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CHAPTER -2

PROBLEM UNDER INVESTIGATION

The present investigation

As indicated in the previous chapter the present study is an exploratory attempt to investigate some aspects of scientific productivity among college teachers. It has been pointed out earlier that research on this problem has been rather meagre particularly in the Indian context, and when one is concerned with college teachers, there is practically no earlier study to guide the present investigator. It is this total non-availability of any earlier research that prompted the investigator to undertake the study.

In addition, however, in recent years productivity of college teachers has become a point of concern for educationists, educational administrators, planners and educational managers because of the acceptance of the idea of linking wages, rewards and promotions to productivity. Acceptance of this involves the following: a clear definition of productivity, establishment of concrete measures and criteria of productivity and the evolving of suitable indices to identify potentially productive individuals. The last would facilitate recruitment of the right type of persons as teachers in colleges and provide them with the necessary conditions conductive to scientific productivity. The
present investigation is primarily interested in the last problem. In brief the main thrust of the investigation is in the direction of studying the relationship between certain personal and psychological characteristics of college teachers on the one hand and their scientific productivity on the other. College teachers play an important role in developing scientific manpower in the country. In addition to their own productive contribution they have to play the role of stimulating, facilitating and reinforcing the scientific skills and abilities of their wards. Thus, scientific productivity among college teachers has assumed importance both in and by itself and also as a stimulator and pace-setter for others.

In recent years higher education in India has been expanding at a rapid rate. Post graduate colleges are being established in remote and traditionally rural centres. These institutions are established and maintained at an enormous cost. In view of this, it has become imperative that teachers attached to these institutions be productive and spread the culture of intellectual curiosity and growth. How far this is a reality today is anybody’s guess. In undertaking this study the present investigator was guided by the above state of affairs. It was felt that such an investigation in spite of its possible limitations would be a worthwhile effort.
Our brief review of the rather scanty research in the last chapter on this problem shows that many of the researchers had directed their attention to factors like working conditions, organizational climate etc. Some of them were concerned with production as such rather than productivity. Still some others were concerned with biographical and personal factors. Our survey did not help to locate even a single study trying to relate psychological factors to scientific productivity. However, researchers in the industrial setting have made a distinction between production and productivity, the latter being essentially psychological in nature and closely associated with perceptual, motivational and attitudinal factors. Among the psychological factors, the emphasis has been on the role of motivational and non-ability factors. In designing the present study, the investigator was guided by these trends and accordingly the study was designed with the main purpose of investigating the relationship between scientific productivity and certain motivational variables. In short, the present investigation may be described as an attempt to compare the motivational profiles of productive and non-productive college teachers.

Productivity and its measurements:

The major focus in the present study is on the scientific productivity of college teachers. Scientific productivity constitutes the main dependent variable. Consequently, the
description and measurement of scientific productivity is a major issue. Unfortunately very little guidance was available for the present investigator on this point from earlier research. In view of this an operational definition had to be evolved along with a suitable scale for measuring scientific productivity. In dealing with a factor like scientific productivity one faces the problem of making a distinction between Direct Productivity and Indirect Productivity. The former is evidenced by products and activities of the individual himself while the latter is reflected elsewhere. A college teacher who is directly productive gives evidence of the same through innovations, research publications, participation in research meetings, conference etc. But, indirect productivity is more difficult to assess. Thus, an effective teacher whose students develop into productive scientists may himself not show any evidence of his own productivity. In fact, one often comes across a distinction sought to be made between a good teacher and a good researcher. This has also raised controversies on how to assess the productivity of a teacher for various purposes.

Investigations of scientific productivity has been to a considerable extent hampered by the very difficulty of operationalising and defining productivity. Reference has already been made to the distinction between direct and indirect
productivity. Even when it comes to a question of direct productivity one finds difficulty in arriving at objective indicators of the same - Lindsey R. Harmon has listed the following as possible indicators of scientific productivity:

(a) education; (b) present jobs; (c) supervisory responsibilities; (d) approximate percentage of time devoted to research, teaching, and administrative activities; (e) monthly income from scientific and technical activities; (f) academic position, rank, etc.; (g) consultancy; (h) patents; (i) publications; (j) membership in scientific and technical society; (k) best scientific or technical accomplishments.

Out of these f, g, h, j and k are applicable to technologically oriented sciences only. Indicators d and e are rather difficult to evaluate and one runs the risk of subjectivism. The following, namely, publications, ideas and other research related activities seem to have the advantage of being applicable to a variety of disciplines and at the same time suitable for objective comments. Seigel, Buss and Manfield (1980) in their study found a high correlation between the number of published articles and 14 items including pre-doctoral productivity, excellence in pre-doctoral science work and early interest in scientific work. Mukerjee (1968), in his work, has employed published research work as a measure of productivity. In view of this, it
appears safe to define scientific productivity in terms of the actual production of research papers and also participation in activities related to this. Thus participation in research and discussion, production of research publication, participation in research competition and finally winning of awards appear to be safe indicators of scientific productivity. Thus scientific productivity may have to be defined in terms of these indicators.

While this may not be a comprehensive definition, this appears to be the best available way of describing and measuring scientific productivity. In terms of validity, this may be the one with a reasonable degree of empirical validity. While the actual number of publications are very objective indicators of scientific productivity, it may not be advisable to use them as exclusive indicators. Publications represent a fairly high level of scientific productivity and this level of activity depends on certain lower levels of activity such as participation in discussions, seminars etc. Involvement and participation in award winning activity shows a high level of involvement in scientifically produced activity. In view of these considerations, the investigator found it necessary to employ a series of indicators ranging from a low value to a high value. Thus one has to deal with a set of graded indicators rather than a single cut-off point. Scientific productivity in this investigation is measured with this approach.
The main dependent variable in this investigation is scientific productivity. Quantification of productivity has always posed problems, particularly in the context of scientific productivity. Here two broad approaches are open to any investigator. The first approach is to employ impressionistic measurement or standardized rating procedures. This approach is beset with certain difficulties. Firstly, there is the difficulty of identifying experts or judges who will be in a position to provide reliable and valid ratings. Most of the subjects in this investigation, however, work in under-graduate colleges where one does not find suitable experts to rate their productivity. Secondly, such ratings cannot be expected to be totally free from subjectivism.

The other approach open to the investigator is to measure scientific productivity through objective indicators which can provide a more reliable and valid evidence though they may not be very subtle and fine in discrimination. However, this latter procedure has the advantage of being more objective though perhaps slightly crude. In this context, it should be mentioned that some of the investigations already mentioned have employed overt indicators like publications, membership of professional associations etc., as evidence of
scientific productivity (B.N. Mukherjee, 1968, National Rosea Council, U.S.A.). Since in the Indian context the present investigation is one of the first of the kind, it was felt that it would be safer to employ the latter approach.

However, while employing overt indicators the investigator had to keep in mind two dimensions, the qualitative dimension of productivity and also the quantitative dimension of productivity. The former implies that different indicators of productivity had to be given differential weights - for example, attending a conference, while it is an evidence of productivity, is not the same as contributing a research paper at a conference. Similarly, by and large, a publications in an international journal is definitely of a higher quality than a publication in a regional journal, as the former is usually evaluated more rigorously. In view of these problems the investigator had to evolve a scale of productivity indicators which would provide for a wide range beginning from a low level of productivity to a high level of productivity, the value of a particular production or product being evaluated against certain accepted standards.

In this context, it may be observed, that the winning of an international award is an indication of higher quality than the winning of a national or regional award. For obvious reasons, participating in a conference cannot be equated with the winning of an award, national or international
At the same time, practical difficulties had to be kept in mind so that the scale did not become too long and artificial weightage differences would have to be introduced. For example, a distinction could have been made again between participating in a local conference and participating in a national conference but it was felt that such fine distinctions would not be very useful and would only increase the length of the scale without making a corresponding contribution.

With these considerations in mind, the following 10 point scale was evolved on the basis of discussion with psychologists, educators, and senior research scientists and scale values were given ranging from 1 to 10.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Score value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winning awards at the international level</td>
<td>10</td>
</tr>
<tr>
<td>Winning awards at the National level</td>
<td>9</td>
</tr>
<tr>
<td>Winning awards at a Regional level</td>
<td>8</td>
</tr>
<tr>
<td>Text books written</td>
<td>7</td>
</tr>
<tr>
<td>Papers published in International Journal level</td>
<td>6</td>
</tr>
<tr>
<td>National level - publication</td>
<td>5</td>
</tr>
<tr>
<td>Patent</td>
<td>4</td>
</tr>
<tr>
<td>Regional Journal</td>
<td>3</td>
</tr>
<tr>
<td>Working papers/Technical memos</td>
<td>2</td>
</tr>
<tr>
<td>Conference - Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>
It may, however, be mentioned that the above procedure has a certain degree of arbitrariness which could not be avoided for the reasons mentioned already. But a distinct improvement in this study is that whereas many other investigators have taken into account only published research papers, the present investigation has taken into account qualitative differences among productive activities.

Classification of Subjects into Productive and Non-productive:

The classification of subjects into groups on the basis of quantitative measures of psychological variables essentially depends on the nature of the distribution of the particular variable. While most psychological variables are assumed to be distributed normally, this assumption does not appear to be warranted in this instance. There does not appear to be any theoretical model nor any empirical model. The investigator is not aware of any investigation where scientific productivity has been measured in a large sample and its distribution examined. In view of this the classification of subjects in the present investigation had to be based only on the empirical data generated in this very investigation of subjects.

When the scores on the scientific productivity were examined, it was found that a large number of subjects (college teachers in the faculty of arts particularly) obtained a score of zero. Further the variation among those who scored at least one and above was very high (Please refer to S.D. on page 68).
A few individuals secured high scores while many secured low scores like one and two. In view of this, it was felt that a correlational approach attempting to correlate productivity scores with the other scores would not only be impossible but unjustifiable. The reality of the situation permitted a classification into only two groups, productive and non-productive, the latter including all those who had obtained scores of one and above. It is true, that this grouping of people with such wide ranging scores may not be justifiable in a very strict sense. But when one considers the culture of research among college teachers, this situation is not totally unexpected. A future investigator working on a similar problem, perhaps 10 years hence, may find a more even distribution of productivity scores than what obtains now. At the same time, it was felt that this fact alone should not restrain the investigator from proceeding with the study. In the light of this the lecturers were classified into two groups, the productive and the non-productive.

One may further add that it is a fact that by and large the present group of subjects have proved to be low in productivity. This is consistent with the overall atmosphere in the colleges in the geographical area examined in this study. At the same time there are exceptions, largely belonging to the faculties of Medicine, Engineering and Sciences where the emphasis on attending conferences, research publications and the winning of awards has always been a reality.
Such factors are bound to introduce wide variations. For example, science teachers have been attending the Indian Science Congress and presenting papers for a long time but the same cannot be said of teachers of arts subjects. Traditionally, it has been a fact, that both the scope and demand for productivity has been higher in non-arts faculties. An important factor here is that, until recently, Medical colleges, Engineering colleges and even higher institutions of scientific research were mostly located in metropolitan cities, thus providing a totally different environment compared to the general run of colleges. This fact can certainly be assumed to have influenced the research culture and atmosphere to such an extent that even degree college teachers in science subjects located in cities have imbibed this. It should also be mentioned that teachers employed in colleges, many of them Government colleges, are liable for transfer from one place to another with the consequence that, their exposure to a research culture has been less intense and continuous.

Other variables studied

Scientific productivity being the dependent variable in this investigation, a detailed presentation of this variable as conceptualised and measured for the purposes of this investigation has been elaborated above. An attempt is now made to discuss the other variables which have been conceptualised as independent or intervening variables influencing
productivity. These variables fall into three categories: attitudinal, perceptual and motivational. Under each of these categories only a limited number of variables was included for the present investigation. These individual variables are explained below:

(a) **Attitude towards the teaching profession**:

In a general way an attitude may be described as an acquired predisposition of readiness to perceive, react and respond in a consistent manner to people, issues, objects or situation. Attitudes have been the subject of a vast amount of research in psychological literature. Such researches have dealt with problems like structure of attitudes, origin and development of attitudes, measurement of attitudes and the influence of attitude on behaviour. Researches in industrial and organisational psychology have pointed out that attitudes are significantly related to performance, morale, satisfaction and other psychological variables (Ganguli, 1961). In recent years it has been found that a person's effectiveness or productivity is related to his attitude to his profession. In view of this it was decided to include this variable in the present investigation. It was assumed that the scientific productivity of college teachers would be significantly related to their attitudes to the teaching profession.
The second variable included in the investigation was the perception of organizational characteristics. Researches have clearly established that organizational characteristics as perceived by workers have a distinct influence on productivity (Mehta, 1977). To the extent that an individual perceives his organization as open, free, consistent and facilitating there would be a positive impact or output. On the other hand perception of an organization as unpredictable inconsistent and restraining, would result in lower performance. An organization which is perceived as "one's own" and as promoting a sense of belongingness is likely to be more conducive and productive.

Perceived organizational characteristics include job characteristics, social characteristics and performance characteristics of the organization. An individual's perception of organizational characteristic is intimately related to his professional attitudes. Healthy professional attitudes may generate a greater degree of tolerance for organizational limitations and thereby sustain a favourable perception. On the other hand, unfavourable perception of the organizations may influence attitudes to one's own profession. In view of this it was decided to include perceived organizational characteristics as a variable in the present investigation.
c) **Motivational variables:**

The third category of variables studied in the present investigation may be described as dynamic or motivational variables. During the past three decades, research in motivation particularly in relation to performance or output has grown by leaps and bounds. The theoretical postulations of Murray, Maslow and Cattell have given a great impetus to motivational research. Equally so the work of Lewin, Hettzqberg and other have accelerated the pace and variety of research in motivation. The work on achievement motivations by McClelland, on Competence motivation by White and others have made serious inroads into management training and practices. In fact, most management theories today centre around Motivational concepts. In view of this it was decided to include motivational variables like achievement, order, autonomy, affiliation, dominance, change, endurance and aggression that may influence productivity. These specific motivational variables were selected because they have been the most prominently investigated variables. A number of investigations have brought out their significant relationship with a number of factors including productivity or performance.

d) **Anxiety:**

Another variable which in recent years has come to be treated as a quasi motivational variable is anxiety. The scientific study of anxiety as a psychological variable can be traced
to the formulations of Freud. Subsequent theories of anxiety have however differed from Freud. Nevertheless, anxiety has become a focal point of research and has come to be recognized as a factor intimately related to normal not so normal behaviour. The investigations of Taylor, Spence and others led to the formulation of the Drive Theory of Anxiety, endowing anxiety with motivational factors. Subsequent studies have more or less resulted in a consensus that an optimal degree of anxiety is a positive motivating factor for better output and good performance in general, indicated a higher degree of anxiety. In the light of the above view it was decided to include anxiety as a variable in the present investigation.

Measurement of the above variables:

In an earlier section a detailed description of the scoring of productivity was given. In this section an attempt is made to present a description of the tools employed for measuring the other variables, namely, attitude towards profession, perceived organisational characteristics and motivational patterns. A number of methods are available to measure these variables. Paper pencil questionnaires, inventories, interviews and a variety of other measures have been employed depending on the purpose and the nature of the investigation. By and large questionnaires and inventories have been popular in investigations involving a sizable sample. In the present study as the size of the sample was fairly large it was decided to employ the questionnaire method.
a) Measurement of attitude towards the profession:

A number of scales have been developed for studying the professional attitudes of teachers both in India and abroad. But none of these was found to be fully satisfactory. In view of this it was felt necessary to develop a scale independently for the present investigation. The scale developed was based on the 'equal' appearing interval principle' of Thurstone. The items were framed so as to cover the four major areas of the profession.

1) Pride in work
2) Intrinsic job satisfaction
3) Job involvement
4) Financial and status satisfaction

Initially about 50 statements were prepared. They were submitted to a panel of experts consisting of 2 psychologists and 2 educationalists who arranged from one to extreme to another in position. This scoring by each judge yielded a composite position for each of the items. When there had been marked disagreement between the judges in assigning a position to an item, that item was discarded. Thus 5 items were deleted making the total items of the scale 45. To find out the temporal stability, test-retest method was used with one month's interval on a sample of 30 teachers working in Presidency College, Madras. The reliability co-efficient was found to be .498 which is statistically significant. The
content validity of the scale had been established and a correlation between the standardized scale developed by Ponnambalam and Visvesvaran (1966) and the new scale was found out (r = .89).

The scale thus constructed was administered to 100 teachers working in Women's Christian College, Madras, along with Shalini Bhogle's "Attitude towards teaching profession scale" which has already been standardized and validated. The ratings of their heads of departments (superiors) were obtained on the teachers attitude towards profession and a personal interview was also made to assess the attitude of the teachers towards teaching. For the purpose of item analysis, the answer sheets of the top 27% of the sample were separated on the basis of the scale value substantiated by the ratings and interview method. The former group represented the sample, having positive effect, and the latter, the negative effect.

The responses of the individuals were considered for each item of the newly constructed scale and for each item the 'discrimination index' was calculated (Garrett, 1962). Thirty-eight items were retained for final use after discarding 7 others. The maximum possible score that an individual could obtain is 38.

The scale in this form was found useful for the investigation. The number of items being only 38, the scale was found to be of optimum length.
b) Measurement of perceived organizational characteristics:

The second major variable for which a tool of measurement had to be identified was perceived organizational characteristics. A number of scales have been developed by different investigators in India and abroad. An examination of these various tools suggested that "The Organizational Atmosphere Scale" developed by Jayalakshmi Indiresan for use with Indian teachers would be suitable for the present investigation from the point of view of length, coverage and other requirements. The scale with 20 items included 5 subscales namely pride, authority, fairness, hindrance and administration. These areas appeared to cover exactly the same areas intended to be covered by the present investigator.

The distribution of the items among the five subscales is as follows:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Item nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Pride' about organization</td>
<td>1 to 6</td>
</tr>
<tr>
<td>Quality of leadership in the organization</td>
<td></td>
</tr>
<tr>
<td>either directly or indirectly</td>
<td>7 to 11</td>
</tr>
<tr>
<td>Treatment obtained by the employees -</td>
<td></td>
</tr>
<tr>
<td>'Fairness'</td>
<td>12 to 14</td>
</tr>
<tr>
<td>Case of getting along - 'hindrance'</td>
<td>15 to 17</td>
</tr>
<tr>
<td>Procedural formalities of the organization</td>
<td></td>
</tr>
<tr>
<td>'administration'</td>
<td>18 to 20</td>
</tr>
</tbody>
</table>
The reliability as reported by the author is 0.934. The sub-test scores were found to be highly intercorrelating with each other.

**Validity:** The sub-tests were derived by using factor analysis. The factor structure was very similar to Halpin and Grofts (1968) OCDQ dimensions.

**Instructions for the organization atmosphere scale:**

The following instructions printed on top of the inventory were read out to the subjects.

"There are twenty statements given below. For each statement five alternatives A, B, C, D and E are given below. You have to indicate the extent of your agreement or disagreement with the statement by ticking the appropriate alternative. The five alternatives are as follows:

- A = Strongly disagree,
- B = Disagree,
- C = Neither agree nor disagree,
- D = Agree and
- E = Strongly agree.

For instance, if you feel you strongly agree with the first statement, "This institute is up-to-date", then tick alternative E."
You are required to indicate your preference and not what you think the institute expects of you. Your answers will be used purely for research purposes.

**Scoring the 'Organizational Atmosphere' Scale:**

The points given to each response ranged from 1 to 5 since the answering was done on a five point scale of agreement. For items 1 to 8, 12, 13 and 15 the points were allotted as follows:

- Strongly disagree - A = 1
- Disagree - B = 2
- Neither agree nor disagree - C = 3
- Agree - D = 4
- Strongly agree - E = 5

For the remaining items (9, 10, 11, 14, 16 to 20) the reverse procedure was adopted. The allotment of points was as follows:

- \( A = 5; \ B = 4; \ C = 3; \ D = 2; \ E = 1. \)

This was because these items denote a negative feature of the organization. This score would indicate the nature of his perception of the organizational characteristics.
c) **Measurement of motivational variables:**

Motivational variables are usually measured in the form of manifest needs. One of the most popular tools in this category is the Edwards Personal Preference Schedule (E.P.P.S.). Originally designed as an instrument for research and counseling, the tool provides convenient and quick measures of independent and stable personality variables of normal subjects. The number of items in the scale is 225 with each item having two alternative responses a and b.

The scale is self-administered and the scoring is also relatively easy. The manifest needs measured through this scale are as follows:

1. **Achievement:**

   To do one's best, to be successful, to accomplish tasks requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to solve difficult problems and puzzles, to be able to do things better than others, to write a great novel or play.

2. **Order:**

   To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a
definite time for eating, to have things arranged so that they run smoothly without change.

3. Autonomy:

To be able to come and go as desired, to say what one thinks about things, to be independent of others in making decisions, to feel free to do what one wants, to do things that are unconventional, to avoid situations where one is expected to conform, to do things without regard to what others may think, to criticise those in position of authority, to avoid responsibilities and obligation.

4. Affiliation:

To be loyal to friends, to participate in friendly groups, to do things for friends, to form new friendships, to make as many friends as possible, to share things with friends, to do things with friends rather than alone, to form strong attachments, to write letters to friends.

5. Dominance:

To argue for one's point of view, to be a leader in groups to which one belongs, to be a leader regarded by others as a leader, to be elected or appointed chairman of committees, to make group decisions, to settle arguments and disputes between others, to persuade and influence others to do what one wants, to supervise and direct the actions of others, to tell others how to do their jobs.
6. **Change:**

To do new and different things, to travel, to meet new people, to experience novelty and change in daily routine, to experiment and try new things, to eat in new and different places, to try new and different jobs, to move about the country and live in different places, to participate in new fads and fashions.

7. **Endurance:**

To keep a job until it is finished, to complete any job undertaken, to work hard at a task, to keep at a puzzle or problem until it is solved, to work at a single job before taking on others, to stay up late working in order to get a job done, to put in long hours of work without distraction, to stick to a problem even though it may seem as if no progress is being made, to avoid being interrupted while at work.

8. **Aggression:**

To attack contrary points of view, to tell others what one thinks about them, to criticise others publicly, to make fun of others, to tell others off when disagreeing with them, to get revenge for insults, to become angry, to blame others when things go wrong, to read newspaper accounts of violence.

**Methods of Administration:**

The E.P.P.S. is easy and convenient to administer. Complete directions are printed on the cover of the booklet.
Answers are to be recorded on a specially prepared answer-sheet. The subject is asked to read the directions. The subject should fill in his name, sex, age, educational status and date on the answer-sheet. After reading the directions, the examiner may ask if there are any doubts. Answers to the questions must be consistent with the printed directions. It may be explained that some of the choices may be difficult to make, but that they should be made as best as possible, in the light of the subject's own estimates of his characteristic.

They are to choose, in all cases only one statement in each pair that they believe to be more characteristic of themselves. Look at the example below:

A - I feel depressed when I fail at something.

B - I feel nervous when giving a talk before a group.

Which of these two statements is more characteristics of how you feel? If "being depressed when you fail at something", is more characteristic of you then you should choose A over B. If B is more characteristic of you than A, then you should choose B over A.

**SCORING THE EPPS**

The scoring for EPPS is done with the help of a template. The template should be placed over the answer sheet so that the items printed above the three wide slots appear within
these slots. Through the three narrow slots running diagonally across the template, draw lines on the answer sheet. These lines go through items 1, 7, 13, 19, 25, 101, 113, 119, 125, 201, 207, 213, 219 and 225. These scores are not counted in obtaining the scores for the personality variables.

Through the wider openings item 151, 157, 163, 169, 175, 26, 32, 35, 44, 50, 51, 57, 63, 69 and 75. These items are to be included in the raw scores and it is also used as a consistency measure. After the scoring is completed, count the number of 'A' encircled in rows and 'B's in the column. Then add the row and column score. The numbers recorded in column '5' are the total row scores for the 15 personality variables. The sum of column '5' must be 210.

The reliability for the EPPS test was found employing the Row and Column method. The obtained indices were significant.

MEASUREMENT OF THE LEVEL OF ANXIETY

During the past three or four decades following Hull's formulations anxiety has been increasingly studied as a motivational variable. This approach, the Drive theory of anxiety, pioneered by Spence, Taylor, Hilgard and others has tended to focus on the motivational properties of anxiety. A number of tools have been developed to measure anxiety.
Anxiety is defined as the continuous and reportable experience of intense dread and foreboding, conceptualised as internally derived and unrelated to external threat. From this point of view anxiety functions as a drive and goads the person to various sorts of adjustment mechanisms. Everyone agrees that anxiety is not a undimensional trait in the individual but is a complex behavioural event that is influenced by situational, personality and mode of response factors and their interactions (Endler et al., 1962).

The IPAT anxiety scale developed by Cattell was found to be adequate for this study, because it is a brief non-stressful and valid tool for measuring anxiety and applicable to all. This test consists of 40 items. Against such items, there are three boxes on the right. The subject is to put an 'X' mark in one of the three boxes on the right which applies to him. The scoring was simple and was done according to the manual. High scores indicated a high level of anxiety and total anxiety score is based on the 40 items.

INSTRUCTIONS

You will find forty questions, dealing with difficulties that most people experience at one time or another. It will help a lot if you check true/false to each, frankly and truthfully, to describe any problems you may have. As you see, each inquiry is actually put in the form of a sentence.
Circle "T" if true, "F" is false, to show how it applies to you. Make your marks now.

Never pass over an item but give some answer to everyone. Your answers will be entirely confidential. Do not spend time pondering. Answer each immediately, the way you want to at this moment (not last week or usually). You may have answered questions like this before, but answer them as you feel now.

Hypotheses:

In the light of the above discussions and the rationale outlined therein, it was decided to formulate certain specific hypotheses, which could be tested through this investigation. The formulation of specific hypotheses was however, beset with considerable difficulty in view of the absence of adequate research efforts in the area of scientific productivity. As already mentioned there have been very few research efforts directed to investigate scientific productivity and attitudinal variables. In view of this, the hypotheses of this study had to be based on researches in the context of industrial productivity and in general in the area of performance. Against this background, the following hypotheses were formulated:

A) The productive group of college teachers will differ significantly from non-productive groups of college teachers in their attitudes to their profession in the following manner:
i) they will exhibit a higher degree of pride in their work;

ii) they will show a higher score on intrinsic job satisfaction;

iii) the productive group will show a higher degree of job involvement;

iv) the two groups are not likely to differ significantly in financial and status satisfaction.

B) The productive group will evidence a significantly more favourable perception of organizational characteristics as measured by the Organizational Atmosphere Scale on all the five sub-scales.

C) The productive group is likely to show a higher degree of the following needs:

i) achievement; ii) autonomy; iii) dominance;

iv) change; and v) endurance. (d) The two groups are not likely to differ significantly in the following needs:

i) order; ii) affiliation; iii) aggression and iv) level of anxiety.

D) Motivational and attitudinal characteristics which differentiate the productive and non-productive are likely to interact and operate in the form of clusters and

E) In addition to the difference between the productive and non-productive groups as such, differences can emerge among the different categories of teachers like Medical, Engineering, Science and Humanities.
It may be reaffirmed that these hypotheses are to a large extent derivations from the researches in other contexts and also from 'intelligible hunches'. As already mentioned the lack of sufficient researches in the area of Scientific Productivity was a serious handicap. At this point it was felt desirable to undertake a pilot study.

**PILOT STUDY**

The pilot study undertaken was mainly concerned with the testing of the suitability of the various tools for use with the present sample and also test their reliability. The details of the pilot study are reported as follows:

**Finalisation of the tool for measuring scientific productivity:**

As already discussed Scientific Productivity in this investigation was planned to be measured through objective indicators of productive acts. For this purpose as already mentioned the questionnaire developed by Lindsey, was the starting point. It was found that some of the items here were not relevant to the local conditions and in view of these considerations, a scale with 10 items of graded productivity values was prepared. This has already been reported in this chapter.

This draft scale with ten items was administered to 30 subjects who are college lecturers drawn from Presidency
College, Madras. The subjects found no difficulty in answering the scale and the responses also showed evidence of high variation among the subjects. Further, as already indicated the distribution of the scores was not normal even in the pilot study, a considerable number of subjects securing a scale of 'O' while others showed a wide range.

Reliability of the scale: The above scale included only items which called for factual informations like attendance at conferences, the winning of awards, the number of publications etc. None of the items call for responses that could be expected to vary systematically or randomly. Further, the respondents were highly educated, were willing to participate in the investigation and were also sufficiently sophisticated to provide the answers. In view of this it was felt that there was neither a need nor a justification for establishing a reliability co-efficient for this scale. However, the other scales employed were concerned with psychological variables like needs, attitudes, etc., thus necessitating the estimation of reliability.

Reliability of the other tools: The other tools which included the Attitude to Professional Scale, the Organizational atmosphere Scale, the Self Analysis Form and E.P.P.S. were administered to the same 30 subjects, on two occasions, separated by an interval of a month to estimate the retest reliability. The results obtained are as follows:
The test, retest reliability co-efficients for the various, personality factors, as extracted from the pilot study are given below:

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>rxy</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Attitude</td>
<td>0.4980</td>
</tr>
<tr>
<td>ii) Perceived organizational characteristics</td>
<td>0.5188</td>
</tr>
<tr>
<td>iii) Achievement</td>
<td>0.6597</td>
</tr>
<tr>
<td>iv) Order</td>
<td>0.5187</td>
</tr>
<tr>
<td>v) Autonomy</td>
<td>0.6181</td>
</tr>
<tr>
<td>vi) Affiliation</td>
<td>0.5522 Significant at .01 level</td>
</tr>
<tr>
<td>vii) Dominance</td>
<td>0.5211</td>
</tr>
<tr>
<td>viii) Change</td>
<td>0.6171</td>
</tr>
<tr>
<td>ix) Endurance</td>
<td>0.5097</td>
</tr>
<tr>
<td>x) Aggression</td>
<td>0.6187</td>
</tr>
<tr>
<td>xi) Anxiety</td>
<td>0.4316</td>
</tr>
</tbody>
</table>

It may be seen from the above Table that the values of reliability co-efficiencies reported here are satisfactory. Both the retest and split-half indicators of reliability are found to be adequate. In view of this the tools were accepted as suitable.
FINAL STUDY

The tools finalised as above after the pilot study were all combined to form a single inventory with separate instructions printed before each specific tool. Thus finalised, they were administered to the selected sample of 160 college teachers who served as subjects for the present investigation. The purpose of the investigation is explained on page 4 which also incorporates the questions meant to elicit personal and biographical details like age, institution, years of service etc. The subjects were also assured of the maintenance of complete secrecy of their responses. It was gratifying to find that all the subjects were able to respond without any serious difficulty. The responses were scored for different variables as per the specific scoring schemes for each of the tools. Excepting in the case of the scale to measure professional attitudes, all the other tools were scored according to schemes outlined by original authors.

The sample

The universe for the present investigation was the population of teachers in the various colleges, arts colleges, science colleges, medical colleges and engineering colleges. It was felt that different institutions should be included, as the present study is probably one of the few of its type in the country. The inclusion of different types of institutions would in the first instance make the investigation more representative and also serves to
identify possible differences among teachers in these different institutions. In this context it may be mentioned that to a certain extent teachers in science, engineering and medical institutions have had better exposure to the culture of scientific productivity and technological values compared to teachers in arts colleges. To a large extent this has been due to historical and cultural reasons. While arts colleges have been established in remote and rural areas engineering and medical institutions have mostly been established in metropolitan and industrial cities.

The selection of the sample for the present investigation however posed a number of problems. College teachers being highly individualistic were reluctant to participate in group testing sessions. Further the very idea that their scientific productivity was being measured made them defensive and shy away from the testing programmes. In view of this the tools had to be administered individually and this called for a considerable amount of persuasion and time. In view of this, it was not possible to employ a standardized procedures of sampling like random sampling or stratified sampling. The only possible solution was to go in for a purposive incidental sampling taking care to ensure its representativeness. Further, it was also necessary to restrict the sampling to colleges from the city of Madras because of a number of practical reasons. The final sampling selected with due care against all the mentioned limitations was as follows:
The sample included 160 teachers drawn from colleges in Madras city including the Madras Medical College, The Indian Institute of Technology and a few leading arts and science colleges. The individual subjects were selected after establishing personal contact and explanation of the purpose of collection of data was spread over a period of six to eight months. The distribution of the sample from the various institutions was as follows:

- Madras Medical College: 40
- Indian Institute of Technology: 40
- University of Madras:
  - Humanity Section: 20
  - Science Section: 20
- Other leading arts and science colleges: 40

The age range of the sample was 29 to 45 years. Their length of service ranged from two to twenty-five years.

**Analysis**

The scores thus obtained were subjected to statistical analysis suitable to test the hypotheses formulated for the investigation. The types of analysis employed included analysis of mean differences through 't' ratios, correlation analysis, multiple regression analysis, and Cluster Analysis. The results that emerged are presented and discussed in the following chapter.