

CHAPTER- III

RESEARCH METHODOLOGY

After a review of the related literature in ChapterII, an appropriate research methodology has been chosen to present in this chapter. An important element that is required before data collection is the formulation of a plan for sample selection, choosing tools, and statistical techniques required to accomplish this study. Since “countable” evidence is the most essential aspect of any research, findings form the core of any study. Evidence describes how the method of judgment (measurement) is useful. The sound objectives, inferences, and conclusions arebased on the procedures to be employed. A researcher makes a design so that whatever task, he does should accomplish the goal, smoothly. In response to research vision, it requires the compilation of its inferences. Too many scores and varied data don’t make sense for educational research unless quantitative inferences are not available. That is why, knowledge of the research design is quite essential as it gives you some sense of the overall procedures, as well as the kinds of relationships between variables that are investigated. It is well established that well-designed studies provide the basis for scientific knowledge of education and bring the greatest benefits for educational practice. Here, the design comprises the population from where the sample has been drawn, size of the sample, type of sample, tools used, statistical techniques used. The most important thing is the type of researchthat is based on the experiment design. It is highly known for its superiority in revealing specific cause-effect relationships.

3.1. Research Study Framework

The present research aims to investigate the Effect of Flipped classrooms on Meta-cognition, Classroom environment, and Academic Achievement of B.Ed. students of Haryana. In this study, the experimental and the control group has been developed. This is carried out in a four-step process. In the first stage, colleges were explored. Then after the college was chosen for the study, which was running an annual course. As the environment has to be the same while execution, so all the setting, context, the university should remain as same was kept in mind. Then 60 students randomly were selected through the lottery method, 30 of the control, and the Experiment was put in a bowl for selection for the study. In the second phase, an experiment was conducted with three interventions. Based on which, both the control and experimental group of B.Ed. students were assessed.

In the third stage, the researcher taught the control group with the traditional method and the experimental group with the Flipped classroom intervention. For that researcher choose two units for teaching and experimenting.

At Stage Four, a Post-test was taken. To assess both control and intervention groups.

All these four stages are presenting in a given table-.

Table-3.1.1. The methodology of the study

Stages	Control Group	Experimental Group
First stage	Selection of the groups for making control group.	Selection of the groups for making experimental group.
Experimental Stage	The flipped classroom was not used, students were taught those units with traditional methods of teaching for two of those units.	Flipped Classroom was used to teach those units for teaching B.Ed. students
Post testing	Meta-cognition, Level, Classroom Environment, and Academic achievement were evaluated after teaching	Meta-cognition level, classroom environment, and academic achievement of B.Ed. students were evaluated after the intervention

3.2. Variables used :

In this research, the Flipped classroom is an independent variable while Meta-cognition, Classroom Environment, and Academic Achievement are dependent variables.

3.3. Sample of the Research:

The sample of this study is comprised of 60 B.Ed. students who were selected from the RKSD College of Education, Kaithal District, Haryana state, by using a purposive sampling technique. Out of 60 B.Ed. students 30 pupils formed a control group and 30 formed an Experimental group. The sample details are provided in the given

Table 3.3.1

Samples	Experimental group N=30	Control group N=30
Total N=60	Male-14, Female-16	Male-14, Female-16

3.4 Tools used :

The tools which were used to collect the data from the sample are given below :

- i. Meta-cognition scale for teacher trainees development and validated by the researcher himself.
- ii. Classroom environment inventory constructed and validated by the researcher himself.
- iii. Academic achievement test constructed by the researcher himself.

3.4.1. Procedure of Metacognition scale for teacher trainees construction

To assess the level of Metacognition of B.Ed. students (Teacher Trainees), this tool contains 5 dimensions. This scale was constructed and validated by the investigator himself. The procedure and steps of scale construction and validation are given below:

- 1) **Planning-** In the first step investigator took care and decided about the appropriate language, structure, and method of construction for the scale. Afterward, the right content in this concern was decided and then the tool was constructed on Meta-cognition Scale for teacher trainees with five dimensions (Awareness, Planning, monitoring, testing, evaluation, and reflection) in the English language based on the Likert scale Method. Then It

was decided to include (4,7,7,7,6,7) items in each of its dimensions. Five points (5=Always, 4=Very Often, 3=Often, 2= Sometimes, 1 =Never) were decided to a lot to the Likert responses on the scale.

- 2) **Item writing-** Items were written based on the review of the literature and the characteristics associated with different types of Metacognition levels. Some are also derived from the pioneer research work of Dr.Punita Govil (Meta Cognition Inventory (2008)

Theoretical Framework was taken out from Winne and Hadwin's self-regulated learning theory (2015), Psychological dimensions of transformation in teacher learning (2015). Zohar,A; David A (2008), Met cognition orientation inventory (2016) Shaw and Anderson's Met- cognition Awareness Inventory (1999)

- 3) **Content Validity of the Constructed items:**The first draft of the Metacognition scale contained 89 items and was given to eight experts to know the usability, clarity, and content validity of the items, and to get their consent to say that items are clear and appropriate enough to measure for which it is written. They were also required to give their suggestions to make corrections in the written items.

Based on expert opinion, corrections were done, 41 items were deleted. According to expert 48 items of the scale found fit to measure the different levels of Meta-cognition of B.Ed. students.

In this way, the first draft of the Meta-Cognition Scale for Teacher Trainees was prepared for pre-tryout.

- 4) **Pre-try out and Pilot study of the first draft of Meta-cognition Scale for Teacher Trainees:** For doing the pilot study 150 B.Ed. Students of the college of education in Haryana were selected Randomly. There were 75 (37 Males & 38 females) and 75 (37 Males & 38 females) were selected as a sample. When the pilot study of the scale was done, the data of responses given by randomly selected 150 B.Ed. students were collected. It was collected from the academic year of 2019-2020.
- Then collected response sheet was prepared in MS-excel. There were 41 items in the first draft of the Meta-cognition scale. For the statements, there was the possibility to achieve a maximum 5 and minimum 1 score on the scale for each item by each respondent.
- 5) **Validity:** Then construct validity of the scale was checked through SPSS's factor analysis. It made 15 factors but they were then kept in the same direction as each question showed value 4 and the commonalities of these dimensions were 1.00 which showed it significant too. Only one item was removed, which was the first item of the awareness dimension.
- 6) **Reliability:** The final draft of the Meta-cognition Scale of Teacher Trainees containing 40 items was taken for the reliability of the scale, Cronbach alpha was calculated with the help of SPSS. The value of Cronbach Alpha reliability came to 0.826. The reliability values showed Meta-cognition scale for teacher trainees is highly reliable.

3.4.2. Procedure of Classroom Environment Inventory construction

To assess, what kind of environment for B.Ed. the class should be there so that learning outcomes can achieve. For these Certain dimensions, Were considered to prepare, the Inventory and this inventory was constructed and validated by the researcher himself. The procedure and steps for the construction of the tool is given below ;

- 1) **Planning-** In the same manner as the first scale was planned, likewise, the researcher decided about the language, methods of construction, and structure of the scale. While planning for the construction of the inventory, the researcher adapted foreign author Edison J. Trickett Rudolf H. Mooc Classroom Environment Scale (2012) and made 9 dimensions comprised 90 items in a scale, each dimension with 10 items respectively. These dimensions were involvement, affiliation, teacher support, task orientation, competition, order and organization, rule clarity, teacher control, innovations. Mode of writing was kept English and used True, false inventory type for the representation of its mode of answering.
- 2) **Content validity** – First draft was contained 90 items and was given to the same eight experts to know the clarity and usability of the content. Based on their suggestion 90 items became reduced from 90 to 57, those 57 found fit to measure the classroom environment of B.Ed.
- 3) **A pilot study of the first draft of classroom inventory-** For doing the pilot study same 150 B.Ed students from the College of Education in Haryana were selected randomly. They were 75 (37 male, 38 female) and 75 (37 male and 38 female) when the pilot study was done, the data of the responses

given by the random selected B.Ed. students were entered in the Ms. Excel sheet and the coding of 1 to true and 2 to false was given. Data was collected from the students who were enrolled during the session 2019-2020.

4) **Item Analysis** - Because it was like an achievement test that is why its item analysis was done. In this way, each respondent had the opportunity to achieve minimum (57×1)=57 and maximum (57×2) =114 on this inventory. Based on the responses of the respondent the total score was calculated. After the calculation of the total scores for each respondent, inventory sheets were arranged in ascending order.

- In the second step 27 % highest scoring and 27 %, lowest-scoring of the inventory were drawn from total responded sheets and classified as high achiever group and low achiever group respectively.
- The mean and SD value for each item of inventory was calculated for both high achiever and low achiever groups. The calculation of the significance of the difference between both groups' means score was done to know the discrimination power of Each item. For it 't' value was calculated. The examination of the significance of difference was calculated at 0.01 level. Two criteria were determined to accept the items for the final draft of classroom environment inventory. The first criteria were that only those items would be selected in the final draft of the scale which has a significant level. If there is more than one item for the characteristics then an item that has a greater value of discrimination power would be selected for the final draft.

- **Selection of item:** After item analysis same 57 constructed items were found adequate.

5) **Reliability of the Inventory:** CronbackAlpha was calculated with the help of SPSS and its value came to .717. This Reliability value showed that **Classroom Environment Inventory** was reliable to measure B.Ed. Classroom Environment through its various dimensions.

3.4.3. Administration of the tools used

This Metacognition scale for Teacher Trainees and Classroom Environment Inventory and Achievement Test was administered on individual students. These were completed under certain instructions. First respondents were asked to fill the personal data printed on the front page. The researcher read the instructions loudly and clearly. Respondent followed her carefully. The administrator explained the mode of responding to the test items of Scale, Inventory, And Achievement Test. When the researcher became sure that the students have understood the mode of recording their responses, he permitted them to turn over the front page of their details and start filling in their responses.

3.4.4. Scoring of Metacognition scale for teacher trainees

On the scale 41 items are ready to have the answers and this is in the form of the Likert Scale with the value 5- Always, 4- very often, 3- often, 2- sometimes, 1- never

Norms-

Based on the statistical results presented in the table. Z – Score norms have been developed and presented.

Norms for interpretation of the level of Meta-cognition have been presented in table 3.4.1.

	Z Score	Level of Meta-cognition
170-Above	-.355 to 1.51	Extremely High
140-169	-1.82 to -0.48	High
110-139	none- to -2.55	Average
80-109	None	Below Average
50-below	None	Below

3.4.5. Scoring for Classroom Environment Inventory

A scoring key that makes scoring a simple task. To determine an individual's raw score, the number of responses is counted to give the direction and the total is entered in the raw score box. To determine the classroom's mean raw score for each subscale, average the subscale raw score for all students in the class.

Scores	Level of Classroom Environment
47-Above	Extremely High
37-46	High
27-36	Average
17-26	Below Average
7-below	Below

To convert an individual's subscale raw score or classes mean raw score to a standard score uses the table.

3.4.6. Scoring of Academic Achievement

- Scores were given to the achievement of the students.
- The test was having 25 items
- with multiple-choice question $25 \times 2 = 50$

	Level of Academic Achievement
40-Above	Extremely High
30-39	High
20-29	Average
10-19	Below Average
0-9	Below

3.4.7. Flipped Classroom

Child and Development content was considered to be used for the flipped classroom from B.Ed. curriculum.

Theories of Child Development :

- 1) Theory of cognitive development by Piaget, concept, stages, and implications with special reference to the Indian context.
- 2) Theory of social and emotional development by Ericson, concept, stages, and implications with special reference to the Indian context.
- 3) Kohlberg's theory of moral development.

Learning and teaching :

Learning paradigm

- 1) Theories of learning (Trail and error (Thorndike), classical conditioning (Pavlov), operant conditioning(Skinner)

- 2) **Activities**
 - Offline content from the different e-resource for home.

 - **Classroom Activities involved:-** Discussion and orientation, Focused demonstration, Faux flipped classroom, group-based activity, virtual-based activity, blackboard race, conjugation pyramid, tic-tok, shooting hoops, statement chain,quizzes,h5p,test mod.

3.5. Procedure of Experiment Research

The research design provides an overall structure for the research process. It helps with topic selection, data collection devices, and data analysis techniques that are relevant to the research objectives.

Experimental research offers a systematic and logical response to the research questions. Experimental methods can be applied effectively in the classroom, where significant factors or variables can be monitored to a certain extent. This is the way to where the cause and effect relationship between the variables is established. This is considered the best way because it provides some control over extraneous variables and the manipulation of variables.

Among the research methods, the experimental method is considered to be a scientific research method. It provides a well-patterened way to respond to research questions. It is the way to establishing a causal relationship between variables. Researchers, since they decide on the nature of the treatment, need to apply it and to what extent.

The ultimate aim is to generalize the relationships between variables so that they can be applied outside the classroom to a wider population of interest. Based on the above benefits of experimental research, the researcher has followed an experimental design for this study.

3.5.1. Meaning

In a simple traditional experiment, an experimental group and a control group are used to compare the results of one treatment to that of different treatment or no treatment.

The experimental group is thus exposed to the treatment envisaged and the control group is not exposed.

3.5.2. Experimental stages

At this stage Flipped classroom was applied to the experimental group and was implemented 60 days. In which Students were given offline materials through e-resources, like DTH channel, you-tube, and various activities were utilized to make them retain the content in the classroom itself, and the control group was taught with the formal traditional classes only.

The same subjects have been taught to the control group of B.Ed.class too.

The teaching medium was bilingual. The Experimental group was taught for 45 min. daily. Appropriate e-resources were shared with participants as part of their learning.

Post-test phase

After teaching three months both control groups and experimental groups were evaluated again individually to have the scores of their progress on Meta-cognition, Classroom Environment, and Academic Achievement with the help of self -prepared tools i.e. Meta-cognition scale for Teacher Trainees, Classroom Environment Inventory and Academic Achievement test.

3.5.3. Benefits from this design

This type of design enables a teacher to experiment in their classroom. Since the same teacher is involved, he allowed a fair attempt to operate the factors of capacity and background of the subjects and general features of the experimental situation.

3.5.4 Experimental threats

1) Internal validity

Internal validity applies to the assumption that the changes in the dependent variables are attributable to the independent variable's influence rather than any unintentional variables... The researcher can have the threat of gaining the scores well if the first experimental group would have dealt before dealing with the control group.

To avoid this threat the researcher first dealt with the control group then dealt with the experimental group.

2) Selection

Differences in the subjects in the groups may lead to different outcomes. According to the law of probability, random assignment of subjects to experimental and control groups guarantees that the groups being compared are not substantially different in composition. In all subjects, the subjects should be equal.

3) Statistical Regression

It's possible that the respondents' identification based on extremely high and low scores had an impact. The topic should have been chosen equally from all of the scoring options.

4) Testing

The hazard of testing refers to the effect of one test on the outcome of a subsequent test. In laboratory experiments, it is normal to test subjects at the beginning and end of the research. If there is a significant change in the post-test score, the researcher may conclude that this is due to the use of a particular intervention method of experimentation. An alternative explanation is that it is due to the use of a pre-test, but time was taken to avoid meeting this threat. This study included a pre-and post-test, and as a result, this hazard was removed.

5) Selection of Instruments:

Internal validity can be jeopardized by differences in findings due to changes in measuring instruments between the pre-test and post-test. The danger was removed by using the same methods to evaluate Meta-cognition, classroom Environment, and academic achievement in the study.

6) Mortality

The loss of subjects that may occur sometimes during the study is called a mortality threat. During this study, such a subject loss did not occur.

7) Maturation

There may be conflicts in subject scores due to a variety of variables related to the time that was not included in the investigation.

The total duration of the study was weeks. So this threat was eliminated.

8) Selection Maturation Interaction

The effect of maturation not being consistent across the groups maybe because of the same selection factor consulting this threat.

The subjects selected were similar in all respects(eg: age), hence this threat was eliminated. Much care has been taken by the investigator to minimize this threat as the samples were within the same stream.

9) External Validity

External validity refers to the difficulty of extrapolating experimental research results to other environments, people, factors, and measuring instruments. The degree to which the results of a study in one situation can be generalized or extended to another situation is known as external validity.

Threats to external validity:

- 1) Interaction effects of selection of biases and the experimental treatment:** This relates to the interaction of some intact group selection factor with the experimental treatment; this would not be the case if the

groups were created randomly. In this study, one class of B.Ed. students were selected so this threat was eliminated.

3.6. Difficulties faced by the Researcher:

When the researcher has completed her study, the final difficulty is knowing how to make sense of the data, the researcher has collected. After dealing with the experimental group researcher faced the top six challenges while compiling a list of challenges. After the issues were established, they felt that the most important problems for distance education and the rest are described below.

- 1) The first difficulty I faced from the start of my journey was that the subject content was not available in the nearby areas.
- 2) The second was CEC content was very slow and very large in delivery of action. So students started feeling bored.
- 3) At the time of data collection, college authorities were not willing to give the classes. They were only ready after the unit test exam.
- 4) when this intervention was used to deal then the students were not found serious about reading the content at home but once the classroom activities dealt then they started completing their online learning at home.
- 5) One more difficulty the researcher faced was due to activities dealt in the classroom there was huge noise so to deal with such situation the groups can be shortened to perform these activities.
- 6) A special class is required where sufficient movement space should be there to perform these flipped activities.

3.7. Handling Ethical issues

Ethical considerations emphasize that ethical considerations are important throughout the research process, not just at the end. When it comes to respecting and honoring participants, ethical issues are important. The ethical considerations were focused on Wallen's (2008:63-65) and Henning et al (2004:73)'s recommendations:

- 1) Participants were assured that they fully understood the study's intent and were reminded in writing that their participation was completely voluntary.
- 2) Anonymity is a virtue. Participants were told that their details would be kept private and that they would not be known at any point during their research.
- 3) Participants' right to privacy has been respected, and all activities have been performed in a trustworthy and open manner.
- 4) Participants were told that they had the right to withdraw at any time during the research and that they would not be penalized in any way if they did so.
- 5) Ethical approval: Since there was no official ethical committee in the Faculty of Education at the time, ethical approval was sought from the head of the research institution.

3.8. Statistical techniques used:

Scores don't have any weight and meaning of explanation of themselves unless any requisite statistical techniques are not employed to test the level of significance of the scores. To fulfill the objectives of the study. For them, the following statistical techniques were employed for data analysis.

Mean:- SD, t-test.

As the hypothesis of the study was null, two-tailed tests were employed for testing the significant difference between the mean scores of the Control and Experiment at the level of Meta-cognition, Classroom Environment, and Academic Achievement.

Mean:

This is called an arithmetic average as well and is determined by adding all of the scores and dividing this sum by the number of scores of pupils.

Formula: $\bar{X} = \frac{\sum X}{N}$ Arithmetic Mean

\bar{X} = Arithmetic mean

$\sum X$ = Sum of all the values of variables

N = dividing by the total number of items

Standard Deviation:

This measure of variability is used with the mean. Sometimes, this is needed for deriving other statistical indexes. This measure of variability involves a rather long and involved process of computation. The mean of the distribution is first determined. The difference between each score and the mean is obtained and squared. These squares are added and averaged and the equal root is computed of the average.

$$\sigma = \sqrt{\frac{\sum (X - \bar{X})^2}{n - 1}}$$

Where SD = Standard deviation

X = the derivations of the item from the mean

1. Some assumptions must be fulfilled for the use of the t-test. According to Vchat (2009, p. 338, p. 359), there are four most important assumptions are variables must be measured on either interval or ratio level. The characteristics of the related variables must be approximately normally distributed, the sample must be randomly selected from the population and the sample has an equal or nearly equal variance.

In this study sample was selected randomly, all three tests were measured at the interval level. t-value can be calculated by using the following formula:

$$S_p^2 = \frac{(n_x - 1) \cdot S_x^2 + (n_y - 1) \cdot S_y^2}{n_x + n_y - 2}$$

$$t - \text{statistic} = \frac{\bar{X} - \bar{Y}}{S_p \cdot \sqrt{\frac{1}{n_x} + \frac{1}{n_y}}}$$

$$df = n_x + n_y - 2$$

where,

\bar{X} = sample mean

\bar{Y} = sample mean

S_p^2 = pooled sample variance

S_p = pooled sample standard deviation

S_x^2 = unbiased sample variance for X

S_y^2 = unbiased sample variance for Y

n_x = sample size of X

n_y = sample size of Y

If the $p > \alpha$, t, t tabulated at df (n - 2) and If the disparity between the two groups is substantial at the “ α ” percent level of significance, it is considered to be significant. At the “ α ” percent mark, the data is said to be consistent with the hypotheses. The findings were analyzed in the following chapter using these instruments, processes, methods, and statistical calculations.