathematics teacher can ill afford to confine himself to the knowledge of mathematics perse. He must take cognizance of the operational realities of the classroom.

Pam Harris who was teaching the tribal aboriginal communities in Australia noted that "....... teachers often get the feeling that mathematics is not relevant ... Teachers often receive negative attitudes from other people so that they go to an aboriginal community expecting that their pupils will not be able to do mathematics. Furthermore, they observe a lack of reinforcement of mathematics in the pupils homelife. Teaching materials mostly are culturally and linguistically biased. Teachers feel discouraged because of the difficulties of teaching mathematics under these conditions".

A large number of scheduled caste and scheduled tribe students are entering the secondary schools of India. They are socially disadvantaged
and face cultural and linguistic problems. Harriss's observations are highly relevant for the mathematics teachers whose onerous job it is to teach children coming from socially disadvantaged homes.

The Effectiveness of a mathematics teacher cannot be estimated without taking note of the situation in which he is teaching the subject. Effectiveness is situational and circumstantial.

Damerow, Dunkley, Nebres and Werry who edited 'Mathematics for All' noted:

"..... Mathematics For All entails an intention to change general attitudes towards mathematics as a subject, to eliminate divisions between those who are motivated towards mathematics and those who are not, and to diminish variance in the achievement outcomes of mathematics teaching. This, in its turn, involves us in an analysis of social contexts, curricula and teaching. It is these forces together which create a web of pressures which, in turn, create situations where mathematics becomes one of the subjects in the secondary school in which selection of students into aptitude and ability groups is an omnipresent reality almost from the time of entry."32

Ultimately the effectiveness of mathematics teacher depends upon his ability to effectively confront the 'web of pressures'. The parameters set by Peter Damerow and others define and delimit the efforts of a teacher towards effectiveness.

Dr. B.C. Mohapatra (1990) had concluded that, "..... an analysis of the likes and dislikes of the students largely depended on the teachers and the methods adopted by them."33
Here he is hinting that it is the effectiveness of the mathematics teachers that ultimately count in properly orienting the students towards this highly abstract and conceptualized subject.
## REFERENCE


2. Ibid


6. Ibid

7. Ibid

8. Ibid


11. Ibid

12. Ibid


23. Ibid :

24. Ibid :


