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# CHAPTER - IV

## RESEARCH PROCEDURE

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RESEARCH PROCEDURE

## Introduction :-

In previous chapter III, a brief account of related literature is given, which points out that the problem choosenby researcher has roots in the existing literature, but further research and exploration is needed in the field of Educational technology.

This chapter deals with the procedure followed and the tools developed and used. It also describes the sample selected, statistical formulae and measures used.

## Behavioural Survey Method :-

The first step in any investigation would be to fix up the procedure of conducting research. The accuracy of results and the validity of conclusions would depend upon the procedure followed for collecting data.

When a researcher sets out to construct a test there are several factors which may determine his operations and line of action. As researcher problem was to construct and standardize an interest inventory, she had followed some general principles and procedures. The present problem comes under descriptive survey-method i.e Surveys of behavioural

phenomena.

Surveys of behavioural phenomena within a school system may be concerned with the behaviour of pupils, teachers, parents, school boards and other person's connected with educational process. Such survey are concerned with verbal behaviour such as expression of opinions or desires or non-verbal behaviours.

They are also concerned with determining the distribution of relatively enduring traits such as intelligence, authoritarianism, schizophrenia, and host of other attributes. Less enduring traits such as attitudes and interests are also surveyed.[1]

As survey of behavioural phenomena need to be most carefully planned if they are to just useful data. The information-gathering process should be based on same theory of the nature of the phenomenon that is being investigated. A classic case of behavioural survey based on well developed concepts and calling for a large number of items of information is presented by the first Kinsey study of sexual behaviour. In this study several hundred items of information were collected about each male included in the sample.[2] Researcher has tried her best to include most number of items.

The present study is related to the construction of an interest inventory. Behavioural survey method is

appropriate because an interest is a characteristic of human behaviour. Hence the researcher selected the said method.

## THE PLAN OF THE WORK :-

For construction of inventory the researcher had taken following points into account.

Limitations under which the inventory has developed -

a.    The main limitation is that the inventory is specially constructed for the subject Educational technology for student teachers at B.ED level.

b.    Another limitation taken into account was for standardization and norm calculation the same heterogenious sample was used.

## Actual Planning :-

Firstly, the prescribed syllabus of Educational technology recommended by Shivaji University for B.ED course was studied and references for construction of inventory were determined by studying the various reference books of psychological testing and Educational technology. After this objectives of inventory were determined.

The first draft of the interest inventory was prepared considering the objectives of the problem as stated in Chapter I

## Preparation of First Draft

<u>Item construction</u> :- When the objectives of the
. Problem were determined and syllabus, source material
was analysed, construction of items was started.
During construction every precaution was taken to
ensure that they were valid. The following things were
taken into account while constructing the items.[3]

a.      More than one type of items were included in the
        preliminary draft in order to make it
        interesting as well as representative.

b.      Preliminary draft was more extensive and
        inclusive in comparison with the final draft.

c.      The items were clearly phrased so that their
        content and not their form determined the
        response. Words like always, exclusively, never
        positivly were avoided.

d.      Similar items were clusterd together.

e.      No item in the inventory was suggestive. It
        didnot give any clue about the answer of the
        rest of the items in the inventory.

f.      Items were accurately worded. Hence, the entire
        item not the part of it suggested the response.

        As it was an interest inventory and not a test,
the major suggestions were taken into account and
inventory was prepared. It contained 150 items.

        The inventory was divided into five areas
namely -

1.    Cognitive interest area :-

This area included the activities based on knowledge, teaching with various techniques, listening of various educational casettes, hearing of various recorded programmes on radio etc,to be interested in doing research based on newly informed mechanical devices, their uses alongwith the limitations.

2.    Creative interest area :-

This area deals with an individuals interest towards self production.

For example to prepare cassettes of various educational programmes, self media package preparation, to prepare two dimensions and three dimensional pictures etc.

3.    Applied Interest area :-

An individual starts using taperecorder, various audiovisual aids, activities such as these are related to applied interest.

4.    Interest related to management :-

This area belongs to statements such as conducting of seminars, the speeches of various educationists, conducting science fair, to take care of various educational instruments etc.

5.    Skill based interest :-

Preparation of transperencies, using tricks during teaching, to demonstrate an experiment or to

16%

24%

24%

23%

14%

- Cognitive Interest Area
- Creative Interest Area
- Applied Interest Area
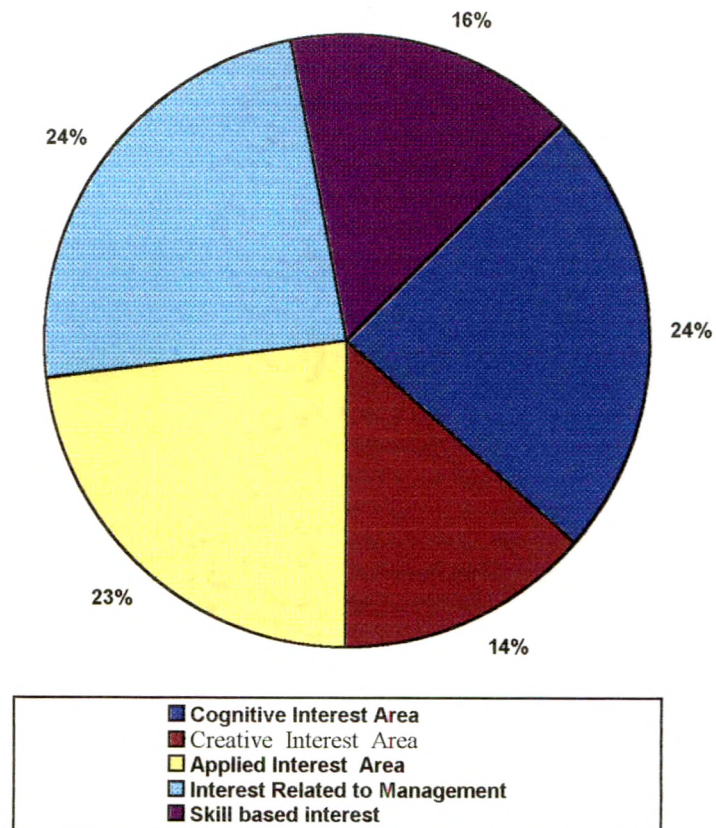- Interest Related to Management
- Skill based interest

Fig. IV.1

Areawise distribution of statements in interest inventory

for Educational technology

dramatise the unit in the text book, to improve the old instruments according to new challanges, such activities which are based on skills of student teachers are included in this particular area.

The distribution of statement in each area is given in Pie. diagram. (See Fig.IV.1)

Then the draft of the inventory was given to six expert teachers in Educational technology and one evaluation scale to each was given for validation of items. This scale was based on percentage of items per area, construction of statements based on syllabus of B.Ed. course properly, weightage given to the units $f$ ., which is enclosed in appendix ( B ).

Thus the items which were valid and recommended by experts were taken into account. According to suggestions of experts the language of items was changed, some items were discarded because of repetition and wrong construction.

Thus the items recommended by the experts were collected together and the inventory was ready for tryout.

Tryout :-

Tryout of the items is a very necessary and important step in preparation of final draft of the inventory because it has following advantages.

## Necessity of Tryout :-

It helps in omitting bad items and selecting good ones in the final form of the test. The best items are always selected by estimating the difficulty level and discriminating power of each and every item.

The tryout form of any test can only give such type of useful data. Sometimes best predicted item fail in the practise. But by the analysis of responses the best constructor selects the best items for the final form.

E.F. Lindquist(1963) brought out the importance of tryout in following manner[4] The tryout of the inventory is useful -

a.      To identify weak or defective items, which need improvements.

b.      To find out very easy or very difficult distractors or items.

c.      To determine the difficulty level of each question.

d.      The data from tryout test helps in choosing the best discriminating items.

e.      To determine the exact sufficient time for finishing the test.

f.      To find out the exact number of items which should be included in the test.

g.      To avoid the overlapping items giving proper hint.

<u>Administration of Tryout</u> :-

The first draft of the inventory was xeroxed and given to the thirty students from B.ED course (1996-97). At the end of the inventory the empty space was provided for the student teacher's suggestions. The time individually required for the completion of the inventory was noted and the mean was calculated. Thus the time was fixed.

The data was collected from the students and the validity index was determined because Lokesh Koul (1984) suggests that, "It is worth noting that the items for non cognitive tests are selected only on the basis of validity index. In such type of tests their is no questions of the difficulty value of an item as the subject is required to respond to a series of statements or questions in 'yes' or 'no', 'agree' or 'disagree', or in a similar way to indicate his feelings or opinions".[5]

The validity index or discriminative power was determined by taking higher twenty seven percent and lower twenty seven percent correct responses given by the students at tryout. The following procedure was followed for calculating the validity index.

a.     The test papers were arranged in order of size for test scores, putting highest score paper on top.

b.     Then twenty seven percent papers at the top were

counted off. Also the bottom twenty seven percent papers were counted, and middle papers were kept aside as they were useful simply to mark off the two end groups.

c. The number in the top group which passed each item on the test and the number in the bottom group which passed each item were tallied and these numbers were converted into percentages.

d. These percents for chance success were corrected.

e. Entering Table 51 (Appendix $D$ )with the percent of successes in the two groups, he biserial r from the intersecting coloumn and row in the body of the table was read.[6]

The statement having validity index 0.16 to onwards were selected because Garrette H.E (1966) writes that, "As a general rule, items with validity indices of 0.20 or more are regarded as satisfactory; but items with lower indices will often serve if the test is long . Items having zero validity are, of course, useless. These items and items having negative validity must be discarded or they must be carefully examined for ambiguities, inaccuracies and other errors.

An experimentally excellent but somewhat laborious method of validating a test is to remove the obviously poor items, and compute the correction of the

remaining total scores (in tentative form) and the criterion. Then again remove the less valid items and recompute the criterion, Correlation, repeating the process until diminishing returns appear.[7]

Remembering the procedure above some statements which were weak were discarded and some statements were rearranged. Thus total 120 statements were finally drafted.

## Sample Selection Procedure :-

Most of the educational phenomenon consists of large number of units. Some populations are very large so their study would be expensive in terms of time, money, effort and manpower.

The process of sampling makes it possible to draw valid inferences or generalisation on the basis of careful variables. Within a relatively small observation proportion of population. A measured value based upon sample data is static. A population value inferred from statistics is a parameter.

Sample is small proportion of population selected for observation and analysis. A good sample must be nearly representative to the entire population as possible and it must provide identically the whole of the information about the population from which has been drawn.

For D.J (1969) has given five steps in sampling

process[9] namely

a.  <u>Universe :-</u>

Includes all possible respondents of certain kind. All colleges of education with similar geographical and Physical, academic conditions.

b.  <u>Population :-</u>

Population of the universe to which the research has access.

c.  <u>Invited :-</u>

All elements of population to which an invitation to participate in research is extended.

d.  <u>The accepting sample:-</u>

It is that the portion of invited sample that accepts the invitation and agrees to participate.

e.  <u>The data producing sample:-</u>

The portion of the accepting sample that actually includes data.

Thus, the sample choosen for testing the reliability of the present inventory comes under population. Thus the sample available for reliability testing was 160 students teachers from the academic year 1996-97. Out of 160 students teachers, those who were absent for retest were deleted. Thus total 135 students were available.

<u>Testing of Reliability:-</u>

<u>Importance :-</u>

Reliability tells that to what extent individual differences of score can be assigned to change the errors. It tells us the extent to which true differences of traits can be attributed to the individual differences. More technically, " Test reliability indicates what proportion of total variance is error variance".

In the words of Garrett (1966), "Reliability of any measuring instrument depends upon the consistancy with which it guages the ability to whom it is applied. [9]

Garrett believes on consistancy.

Anne Anastassi (1982) has given the definition of reliability as, "Reliability refers to the consistancey of scores obtained by the same individual when reexamined with the same test on different occasions or with different sets of equivalent items or under other variable examining conditions".[10]

The reliability was calculated by taking effect of climate, situations, emotional reactions, personal problems of the examinee into account while administering it. The method followed for reliability determination was test-retest method. As given previously the inventory has been divided into five

different areas. The scoring keys were prepared for each area. The inventory was given to student-teacher twice within the interval of forty five days.

Test-Retest method is the method of determining the agreement between two sets of score. The test is given and repeated on the same group, and the correlation is computed between the first and second set of scores. For the present inventory the correlation has been computed which is given on page. )

Test retest method has following objection but researcher had tried her best to overcome the major objection . The major objection is about the time interval. Garrett (1966) says, "If the test is repeated immediately many subject will recall their first answers and spend their time on new material, thus tending to increase their scores"[11]. That is immediate memory effect.

But as this is interest inventory there is no question about the right and wrong answers. The time interval is kept of forty five days. Thus the researcher had tried to overcome this objections of immediate memory effect.

According to Garrett (1966) when a test is given and repeated the reliability coefficient is primarily a stability coefficient.[12]

The coefficient of correlation was determined by

Pearson's product moment method by using the formula for grouped data.[13]

$$r = \frac{\dfrac{x^1y^1}{N} - C_x C_y}{\sigma_x \ \sigma_y}$$

in which,

x'y' = sum of the product of deviations.

N = Number of paired associates.

Cx = Correlation in the X series (test) taken in class interval units.

Cy = Correlation in the Y series (retest) taken in class interval units.

$\sigma$x = Standard deviation for X series (test) or distribution.

$\sigma$Y = Standard deviation for Y series (retest) or distribution . calculations are enclosed in appendix( F,G,H,I,and J)

As the coefficient of correlation is nothing but the reliability coefficient of the test. The reliability coefficient for the five fields were found to be

1. Cognitive interest = 0.825

2. Creative interest = 0.8070

3. Applied interest = 1.001

4. Interest related to management = 0.8408

5. Skill based interest = 0.928

**Validity :-**

Validity is the watchword or foundation stone over which entire superstructure of testing is based. Validity of the test is the degree that we know what a test measures. Validity information permitts us to judge whether the test measures the right things for our purpose. No test is 100% perfect. Therefore if a test measures to a high degree things it purports to measure, it is valid.

According to Thorndike and Hagen (1969), "A measurement procedure is valid in so far as it correlates with some measurement of success in the job for which it is being used as a predictor".[14] Hence correlation with some measurement of success is important. Lee J.CronbacK (1960) says, "Validity is the extent to which a test measure, what it purports to measure".[15] There are two mainly approaches to find out the validity of test.

As the statement were checked by the expert teachers the internal and content validity has been proved.

Also the present inventory will be important for every student teacher incoming for B.ED course. So it can also be considered that this inventory has predictive validity.

The interpretation of face, logical, content validity is given in chapter V.

## Standardization of the interest inventory in Educational technology (IIET) :-

### Standardization :-

Standardization means the process of finding comparative norms. It is nothing but the uniformity of testing conditions. When we standardize a test we analyse the curriculum very critically, select items carefully and observe more strict standards, than the informal objective tests. Standardization literally means "brought to a level of standard". In this process every condition which affects performance must be specified if the inventory is to be regarded as truely standardized.

According to Thomas. "Standardized test is one which has been given to so many people that the test makers have been able to determine fairly accurately how well a typical person of a particular age or grade-in school will succeed in it." This definition is quoted by authors Asthana and Agrawal (1982)in their book Measurement and Evaluation in Education and Psychology.

There are lot of definitions of standardization given by C.V.Good, Lee J.Cronback etc. but all the definitions describe importance of content which has been selected and checked empirically norms which has been established, and uniform methods of administering and scoring which may be scored with a high degree of objectivity.

Shortly the standardized test is a test in which the procedure, apparatus and scoring have been fixed so that precisely the same test can be given at different times and places.

Hence item selection, administering, scoring and standardization are main features and criteria for good interest inventory or any psychological test. Criteria of good psychological test may be represented as follows.[16]
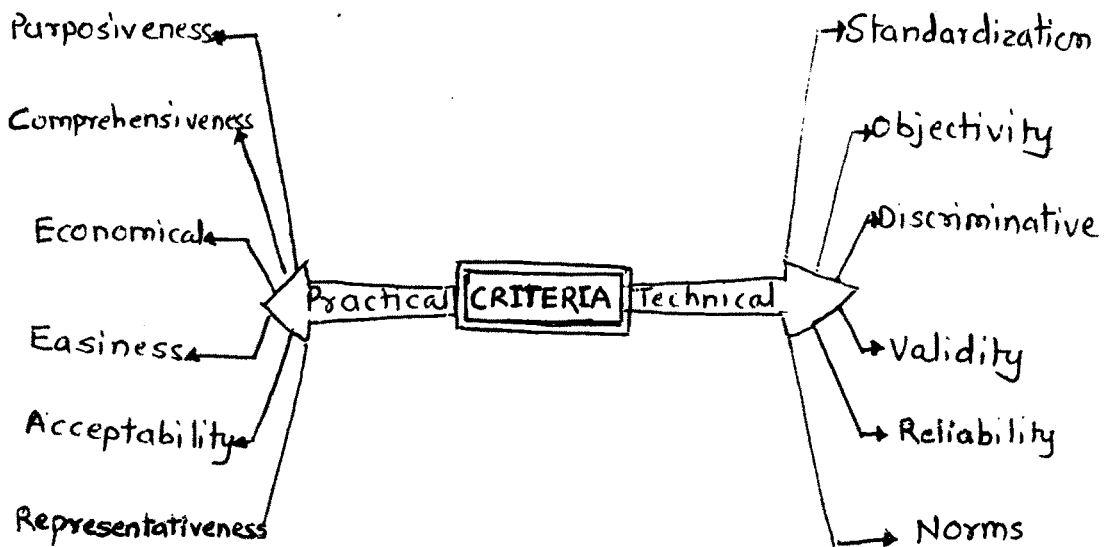


Fig.IV.2 - Criteria for good psychological test

( Source : Mahesh Bhargav:आधुनिक मनोवैज्ञानिक परीक्षण एवं मापन )

So the taking into consideration the major aspects or criteria of a good or ideal psychological test, the present inventory have been made carefully.

For calculation of norms, first their is necessity of score lists as well as various groups which have been considered. In the present inventory
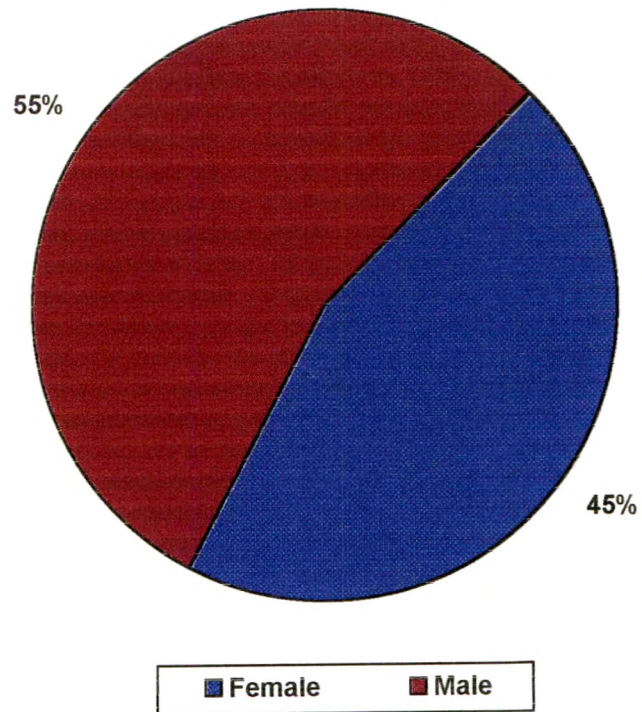
55%

45%

Female    Male

Fig IV.3

Distributiion of Male and Female

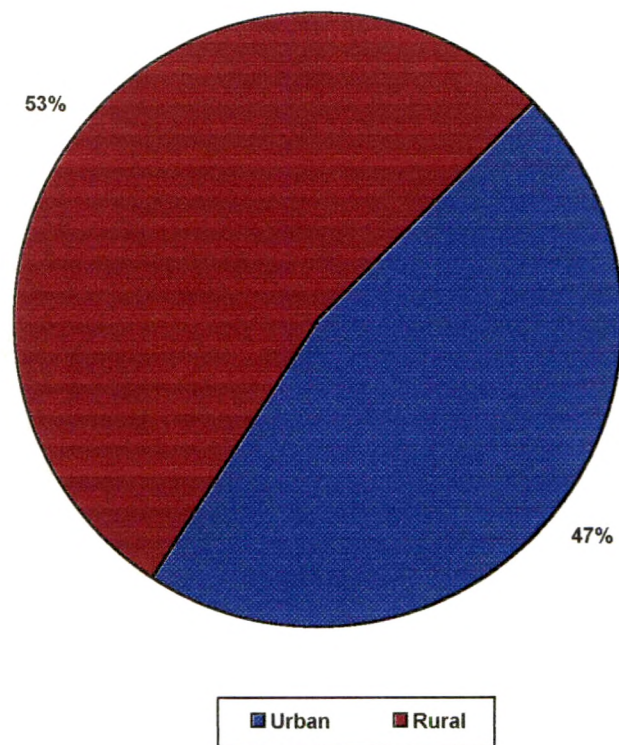student teachers in sample

53%

47%

◼ Urban    ◼ Rural

Fig. IV.4

Distribution of Urban and Rural

student teachers in sample.
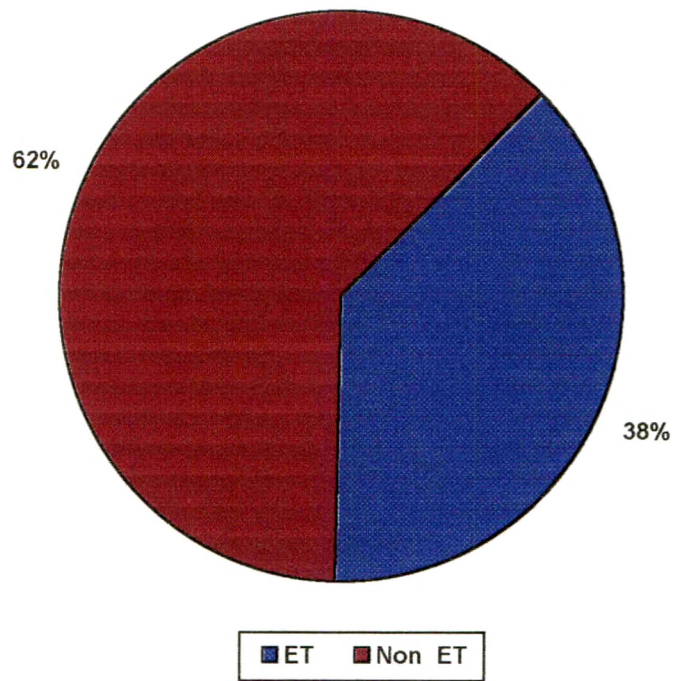
62%

38%

ET    Non ET

Fig. IV.5

Distribution of ET and Non ET

student teachers in sample

there are total three groups namely female student teachers - Male student teachers, Urban student teachers -Rural student teachers, student teachers with E.T. and student teachers without E.T that is Non ET.

The distribution of these groups are shown in Pie diagrams (See Fig.IV.2, IV.3 and IV.4)

After grouping the students according score lists the frequency distribution tables were prepared for each subgroups separately.

Then means for each subgroup that is Male student teachers, Female student teachers, etc were calculated separately using formula.[17]

$$M = \frac{\Sigma fXm}{N}$$

where f = frequency,

Xm = midpoints of each class interval.

Then from those two means the difference have been calculated. To determine '$\delta$' that is standard deviation, using formula.[18]

$$\delta = i \sqrt{\frac{\Sigma fd^2}{N} - c^2}$$

Where    $\delta$ = Standard deviation

i = Size of class interval

$\Sigma fd^2$ = frequency X sum of square of deviation from A.M.

C = Correction in reference to class interval which is given by $\frac{fd'}{N}$

N = Total frequency of group.

By getting standard deviation for each participant group, data was subjected to calculate $\sigma_D$.[19]

$$\sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$

Where    $\sigma_D$ = Standard error of the difference between uncorrelated means.

$\sigma_1$ = the standard deviation of first sample

$\sigma_2$ = the standard deviation of second sample

$N_1$ and $N_2$ = sizes of the two samples

Then to determine critical ratio or $t$ value the value of $\sigma_D$ was used in the following formula.[20]

$$t = \frac{D}{\sigma_D}$$

Where    CR = Critical ratio or t value

$\sigma_D$ = difference between means of two groups.

Thus the Means, standard deviations, standard error of the difference between correlated means were calculated for total score. When the critical ratio or $t$ value was found non significant the null hypothesis has been retained. But when the t value was significant at 0.05 and 0.01 levels of significance the norms were calculated separately. The difference between means of female and male student teachers and Urban and Rural student was found to be significant at any one or two levels (0.05 and 0.01) so separate norms have been calculated for Female and Male student

teachers, and also Urban and Rural student teachers. But the difference between the means of Non ET and ET student was not significant at both 0.05 and 0.01 level hence there was no question of calculating norms.

### Calculation of Norms :-

The formation of direction is a major part of the standardization of new test that is oral, instruction to testee, preliminary demonstrations, handling querries from testee's surrounding etc. In the present IIET the instructions are given in the test booklet. Also the instruction which should be given by supervisors are given in the manual.

The another essential part of standardization is establishment of norms. As norms are extremely inportant in guidance. The persons position relative to his group has to be fixed as definitely as possible. In the present IIET as the relative reliabilities of each area are high. The score lists of retest has been taken into account for hypothesis testing and norms calculations.

The norms were calculated in the form of percentiles and distributing them into stannine scale which is contraction of standard nine.

The norms were calculated considering total score of the student teachers as well as separate scores for five areas. The score lists are given in appendix ( N ). (With scores of student teachers in each group)

The formula used for percentile score was

$$P_p = L + \frac{\frac{PN}{100} - F_b}{f_m} \times i$$

Where  $P_p$ = Desired Percentile.

L = Exact lower limit of the class interval where the desired percentile lie,

p = The score showing desired percentile

$F_b$ = Cumulative frequency below the class interval where the percentile lie.

$F_m$ = Frequency within the C.I, where the percentile lies.

N = Total number of candidates.

i = Length of the class interval[21]

Attempt was made to draw sample as widely as possible, so as to make it adequate and representative.

The each hypothesis was tested by making use of the mean, standard deviation, standard error, and critical ratio (t value).

Along with the described characteristic of standardized inventory the following criteria were also taken into account.

**Objectivity of the IIET :-** The objectivity of items and scoring is taken into account.

**Adequecy :-** The adequecy of the test has been maintained by taking almost all the activities and

abilities of student teachers regarding the selected topics in the syllabus of Educational technology as B.ED level.

Practicability :- (Usability)

We know that main two factors of standardized inventory are validity and reliability. But along with these two if the inventory is not used then there will be no advantage or use of that inventory. So usability is also important. It depends upon following facts and has been maintained by inventory constructor.[22]

1.    The main instruction have been given on the first page of the inventory properly.

2.    Scoring of inventory - The checking/scoring is made objective by preparing scoring keys.

3.    Interpretation of scores - The interpretation of scores and calculation of norms has been done properly.

4.    Economy - Printing of inventory, checking of answer papers etc is possible in reliable cost.

5.    The present inventory can be used in every B.ED college for measurement of interest in Educational technology.

Manual and scoring keys :-

M.B.Buch (1978-83) summarized need for the better manual. It must be emphasized that a manual helps not only the user of that test but also the developers to organise his thinking, codify his

procedures and communicate his ideas and intentions to others. Hence in order to be useful the test manual should contain certain information".[23]

Most of the manuals of the tests reported in Survey of Research in Education are adequate and in some respects misleading. So it has been strongly suggested that all developers follow the standard Sets by the American Psychological association in the publication referred to earlier.

In order to improve the presently available test manual, the stress has been given on the following points by researcher.

1.  The test manual prepared by researcher describes development of test, and specifications followed in writing of items.

2.  The manual gives clear and complete description of norms group. For example age, sex, educational status etc.

3.  The year of publication and collection of norm data is given in the manual.

4.  The norms are calculated for each group separately.

5.  Norms for total scores in the inventory are also given.

The manual giving information about the total procedure, administration, reliability, validity, norms etc has been prepared which has been available

for furtherinvestigation in appendix ( P ).

separate scoring keys were prepared for five areas. (See appendix P ).

## Summary :-

In chapter IV the information about method, sample, statistics, formulae etc has been given about interest inventory in Educational technology.

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