3

METHODOLOGY OF RESEARCH

Research is an endless quest for knowledge and an unending search for truth. It brings to light new knowledge or corrects previous errors and misconceptions and adds in an orderly way to the existing body of knowledge. The knowledge obtained by research is scientific and objective and is a matter of rational understanding, common verification and experience.

“Research is considered to be the more formal, systematic and intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation usually resulting in some sort of formal record of procedure and a report of results in conclusion”. (J.W. Best)

“Research is an honest, exhaustive, intelligent searching for facts and their meanings or implications with reference to a given problem. It is the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data. The best search is that which is reliable, verifiable and exhaustive, so that it provides information in which we have confidence”. (P.M. Cook)

Research in education is needed to improve educational practices and policies. Many of our educationists are constantly engaged in research to find out effective methods of instruction and satisfactory techniques of improving pupil behaviour. Research in education is also undertaken to develop suitable learning materials, satisfactory techniques of evaluation, more comfortable physical facilities and more efficient systems of educational management and administration.
Traverse considered educational research as that activity which is directed towards development of a science of behaviour in educational situations. He was of the opinion that the aim of research is to provide knowledge which will permit the educator to achieve these goals by the most effective methods.

Rummel has observed that since no two research undertakings are exactly alike, it is impossible to set forth any right formulation of method or procedure. There is a wide variation in the condition and circumstances which determine the objectives and nature of research problems in different fields. The purposes of a study may vary from researcher to researcher in terms where it is to be conducted and the applications to be made of it. In addition, great differences in the capacities, and characteristics among the individuals who do research work are a proved fact. Thus, all methods defy portrayal in terms of formulae or standardization.

Considering its special advantages, and depending on the nature of the present study, the survey method has been chosen to study the teaching aptitude, social adjustment and job satisfaction of secondary school science teachers of Chittoor district.

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the “Research Design”. Decision regarding what, where, when, how much, by what, concerning an inquiry or a research study constitute a research design.

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to research purpose with economy in procedure (Clair Selltiz and others, 1962). Infact, the research design is the conceptual structure within which research is conducted. It constitutes the blue print for the collection, measurement and analysis of data.
A good design is often characterized by objectives like flexible, appropriate, efficient, economical and so on. Generally the design, which minimizes bias and maximizes the reliability of the data collected and analysed, is considered a good design. The design, which gives the smallest experimental error, is supposed to be the best design in many investigations. Similarly, a design which yields maximal information and provides an opportunity for considering many different aspects of a problem is considered the most appropriate and efficient design in respect of many research problems. Thus, the question of good design is related to the purpose of the research problem and also to the nature of the problem to be studied.

For the present study, the following aspects have been discussed which are concerned with the design of the study. Research procedure includes the operational definitions of different terms used, the hypotheses that are framed for testing and the rationale of the formulated hypotheses. Selection of the sample includes the sampling techniques used, the reasons for selection of a particular sampling technique and the selection of samples according to variables. Selection of tools includes the selection of suitable tools for collection of data, description of the tools selected, testing their suitability for the present study, and the procedure followed in administering the tools to collect the data required for the study.

The normative survey method of investigation is very common in educational research, which attempts to describe and interpret what exists at present in the form of conditions, practices, processes, trends, effects, attitudes, beliefs etc.

In normative survey method, the term, ‘normative’, implies the determination of normal or typical conditions or practices at present time and the term, ‘survey’, indicates the gathering of the data regarding current
conditions. The normative survey method is an organized attempt to analyse, interpret and report the present status of a social institution, group or area. Survey studies collect information on what exists, on what we want, and on how to get there.

In the present study, normative survey method has been used. The normative survey of research is usually designed to obtain permanent and precise information concerning the current status of phenomena and, whenever possible, to draw valid general conclusions from the facts discovered. It does not restrict itself only to fact finding but may often lead to research that results in the formulation of important principles of knowledge and solutions of significant problems concerning local, state, national and international issues.

**OPERATIONAL DEFINITIONS OF KEY TERMS**

The operational definitions of the important terms used in the present study are discussed here.

**Teaching**

‘Teaching’ is a social and professional activity. It is a process of development. It is a system of actions which induce learning through interpersonal relationship. Teaching is a purposeful activity. The ultimate goal of teaching is to bring all-round development of a child.

Teaching is an art as well as a science because teaching can be studied objectively and scientifically. Teaching has a scientific foundation.

Thus, teaching is an activity taken up in schools to realize the educational goals.
Teaching Aptitude

Teaching aptitude refers to the aptitude for the teaching profession. The word ‘aptitude’ is derived for the word ‘Aptos’ which means fitted for. It may be defined as a pronounced innate capacity for or ability in a given line of endeavor such as particular teaching, school subject, art or vocation. It refers to an individual's in born capacities or potentialities which are indicative of special abilities.

Teaching aptitude is the capacity to acquire proficiency with a given amount of training in teacher education. It refers to the capacity of an individual to be skilled in teaching, receiving formal or informal training. It also refers to a teacher’s character, optimistic attitude, fair mindedness, impartial behaviour, good manners, cooperativeness, wide interest, scholarly taste, dynamic personality, etc.

Social adjustment

Adjustment is a signal of harmonious relationship between a man and his environment. When we adjust ourselves by this means we are changing in some way to adopt or accommodate ourselves in order to get certain demands of our environment. The conditions in the environment are in a continuous realm of changes. We change our nature in order to get ourselves in the realm of nature. Thus, the process of adjustment is a continuous one.

An individual’s social adjustment can be ascertained by his social development and adaptability to the social environment. Social adjustment requires the development of social activities and virtues in an individual. It also requires that one should be social enough to live in harmony with one’s social beings and feel responsibility and obligation towards one’s fellow humans, society and country.
Job satisfaction

Job satisfaction is a complex phenomenon having multiple interrelated casual factors: personal, social, cultural and economic. Job satisfaction is the result of various attitudes the person was towards his job, job related factors and towards life in general. Job satisfaction depends on various attitudes of an employee, related to the job and are concerned with factors like wage, supervision, steadiness of employment, conditions of work, opportunities for advancement, recognition of ability, fair evaluation of work, social relations in the job, treatment by employees, work environment and other such related factors; other personal factors such as employee’s age, gender, health, temperament and level of aspiration should also be considered. Moreover, his family relationships, social status and activities in various organizations also contribute to the job satisfaction of an employee.

Job satisfaction is an individual’s emotional reaction to the job itself. It is a person’s attitude towards the job.

Secondary School Science Teacher

Teachers who are teaching science (both biological and physical sciences) to secondary classes and who are in the cadre of school assistant were considered as secondary school science teachers.

Private Secondary Schools

The secondary schools managed by private organizations or persons, either partially or totally, were included in private schools. The public schools, government recognized and or aided schools managed by the private managements were included under private schools.
Government Secondary Schools

The secondary schools under the sole management of government officials were included under government schools. So, the secondary schools managed by Zilla Parishads, Municipalities, Municipal Corporations or Government were included in this category.

Urban Secondary Schools

The secondary schools located in an urban area were considered as urban secondary schools.

Rural Secondary Schools

The secondary schools located in rural area were considered as rural secondary schools.

Telugu Medium Teachers

Teachers working in Telugu medium secondary schools were included in this group.

English Medium Teachers

Teachers working in English medium secondary schools were included in this group.

Residential Secondary Schools

The schools where the students stay all the time were considered as residential secondary schools. The students study in school and stay in attached hostel.

Non-residential Secondary Schools

The students get formal education in non-residential schools as day scholars and they stay at home after the instructional period is over.
Age

The actual or chronological age of the secondary school science teachers was taken into consideration and categorized into two age groups, viz., 1. Below 40 years of age, and 2. Above 40 years of age.

Experience

The length of teaching service was considered as the experience of the secondary school science teacher and the teachers were categorized into two groups, viz. 1. More-experienced (above 15 years), and 2. Less-experienced (below 15 years).

VARIABLES OF THE STUDY

A variable, as the name implies, is something which varies. This is the simplest and broadest way of defining a variable. However, a behaviour scientist attempts to define a variable more precisely and specifically. From his point of view, variables may be defined as those attributes of objects, events, things and beings which can be measured. In other words, variables are the characters or conditions that are manipulated, controlled or observed by the experimenter. Intelligence, anxiety, aptitude, adjustment, satisfaction income, education, authoritarianism, achievements, etc., are the examples of variables commonly employed in psychology, sociology and education.

Variables are necessary requisites for any worthwhile research for the purpose of comparison. For the present study, the following variables are considered.

1. **Gender:** Secondary school men science teachers versus secondary school women science teachers.

2. **Locality:** Urban secondary school science teachers versus rural secondary school science teachers.
3. **Management:** Government secondary school science teachers versus private secondary school science teachers.

4. **Residence:** Residential secondary school science teachers versus non-residential secondary school science teachers.

5. **Medium of Instruction:** English medium secondary school science teachers versus Telugu medium secondary school science teachers.

6. **Age:** Aged above 40 years secondary school science teachers versus aged below 40 years secondary school science teachers.

7. **Experience:** More-experienced secondary school science teachers versus less-experienced secondary school science teachers.

1. **Gender**

   Now–a–days, women’s education has gained much importance as many parents and others are encouraging them to pursue higher education. Many women are getting into teaching profession. For the nature of women, teaching profession is very suitable. As the psychological conditions, exposure to the society and education and other aspects of men and women vary differently, there may be a significant difference in the possession of teaching aptitude. So, a comparison between men and women secondary school science will reveal of any difference that exists in the possession of teaching aptitude, social adjustment and job satisfaction of science teachers.

2. **Locality of the School**

   The rural and urban secondary school science teachers differ in a variety of aspects such as exposure to environment and work, participation in social problems, educational culture, morale, academic affairs, co-curricular and
extra-curricular activities. These will definitely influence the teaching aptitude. So, a comparison between rural and urban secondary school science teachers will reveal if any difference that exists in the possession of their teaching aptitude, social adjustment and job satisfaction.

3. Management of the School

In the government schools, appointment of the teachers, service conditions, pay protection, retirement benefits, administration, supervision, etc., are very clear; but in private schools, the above said aspects depend on the attitude of managements. This will have considerable influence on the teaching aptitude. So, a comparison between science teachers working in these two types of schools will reveal differences that may exist in the possession of their teaching aptitude, social adjustment and job satisfaction.

4. Residential Schools and Non-residential Schools

The teachers working in non-residential schools stay in the schools during the instructional period and the rest of the time they spend as they wish. But, the teachers working in residential schools participate in the instructional activities during the formal education period along with participation in the study periods, remedial teaching, etc., after the formal instruction; and every night they stay in school/hostel during nights to take up additional instructional activities. This may lead to level of possession teaching aptitude, social adjustment and job satisfaction, and, hence, this variable was considered for comparison.

5. Medium of Instruction

Medium of instruction is another variable that can be considered. The medium of instruction has a definite role in teaching and learning to play as it is the channel for right communication. The communication skills and language
efficiency will play their legitimate role in teaching aptitude, social adjustment and job satisfaction. Hence, this variable was considered for comparison.

6. Teaching Experience

Teaching experience enriches a teacher in several aspects. It even enhances the attitude and aptitude of teachers in different directions and dimensions concerned with teaching. So, a comparison between more experienced teachers and less experienced teachers will reveal of any significant difference that exists in the possession of teaching aptitude, social adjustment and job satisfaction.

7. Age

Age influences an individual’s behaviour, maturation, way of thinking, level of reasoning, understanding the situations, attitudes and aptitudes. So, a comparison between below 40 years aged and above 40 years aged science teachers will reveal if any significant difference exists between them in the possession of teaching aptitude, social adjustment and job satisfaction.

HYPOTHESES OF THE STUDY

Hypothesis is a guess, a supposition or a tentative inference as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain such facts as already are known to exist in a given area of research and to guide the search for the new truth.

A hypothesis may be defined as a proposition or a set of propositions set forth as an explanation for the occurrence of some specified group or phenomena either asserted merely as a provisional conjecture to guide some investigation or accepted as highly probable in the light of established facts.
The following hypotheses were formulated in the present study.

**Hypothesis 1:** The secondary school science teachers are not possessing high teaching aptitude.

**Hypothesis 1A:** There is no significant difference in the teaching aptitude of men and women secondary school science teachers.

**Hypothesis 1B:** There is no significant difference in the teaching aptitude of rural and urban secondary school science teachers.

**Hypothesis 1C:** There is no significant difference in the teaching aptitude of government and private secondary school science teachers.

**Hypothesis 1D:** There is no significant difference in the teaching aptitude of English medium and Telugu medium secondary school science teachers.

**Hypothesis 1E:** There is no significant difference in the teaching aptitude of residential and non-residential secondary school science teachers.

**Hypothesis 1F:** There is no significant difference in the teaching aptitude of aged below 40 years and above 40 years secondary school science teachers.

**Hypothesis 1G:** There is no significant difference in the teaching aptitude of more-experienced and less-experienced secondary school science teachers.

**Hypothesis 2:** The secondary school science teachers are not possessing high social adjustment.

**Hypothesis 2A:** There is no significant difference in the social adjustment of men and women secondary school science teachers.
**Hypothesis 2B:** There is no significant difference in the social adjustment of rural and urban secondary school science teachers.

**Hypothesis 2C:** There is no significant difference in the social adjustment of government and private secondary school science teachers.

**Hypothesis 2D:** There is no significant difference in the social adjustment of English medium and Telugu medium secondary school science teachers.

**Hypothesis 2E:** There is no significant difference in the social adjustment of residential and non-residential secondary school science teachers.

**Hypothesis 2F:** There is no significant difference in the social adjustment of aged below 40 years and above 40 years secondary school science teachers.

**Hypothesis 2G:** There is no significant difference in the social adjustment of more-experienced and less-experienced secondary school science teachers.

**Hypothesis 3:** The secondary school science teachers are not possessing high job satisfaction.

**Hypothesis 3A:** There is no significant difference in the job satisfaction of men and women secondary school science teachers.

**Hypothesis 3B:** There is no significant difference in the job satisfaction of rural and urban secondary school science teachers.

**Hypothesis 3C:** There is no significant difference in the job satisfaction of government and private secondary school science teachers.

**Hypothesis 3D:** There is no significant difference in the job satisfaction of English medium and Telugu medium secondary school science teachers.
Hypothesis 3E: There is no significant difference in the job satisfaction of residential and non-residential secondary school science teachers.

Hypothesis 3F: There is no significant difference in the job satisfaction of aged below 40 years and above 40 years secondary school science teachers.

Hypothesis 3G: There is no significant difference in the job satisfaction of more-experienced and less-experienced secondary school science teachers.

Hypothesis 4: There is no significant association among teaching aptitude, social adjustment and job satisfaction of secondary school science teachers.

Hypothesis 4A: There is no significant association among teaching aptitude, social adjustment and job satisfaction of men and women secondary school science teachers.

Hypothesis 4B: There is no significant association among teaching aptitude, social adjustment and job satisfaction of rural and urban secondary school science teachers.

Hypothesis 4C: There is no significant association among teaching aptitude, social adjustment and job satisfaction of government and private secondary school science teachers.

Hypothesis 4D: There is no significant association among teaching aptitude, social adjustment and job satisfaction of English medium and Telugu medium secondary school science teachers.

Hypothesis 4E: There is no significant association among teaching aptitude, social adjustment and job satisfaction of residential and non-residential secondary school science teachers.
Hypothesis 4F: There is no significant association among teaching aptitude, social adjustment and job satisfaction of aged below 40 years and above 40 years secondary school science teachers.

Hypothesis 4G: There is no significant association among teaching aptitude, social adjustment and job satisfaction of more-experienced and less-experienced secondary school science teachers.

SAMPLE OF THE STUDY

After finalizing the variables of the present study, considerations were given to whether the entire population is to be made the subjects for data collection or a particular group is to be selected as a representative of the whole population. The entire population here refers to all the secondary school science teachers working in Chittoor district.

Of the two techniques, the second one, namely, the selection of a group as a representative of the whole population was found to be more convenient and suitable. This technique leads to a considerable saving of time, effort and finance. As the number of science teachers selected is small, it is possible to obtain accurate and reliable results. As this sampling technique was more advantageous, it was selected for the collection of data.

In any social research, various methods are utilized for selection and drawing of samples. After a detailed study of all these methods and considering the variables selected for the research work, the ‘stratified sampling method’ was found to be most suitable.

In the stratified sampling method, the entire population will be divided into smaller homogeneous groups or strata, and then a sample is selected within each group. Every sampling unit in the population is placed in one of the strata prior to the selection of the sample so that the sum of the strata is identical with the population.
Stratified sampling method has certain merits as a technique of sampling. Auckoff has rightly said that stratified sampling enables the researcher to make a composition of properties of the strata as well as to estimate population characteristics.

In this stratified sampling method, the investigator will have greater control over the selection of the sample when compared with random sampling. In random sampling, although every group has a chance of being selected and included in the sample, there is every possibility, and sometimes it does happen, that certain important groups are left unrepresented. But, in stratified sampling method, no important group is likely to be left out.

Stratified sampling method is the ideal one when comparison between different variables has to be made. For example, if comparison has to be made between private and government school science teachers or rural and urban science teachers, it would be very difficult to select the required number of units through any other method of sampling. If any other method is used, the problem of bias and prejudice creeps in.

Replacement of units is also possible in the stratified sampling method. Normally, if a particular unit is not accessible for a study, it is difficult to replace it by another, but in this method it is possible. Stephen states that stratification automatically brings about a replacement of persons lost in the sample, by persons of the same stratum, thus partly correcting the bias that would result if there were no replacement of losses. As the entire population is divided into particular strata, it is easy and convenient to replace an inaccessible case by an accessible one.

In stratified sampling method, much depends on stratification process. The following precautions were taken while stratifying the population. The variables involved in the study were taken note of; care was taken to see that
each stratum in the universe was large enough in size so that selection of items could be done on random basis; the strata formed were definite and clear cut; each stratum was free from influence of the other; and there was no overlapping.

Before actually selecting the sample, certain fundamental principles were considered to make the sample scientific and clear cut (Bhaskara Rao, 1989).

Firstly, the 'universe' was clearly defined. In the technical phraseology of research, the whole population out of which the samples are selected is known as the 'universe'. For the present research work, the universe includes all the secondary school science teachers working in secondary schools of Andhra Pradesh. The study was limited to a particular geographical area, viz., Chittoor district, to facilitate appropriate sample selection and to avoid wastage of time and money.

Secondly, decision was made about the units of the sample. A unit of sample may be a house, a family, a group of individuals or a single individual. A good unit should possess the following characteristics. 1. Clarity: The unit should be clearly defined in unambiguous terms. This would make the study easy and efficient. For the present research work, a sampling unit is defined as a secondary school science teacher working in any secondary school of Chittoor district. 2. Suitability: A good unit should be well suited to the problem under study. Since the problem is the study of the teaching aptitude, social adjustment and job satisfaction of the secondary school teachers, the unit selected is well suited to the problem. 3. Accessibility: The unit selected should be easily accessible to the researcher. If the units selected are difficult to reach and if the researcher fails to make use of them, the study would be vitiated. The selected sampling units, i.e., secondary school science teachers, are easily accessible since they could be approached in any secondary school.
Thirdly, availability of sample and preparation of the source list are very much essential. This is an important factor that makes representative selection possible. A source list is the list which contains the names of the units of the universe from which the sample may be selected. It may exist even before the beginning of the project or it may be prepared afresh by the investigator himself. Without a source list, study through sampling method is not possible. For the present research work, a source list consisting of the names of secondary schools in the Chittoor district is used. Care was taken to see that the source list was up-to-date and valid and that there was no repetition of names of the schools. This source list was found to be relevant and suitable because it included secondary schools as the study deals with the teaching aptitude, social adjustment and job satisfaction of secondary school science teachers.

Besides considering these principles, it is extremely important to think about the size of the sample to be selected. If the sample is either too small or too large, it will make the study difficult and the results untenable. According to Parten, "An optimum sample in survey is one which fulfils the requirements of effective representatives, reliability and flexibility. The sample should be small enough to avoid intolerable sampling error." The size of sample for the present research work was decided after considering the following factors (Bhaskara Rao, 1989).

1. Since an intensive study was planned, a very large number of samples were not selected. In the case of an intensive study, employing a very large number of samples is not very useful as it involves huge consumption of resources. A smaller sample will be more convenient.

2. The size and selection of the samples are also influenced by the nature of the universe. If the universe is homogeneous, even a small-sized sample may yield dependable and required results. If the universe is heterogeneous, small-
sized samples may not be useful. In the case of the present study, the heterogeneous universe was split into smaller homogeneous strata and then the samples were selected from these strata. For example, the secondary school science teachers of Chittoor district were broadly grouped under government and private, and rural and urban secondary school science teachers. A sample was selected from each of these groups.

3. The researcher needs to determine the number of groups to be formed. In case the number of groups proposed is large, the size of the samples shall have to be large so that every group would be of proper size and suit the requirements of the study; in case the number of groups proposed is small, even small-sized samples can fulfill the requirement. In the case of the present study, the universe was divided into male and female science teachers, government and private school science teachers, less experienced and more experienced science teachers, etc. Since the number of groups was moderate, a reasonable sample was selected from each of these groups.

4. Practical considerations and accuracy will also play a vital role in determining the size of the sample. Every study is guided by certain practical considerations such as time, resources, accessibility of the data, etc. Generally, it is believed that a large-sized sample is more representative and usually produces accurate results. This, of course, mainly depends upon the technique of sampling used. If the sampling technique is scientific, even small-sized samples can produce dependable and accurate results. While selecting the size of the sample for the present study, practical considerations like the availability of resources and time were taken into consideration. Care was taken to make the sample selection technique as scientific as possible.

5. The size of the sample is also governed by the size of the tools to be used. In case the tools are short and the questions asked pertain to certain limited factors, a large sample can be selected. In case the tools are large and
the questions complicated, the sample should be small in size so that, from administrative point of view, the researcher may not be put to unnecessary troubles. In the present study, as the tools selected belonged to affective domain, a very large sample was not selected.

6. The sampling method also determines the size of the sample. When random sampling method is used, the samples have to be large. On the other hand, if samples are selected through stratified sampling method, the reliability can be achieved even with the help of small-sized samples.

Taking these factors that influence the size of the sample into consideration, it was decided that an ideal sample would consist of 480 secondary school science teachers. This sample is small enough to avoid unnecessary troubles and large enough to avoid intolerable sampling errors.

After deciding about the sampling method, the universe selected was divided into different strata. The variables chosen for the study were considered in dividing the universe. The sampling design employed here involved not only the stratification of the universe but also the random sampling technique to select the samples from within the stratum.

The total sample of 480 secondary school science teachers consisted of: men secondary school science teachers 240; women secondary school science teachers 240; government secondary school science teachers 240; private secondary school science teachers 240; urban secondary school science teachers 240; rural secondary school science teachers 240; English medium secondary school science teachers; Telugu medium secondary school science teachers; residential secondary school science teachers 240; non-residential secondary school science teachers 240; more-experienced secondary school science teachers 240; less-experienced secondary school science teachers 240; aged above 40 years secondary school science teachers 240; aged below 40 years secondary school science teachers 240.
Showing the sample size in the present study

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</tr>
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<td></td>
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<td>Women</td>
<td>240</td>
<td></td>
</tr>
<tr>
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<td>Management</td>
<td>Government</td>
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<td>480</td>
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<td></td>
<td>Private</td>
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<tr>
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<td>Medium</td>
<td>Telugu Medium</td>
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<tr>
<td></td>
<td></td>
<td>Below 40 Years</td>
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</tbody>
</table>
SCIENCE TEACHERS
(480)

Male
(240)

Female
(240)

Rural
(120)

Urban
(120)

Govt
(60)

Private
(60)

Govt
(60)

Private
(60)

Govt
(60)

Private
(60)

Govt
(60)

Private
(60)

Resi
(30)

N-Resi
(30)

Resi
(30)

N-Resi
(30)

Resi
(30)

N-Resi
(30)

Resi
(30)

N-Resi
(30)

Resi
(30)

N-Resi
(30)

Note: N-Resi : Non Residential
<40y : Below 40 years age
>40y : Above 40 years age
LE : Less Experienced
ME : More Experienced
TOOLS OF THE STUDY

A research tool plays a major role in any worthwhile research as it is the sole factor in determining the sound data and in arriving at perfect conclusions about the problem on hand, which ultimately, helps in providing suitable remedial measures to solve the problem concerned.

The selection and use of the tools can be done in two ways. The first one is to construct a tool independently by the investigator for his own study. Here, there are many problems in doing so. Preparation and standardization of a perfect tool itself is a major task and one can safely say that it is a doctoral study. On construction of their own tools, Anand and Padma (1987) felt that "A note of caution has to be struck when a researcher develops a tool for his study by merely pooling some items and does not subject it to the sophisticated techniques of tool construction. The result would be then, obviously, a poor quality research". With this, one can say that preparation and standardization of tools is a major task, and one should take care of aspects like selection of area and sample, pooling up of statements related to the area, consulting the experts and application of sophisticated statistical techniques. (Bhaskara Rao, 1997).

The other way of selection and use of tools is right selection of tools from already standardized ones available in the field of study. Here again locating the tools and identifying their usefulness to the study on hand is a tedious job. Even then, this technique is very useful when a research work is studied in depth, when the research work involves a good number of variables and when there is scarcity of time and other resources. Some people believe that some of the instruments available do not measure up to their standards. In some instances, consideration should be given to the logistics of the situation. Lacking time and financial resources for the construction of a test, many researchers can not expect to produce a better instrument. In these cases, the most logical procedure that one can follow is to choose the best instrument available for this purpose. (Bhaskara Rao, 1997)
MEASUREMENT OF TEACHING APTITUDE

Considering the flaws and merits of the selection of tools in either way, the researcher is interested in using the standardized tool as the present study involves a thorough study of teaching aptitude of the secondary school science teachers. Hence, the investigator selected the "Teaching Aptitude Test Battery (TATB)", which was prepared and standardized by Shamim Karim and Ashok Kumar Dixit, to study the teaching aptitude of the secondary school science teachers working in the secondary schools of Chittoor district.

Detail of TATB

Piagetion theory of cognitive development has revolutionized many general and specific concepts of education which has drawn the attention of a good number of psychologists and in the recent past a good deal of research has gone into the quest for factors affecting teaching (Centra 1979; Leventhal, Perry, Abrami, Turcote and Kane, 1981).

No doubt "teaching is the most difficult of all arts and the profoundest of all sciences" (Mann, 1853). But, now-a-days, it has become the easiest job. As we see every day, there has been rapid decrease in the quality of teaching efficiency though the quantity of teachers has increased a lot giving rise to the large number of frustrated and maladjusted individuals. Ours is a democratic country, its quality depends on the quality of its individuals and the quality of their education which directly or indirectly depends on the teaching efficiency of the teachers, i.e., the quality of a teacher in an educational system is a more important factor than all other educational factors.

Since ability to become efficient and to find in it a certain amount of zest is of vital importance for happiness and health of mind whether in school, college, business, government or in trade and industry, it becomes essential that a teacher should be efficient in his teaching. "What should be the distinguishing
characteristics of an efficient teacher?" has been a question of keen interest for the psychologists and educationists, and a good deal of research has been done in this respect. But, before going deep into it, let us see what efficiency or aptitude really means. In Warren's Dictionary, aptitude has been defined as "a condition or a set of characteristics regarded as symptomatic of an individual's ability to acquire with training some knowledge or skill or set of responses such as the ability to speak language, to produce music, etc. Actually, the term aptitude is used in two ways - (i) when we say that a man has a great deal of aptitude for art, meaning that he has, in a high degree, many of the characteristics which make for success in artistic activities or (ii) when we say that a person lacks this specialized ability, which is of varying importance in a number of different occupations. The term aptitude, here, has been used as relative to the concept of ability, capability, capacity, efficiency, etc., and efficiency in teaching refers to a high degree of ability, fitness or talent related to drive, consideration, emotional stability, objectivity, intelligence and the like (Monroe, 1952) required for teaching in terms of discovering and defining pupil needs, setting goals, stimulating interest, choosing learning experiences, guiding learning activities, appraising results (Monroe, 1951), defusing and drawing powers of youth to be disciplined according to cultural acts and guiding for the optimum development of personality and socio-cultural usefulness (The Commission on Teacher Education, 1944) by organizing and creating desirable situations (Trow, 1944, Mursell, 1968). Teaching aptitude is not only related to the efficiency of the teacher in teaching in the classroom but is related to several factors as cooperative nature of the teachers, teacher's moral character and discipline, dynamic personality, considerativeness, optimistic attitude, fair mindedness, impartial behaviour of the teacher, etc. Deshpande, et al (1970), Holmes (1971) and Hartley and Hogan (1972) found that efficiency in teaching depends on the evaluation capacity of the teacher, upon command over the subject of teaching (Black Wood and Powell, 1971). Monroe (1952)
found that insight, understanding, foresight, intellectual activity and common sense are responsible for the promotion of efficiency. In teaching, in the recent past, a good number of measures have been developed to evaluate the efficiency of teachers. Prakash and Srivastava (1973) developed Teaching Aptitude Test; Chauhan, N. S. and Jain, Kashmi (1976) developed Teacher Efficiency Scale (1976) and Tiwari, Geeta and Srivastava, R.P. (1986) prepared Teaching Aptitude Test for college teachers. Hence, the necessity of such an important and much needed instrument gave rise to the idea of constructing and standardizing the present tool, the TATB.

This test aims to measure the aptitude for teaching. There are 80 items related to 8 areas or sub-tests. Each sub-test contains 10 items. There is no time limit for the test but usually it takes 30 minutes to complete the test. The 8 sub-tests are related to the following 8 areas of teaching aptitude.

1. **Co-operative Nature:** The trait has been used for measuring the co-operative nature of the teachers towards their taught, since this trait is very important for establishing relationship between the teacher and the taught.

2. **Consideration:** The items of this area are attributed to the general and particular attention, patience, tolerance, consideration, etc., of the teacher, which is to be devoted for the all round development of the personality of the pupils and to remove the obstructions in the way of all round development of the pupils.

3. **Wide Interest and Scholarly Taste:** The teacher is also an active participant in co-curricular activities of the students and is always a student in the acquisition of knowledge. The items of this sub-test are framed to measure the wide interest and the scholarly taste of the teacher.

4. **Fair Mindedness and Impartiality:** Fairness and impartiality are the most essential traits of a teacher's personality. The items of this sub-test are framed to measure the same.
5. **Moral Character and Discipline:** Teacher's moral character and discipline are very important factors for teaching efficiency since teacher's high moral character and discipline bring harmony in thinking, feeling and doing. The items of this sub-test are framed accordingly.

6. **Optimistic Attitude:** Optimistic attitude is an important aspect of efficient teaching or making teaching successful. The items of this sub-test are framed to judge the degree of optimistic attitude of a teacher.

7. **Motivational Aspect:** Motivation is an essential aspect of successful teaching. The items of this sub-test are framed to judge as to what extent a teacher can motivate.

8. **Dynamic Personality:** Dynamism in personality refers to the teacher's adjustment with his students and class room atmosphere, which is very essential for a right goal at the right time. The items of this sub-test are framed to measure the dynamic personality of a teacher.

**Psychometric Properties of the Test**

It is essential to know the psychometric properties of a test for its proper development. For this purpose, Otis and Smith's job psychographic method was followed since this method is very much useful for the selection of traits, analyzing the information and retaining the items of various aspects of teaching profession. Here, a list of 15 abilities and traits of teaching job has been collected at first with the help of the studies of Witty (1947), Barr (1948); Menon (1949), Adayal (1952), Prakash and Srivastava (1979), Kumar, Pramod and Mutha, D.N. (1980), Chauhan, N.S. and Jain, Rashmi (1982), etc. These fifteen abilities and traits of teaching profession were given to twenty five psychologists and educationists for rating on a five point scale (Highly Agreeable, Agreeable, Indifferent, Disagreeable, and Highly Disagreeable). The experts' ratings were ranked and tabulated and on its basis, eight higher ones
were selected for the final form of the test. The final form of the test contains eight traits or aspects of an efficient teachers as: (i) co-operative, (ii) considerate, (iii) wide interest and scholarliness, (iv) fair minded and impartial, (v) moral character and discipline, (vi) optimistic attitude, (vii) motivational aspect, and (viii) dynamic personality.

**Selection of Items**

Initially, 200 items were selected and given to the 10 judges for review. After judges had reviewed the items, 60 items were deleted and 160 retained. This form of the test was administered on a sample of 500 undergraduate pupil teachers of 19 to 30 years age group of Agra district belonging to rural as well as urban area. On the basis of item analysis, out of 160 items only 80 highly scored items have been taken for the final form of the test battery, i.e., 10 items of each trait.

**Test Administration**

As we all know, teaching aptitude is primarily a student-teacher concern and as such, there should be co-ordination between the two and each should actively participate as well. The items framed in the test do judge the aptitude a teacher has for teaching and, moreover, in what degree. As such, to make this test a reliable source of measurement of the same, it is advised that before administering the test, a tester should be careful of the following points.

1. The place of administration of the test should be such that the testee may work comfortably and without any disturbance. The usual setting for the test administration is the class room. But the tester should be careful that the class is not over crowded. A maximum of 30 subjects should be taken for group administration at a time in a given room, taking into account the size of the room.
2. The subjects should be properly motivated to take the test. The word 'test' should, however, never be used. Rather it should be presented as a set of interesting statements which the subjects would enjoy responding to. What is important is to avoid a threatening situation which is frequently associated with testing.

3. The language used by the test administrator in giving instructions to the subjects should be as simple as possible so that each one understands what is required of him.

4. The test administrator should see that each subject has available with him a pen or pencil. He should, however, have a stock of pens or pencils with him so that he may be able to meet any emergency.

**Instructions to the Testee**

Some statements are given on the following pages. Please read them carefully. These statements are followed by three types of responses-Agree, Doubtful and Disagree against each statement. If you agree with a given statement then encircle "Agree", if you are doubtful then encircle "Doubtful", and if you disagree then encircle "Disagree". Please respond to all the statements and do not omit any. Your responses will be kept confidential and as such, and respond without any hesitation.

**Scoring Procedure**

For the purpose of scoring the test, 3 marks should be given to 'Agree' responses, 2 marks to each 'Doubtful' response and 1 mark to each 'Disagree' response. For getting the total score, the response marks of all the statements should be added together to form total raw score of the test battery.
Reliability of the Test

Since reliability is the most essential and significant feature of a test, the Split-Half and Test-Retest reliabilities have been calculated for this test battery. For calculating the split-half reliability, Guttmann and Spearman Brown's prophecy formula have been used which yielded the coefficient of correlation as +0.851 and +0.913 respectively when this test was administered to a sample of 100 subjects. These reliability coefficients reveal that the present test battery is highly reliable.

As for the test-retest reliability, the present test was administered twice to a sample of 100 pupil teachers with a time lapse of two weeks and the co-efficient correlation was found to be +0.894.

Validity of the Test

Validity of the present test was obtained by computing coefficient of correlation between scores of the test and the assessment of the final examination marks and between the scores of the test and marks obtained through the ratings by their respective teachers and head of the department.

The co-efficient of correlation between the test scores on 100 pupil teachers and the total marks of theory and practical teachers was +0.625.

The co-efficient of correlation between the test scores on 100 pupil-teachers and their respective teachers and between test scores and heads of the department rating marks were +0.514 and +0.426 respectively.

Norms and their Interpretation

The normalised standard scores (T-scores) for the present test battery were obtained from a sample of 800 secondary teachers, both males and females in equal number, given in the following table.
Table showing T-Scores, (Norms for the sample of 800 subjects and classified descriptive grades).

<table>
<thead>
<tr>
<th>Raw Scores Range</th>
<th>T-Scores</th>
<th>Grade</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>226-240</td>
<td>84</td>
<td>A</td>
<td>Most Efficient Teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Very High Teaching Aptitude)</td>
</tr>
<tr>
<td>211-255</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>196-110</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>181-195</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>166-180</td>
<td>62</td>
<td>B</td>
<td>Efficient Teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(High Teaching Aptitude)</td>
</tr>
<tr>
<td>151-165</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>136-150</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>121-135</td>
<td>50</td>
<td>C</td>
<td>Average Teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Average Teaching Aptitude)</td>
</tr>
<tr>
<td>106-120</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96-105</td>
<td>40</td>
<td>D</td>
<td>Poor Teacher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Low Teaching Aptitude)</td>
</tr>
<tr>
<td>81-95</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-80</td>
<td>27</td>
<td>E</td>
<td>Very poor teacher</td>
</tr>
<tr>
<td>51-65</td>
<td>21</td>
<td></td>
<td>(Very Low Teaching Aptitude)</td>
</tr>
</tbody>
</table>

The above tool was administered to a small sample and found suitable for the present study and found suitable as per the validity and reliability values.
MEASUREMENT OF SOCIAL ADJUSTMENT

Considering the flaws and merits of the selection of tools in either way, the researcher is interested in using the standardized tool as the present study involves a thorough study of social adjustment of secondary school science teachers.

The investigator has used the Social Adjustment Inventory (SAI) constructed and standardized by Dr. Roma Pal.

Details of Social Adjustment Inventory

In this social adjustment inventory, the number of items are sixty and they are in the form of statements. The statements are followed by "Yes" and "No" responses. If the subject agrees with the statement, he has to put tick [✓] mark before 'Yes" and does not agree then has to put tick [✓] mark before "No". The subject has to respond to all the statements given. There is no time limit but the subject has to complete it at the earliest.

Relation between Social and Emotional Adjustments

The individual adjusts both socially as well as emotionally to his environment since both types of adjustment are very important for a successful and happy life. Social adjustment refers to the change in habitual conduct or behaviour which is essential for an individual in order to fit into the community in which he lives. Emotional adjustment is a prerequisite for social adjustment as Schneider found that emotionally well adjusted persons are quick to establish affectionate relations with others. Hence, items for both social as well as emotional adjustment have been included in the present social adjustment inventory. As pointed out by Adler (1930), "A socially well adjusted person is not only efficient and happy in his environment but also he must have a sense of social feeling, i.e., he must be cooperative and sympathetic". As such, items which help to assess the above mentioned aspects of emotional and social
adjustment are included in the present social adjustment inventory mainly for identifying and distinguishing well adjusted individuals from the poorly adjusted individuals.

**Scoring**

The scoring system of the inventory is very simple. As mentioned earlier, each item has two responses viz., Yes or No. For the response of "Yes", 2 scores should be given and in case of "No" response, 1 score.

**MEASUREMENT OF JOB SATISFACTION**

Considering the flaws and merits of the selection of tools in either way, it was thought that to select a standardized questionnaire as a tool for the present study is more appropriate and suitable. Hence, the Teacher Job Satisfaction Questionnaire developed and standardized by Promod Kumar and Mutha. D.N. (1976) has been selected to study the job satisfaction of teachers working in Chittoor district.

**Details of the Job Satisfaction Questionnaire**

Job satisfaction is the result of various attitudes possessed by an employee towards his job. These attitudes are related to specific factors such as wages, conditions of work, advancement opportunities, prompt settlement of grievances, fair treatment by employers and other fringe benefits. Job satisfaction may be defined as an attitude which results from a balancing and summation of many specific likes and dislikes experienced in connection with the job (Bullock, 1952). The job satisfaction questionnaire has been developed with a view to provide an instrument to assess the job satisfaction of school teachers for applied and research purposes.
Contents of the Questionnaire

Initially, job satisfaction questionnaire consisted of 40 'Yes-No' type items selected on the basis of previous studies and following interviews with teachers and principals of higher secondary schools and teacher educators. These items were classified into four different aspects of job satisfaction in teaching. These include (a) satisfaction with work; (b) satisfaction with salary, security and promotion policies; (c) satisfaction with institutional plans and policies; and (d) satisfaction with authority including school management. These 40 items so classified into four different aspects were given to a group of twelve experts for their opinions and comments. These were also discussed with 20 teachers of secondary schools of Jodhpur city. In view of criticism and comments offered by experts and teachers, 9 items were altogether rejected, while others were modified or rewritten. Thirty one items were thus selected in the questionnaire. These items showed 100% agreement amongst the judges as related to job satisfaction of teachers.

First Try-out

The teacher job satisfaction questionnaire was administered to a group of 100 male and female teachers randomly selected from higher secondary schools of Jodhpur city. It was emphasized that no item should be omitted and there was nothing 'right' or "wrong" about these questions. They were encouraged to answer each item according to their personal agreement or disagreement. It was assured that their replies would be kept confidential. No time limit was assigned.

Twenty seven items of the questionnaire were positively worded and 4 items were negatively worded. All these items were scored ‘1’ and ’0’ depending on the direction of the items. The sum of these values gives the job satisfaction score for the subject. The total score varied from 0 to 31 showing lowest job satisfaction to highest job satisfaction of the subject.
Selection of Items

All the items were scored out to obtain the frequency of distribution. Twenty seven of the subjects with the highest scores and 27 of the subjects with the lowest scores served as criterion groups (Kelly, 1939). Discriminating value for each item was then determined. Twenty nine items with discriminating value of 25 and above were finally selected for the questionnaire.

Final Form of the Questionnaire

The Teacher Job Satisfaction Questionnaire (TJQ) consists of 29 highly discriminating 'Yes-No' type items.

All the items, except 6 and 29, are positively worded. All these items are given a score of "1" for positive responses except for items 6 and 29, in which case reverse is applicable. The sum of these values gives the job satisfaction scores for the subject. The total score varies from 0 to 29 showing lowest job satisfaction to highest job satisfaction for the subject.

The final form of Teacher Job Satisfaction Questionnaire (JSQ) was put to statistical verification.

Statistical Results

The mean, median and S.D. for the sample are given in the following table. The distribution seems to be slightly positively skewed.

<table>
<thead>
<tr>
<th>Mean</th>
<th>Median</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.64</td>
<td>15.48</td>
<td>6.78</td>
</tr>
</tbody>
</table>

The skewness and kurtosis for the sample were found to be 0.07 and 0.264 respectively.
Table showing Skewness, Kurtosis and S.E (N=202)

<table>
<thead>
<tr>
<th></th>
<th>Mean Value</th>
<th>S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skewness</td>
<td>0.070</td>
<td>0.170 ns</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.264</td>
<td>0.058 ns</td>
</tr>
</tbody>
</table>

Since the S.E. of skewness and kurtosis is less than 1.96, the 5% level of confidence is interpreted to mean that the sample does not differ from normality (Mc Namer, 1962).

**Reliability**

The split-half reliability (correlating the odd-even items) of the test applying Spearman-Brown formula is 0.95 (N=100) with an index reliability of 0.97.

The test-retest reliability of the test is 0.73 (N=60; Time interval = 3 months) with an index reliability of 0.85.

Table showing Split-half and Test-retest Reliability

<table>
<thead>
<tr>
<th>Method</th>
<th>n</th>
<th>r-value</th>
<th>Index of Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split-half</td>
<td>100</td>
<td>0.95</td>
<td>0.97</td>
</tr>
<tr>
<td>Test-retest</td>
<td>60</td>
<td>0.73</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Validity**

Only highly discriminating items are included in the questionnaire following item analysis (Garrett, 1961). The upper 27% and lower 27% served as criterion groups (Kelly, 1939). The face validity of the measures is very high. The content validity is ensured as the items for which there has been 100 percent agreement amongst judges regarding their relevance to teacher’s job satisfaction are included in the questionnaire.

The Job Satisfaction Questionnaire, thus developed, consists of 29 items to measure the job satisfaction of school teachers.
DATA COLLECTION

The investigator personally visited the selected secondary schools and administered the tests after taking permission from the administration. Before administering the test, clear instructions were given to the secondary school science teachers and doubts were clarified. Tests were administered in ideal conditions. Thus, data was collected from the total sample, scoring was done and scores were assigned to each secondary school science teacher.