

CHAPTER – IV

*ANALYSIS AND INTERPRETATION  
OF DATA AND FINDINGS*

CHAPTER – IV

**ANALYSIS, INTERPRETATION OF DATA  
AND FINDINGS**

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CHAPTER – IV  
ANALYSIS AND INTERPRETATION OF DATA  
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**FORMAL OPERATIONAL REASONING ABILITY**

To compare the formal operational reasoning ability of student-teachers of Government College of teachers education and private non-aided College of Education, totals of mean scores of stating of hypothesis and testing of hypothesis are compared.

Table –2

FORMAL OPERATIONAL REASONING ABILITY OF  
STUDENT-TEACHERS OF GOVERNMENT COLLEGE  
OF TEACHER EDUCATION AND PRIVATE  
COLLEGE OF EDUCATION

	Ability	Sex	Government College of Teachers Education		Private Non-aided College of Education	
			Mean	S.D.	Mean	S.D.
For all four problems together	Stating of hypothesis ability	M + F	27.88	5.70	20.68	5.62
	Testing of hypothesis ability	M + F	8.80	1.51	7.85	7.27
	Formal operational reasoning ability	M + F	36.68	7.21	28.53	12.89

## OBSERVATION AND INTERPRETATION

From table 2, it is observed that, for all four problems under consideration, Mean scores of formal operation at reasoning ability of student-teachers of Government college of teachers education is more than that of student-teachers of Private non-aided College of Education.

## SECTION – II

### STATING OF HYPOTHESIS

To study the ability to state hypothesis at student-teacher of Government College of Teacher Education and Private non-aided College of Education, stating of hypothesis questionnaire was used.

### STATING OF HYPOTHESIS

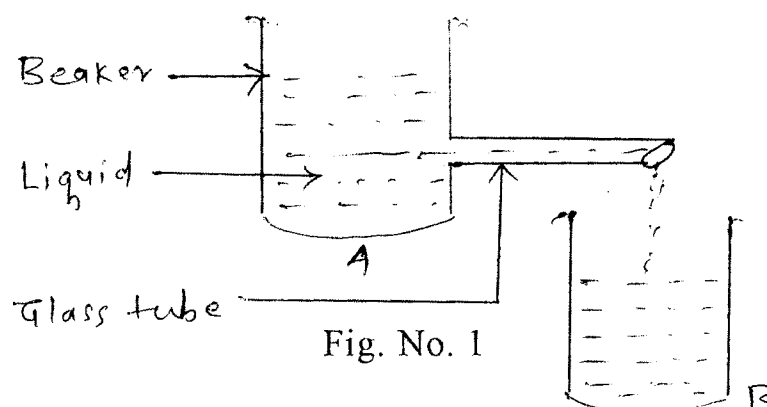
In this questionnaire four problems were included. They are the flow of liquid through a tube problem, the simple pendulum problem, the ramp problem and the seed problem. After the practice problem on the drying up of handkerchief the student-teachers were asked to state hypothesis for the four problems in the questionnaire as they arose in their individual heads. They were asked to number their ideas because this instruction went a long way in facilitating the scoring of responses. The first problem attracted as many as 27 hypotheses. Similarly, the frequencies for the other three problems were 21, 22, 30 respectively. It is seen that student-teachers on the whole see the experimental situation presented hypothetically in all possible ways regardless of the incidence of the same.

The four problems as they were administered to the student-teachers and the hypothesis they stated for each of them are as follows:

## Problem No. 1

**THE FLOW OF LIQUID THROUGH A TUBE PROBLEM**

Have a look at the diagram given below :



There are two beakers A and B. Beaker A contains as much liquid as you wish (want). It (Beaker A) is placed at a higher level than the Beaker B. A glass tube is fixed to the beaker A. the liquid through from Beaker A trough the glass tube into the beaker B. name all the factors upon which the quick filling up the beaker B depends.

The hypothesis stated by the student-teachers were –

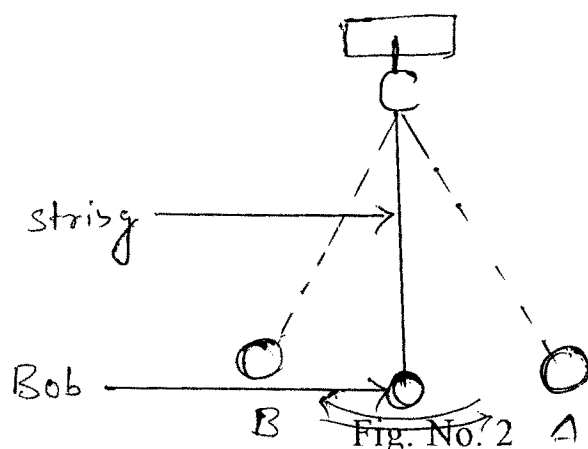
1. Diameter of the liquid in beaker A
2. Level of the liquid in beaker A
3. Height of beaker A from surface
4. If there is succession below in beaker A
5. Amount of liquid in beaker A
6. Viscosity of the liquid
7. Size of beaker A

8. Material of beaker A and B
9. Temperature of liquid in beaker A
10. Atmospheric pressure
11. Nature of the liquid
12. Colour of the liquid
13. Size of the tube
14. Shape of the tube
15. Place of beaker A and B
16. Length of glass tube
17. Height of beaker A
18. Purity of the liquid in beaker A
19. Distance between two beakers
20. Speed of the liquid
21. Pressure of the liquid
22. Size of the beaker B
23. Nature of the liquid
24. Suitable arrangement of beaker A and B
25. Pressure of air on liquid
26. Density of liquid
27. No leakage

## Problem No. 2

**THE SIMPLE PENDULUM PROBLEM**

Have a look at the diagram



It consists of a string whose one end is attached to a book and other end to a bob. If you give it a slight push, it moves to and fro sideways. To put it in other words, it moves from A and B and back to A. This is called ONE OSCILLATION (a complete movement). Now name all the possible factors on which one oscillation of any simple pendulum depends.

The hypothesis stated by the student-teachers were –

1. Weight of the ball
2. Length of the thread
3. Diameter of the ball
4. Material of the string
5. Volume of the ball
6. Thickness of the string

7. Flexibility of the string
8. Weight of the string
9. Material of the ball
10. Size of the ball
11. Shape of the hook
12. Force of the push given to the bob
13. Colour of the bob
14. Strength of the string
15. Amplitudes
16. Weight of the ball
17. External pressure on the ball
18. Distance from the hook
19. Atmosphere
20. Length of the string
21. Colour of the hook

## Problem No. 3

**THE RAMP PROBLEM**

Have a look at the diagram

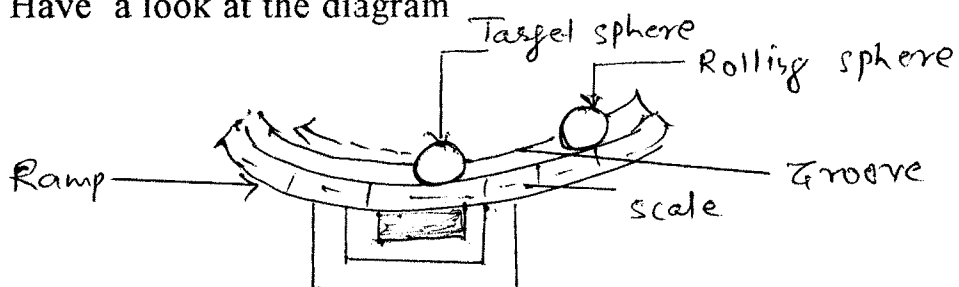


Fig. No. 3

There is a ramp with groove along which spheres can roll up and down. A target sphere placed at the centre of the ramp. When (rolling) another sphere is released from the right (see the diagram), it rolls down the ramp, strikes the target sphere and make it move up the ramp on the left.

The movement of the target sphere on any ramp depends on the following possible factors :

The hypothesis stated by the student-teachers were :

1. Weight of the main ball and moving ball
2. Surface of the slope
3. Shape of the ramp
4. Material of the ramp

5. Smoothness of the ramp
6. Length of the ramp
7. Height of the stand
8. Nature of the groove
9. The depth of the groove
10. Breadth of the ramp
11. Weight of the target sphere
12. Weight of rolling sphere
13. Force of air
14. Push given to rolling sphere while releasing it
15. Size of the groove
16. Length of the ramp
17. Depth of the groove
18. Nature of the groove
19. Rolling sphere is heavier than target sphere
20. Size of the rolling sphere
21. Angle between left and right slope
22. Shape of the target sphere

Problem No. 4

### THE SEED PROBLEM

A farmer wishes to grow healthy plants. Name all the possible factors he should consider to make seeds grow into healthy plants.

Factors stated by the student-teachers were :

1. Quality of seeds
2. Nature of the soil
3. Climate
4. Light availability
5. Water availability
6. Sowing the seeds in rows
7. Fertile soil
8. Presence of mineral salt in the soil
9. Fertilizer's used
10. Spraying of insecticides
11. Sunlight
12. Rainfall of the place
13. Removal of dried flowers and leaves
14. Protecting seeds from birds
15. Moisture in the air
16. Size of the land
17. Season when the seeds are sown
18. Presence of rodents

19. Spacing of plants
20. Wind
21. Salt and water ability of soil
22. Percentage of rainfall
23. Knowledge about the crop grown
24. The region
25. The physical strength of the farmer
26. Use of tractor for sowing seeds
27. Sowing the seeds in rows
28. Rainfall of the place
29. Colour of soil
30. Size of land

### **SCORING**

Scoring was done simply by giving one mark for each hypothesis stated. Total number of hypothesis stated student-teacher wise and college wise was counted for each problem as well as for all four problems together, which provided the measure for 'stating of hypothesis' as a whole.

Table - 3

MEANS COLLEGE-WISE, SEX-WISE AS WELL AS  
MEDIUM-WISE FOR THE FOUR PROBLEMS OF STATING  
OF HYPOTHESIS

Sr. No.	Problem	Sex	Government College of Education			Private non-aided College of Education		
			Mean			Mean		
			English	Kannada	Average	English	Kannada	Average
1.	The flow of liquid through a tube problem	M	7.33	6.77	6.84	5.18	4.97	5.03
		F	6.5	6.15	6.31	5.63	7.00	6.06
		M + F	6.71	6.57	6.61	5.37	5.20	5.26
2.	The simple pendulum problem	M	6.5	6.09	6.14	4.93	4.57	4.68
		F	6.55	6.45	6.50	5.45	4.80	5.25
		M + F	6.54	6.21	6.30	5.15	4.60	4.80
3.	The ramp problem	M	5.83	5.91	5.90	3.93	4.02	4.00
		F	6.22	6.05	6.13	4.27	5.60	4.69
		M + F	6.12	5.95	6.00	4.07	4.20	4.15
4.	The seed problem	M	9.66	8.78	8.86	5.93	6.45	6.30
		F	8.83	9.40	9.13	7.54	6.00	7.06
		M + F	9.04	8.95	8.98	6.59	6.59	6.47
	Total	M	29.33	27.51	27.73	20.00	20.02	20.02
		F	28.11	28.05	28.08	22.90	23.20	23.00
		M + F	28.41	27.68	27.88	21.18	20.40	20.68

## OBSERVATION AND INTERPRETATION

From Table 3, it is observed that,  
Means scores,

1. For the problem 'The flow of liquid through a tube' ability of stating hypotheses of student-teachers of Government College of Teacher Education is more than that of student-teachers of private non-aided College of Education.
2. For the problem 'The simple pendulum' ability of stating hypotheses of student-teachers of Government College of teacher education is more than that of private non-aided college of education.
3. For the problems 'The ramp' and 'the seed problem' ability of stating hypotheses of student-teachers of Government College of teacher education is more than that of student-teachers of Government college of teacher education is more than that of student-teachers of private non-aided college of education.
4. For all the four problems under consideration, ability of stating of hypotheses of female student-teachers of both, Government college of teacher education and private non-



## OBSERVATION AND INTERPRETATION

From Table 4, it is observed that,

1. Mean scores of ability stating hypotheses of all student-teachers of Government college of teacher education is more than that of all student-teachers of private non-aided college of education.
2. Mean scores of ability of stating hypotheses of female student-teachers of both, Government College of teacher education and private non-aided college of education is more than that of male of student-teachers of both types of colleges.
3. Mean scores of ability of stating hypotheses of English medium student-teachers of Government college of teacher education is more than that of English medium student-teachers of private non-aided college of education.
4. Mean scores of ability of stating of hypotheses of Kannada medium student-teachers of Government college of teacher education is more than that of Kannada medium student-teachers of private non-aided college of education.

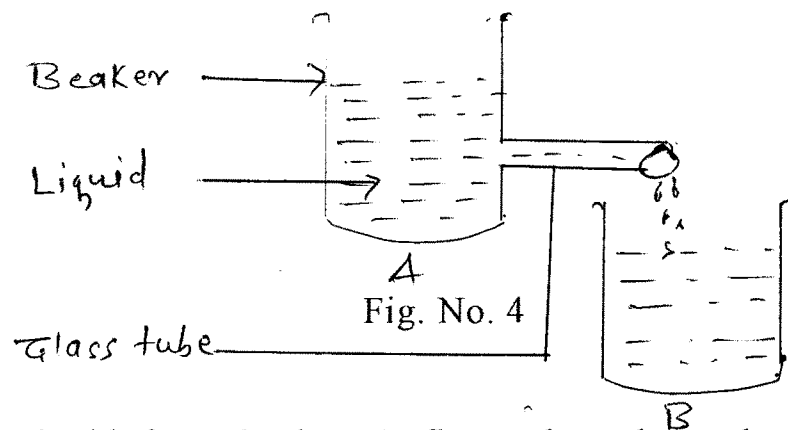
### SECTION – III

## TESTING OF HYPOTHESIS

In this questionnaire four problems were selected out of which the first three problems were similar in character. The three problems are : the flow of liquid through a tube problem, the simple pendulum problem, the ramp problem and the worms problem. In each of these problems, out of many hypothesis emitted only two were selected from each problem. They are called variables in this study. The fourth problem is different.

The data for fourth experiments were presented diagrammatically. The student-teachers were free to have a look at the data any way they liked. They were supposed to answer two questions by having close look at diagrams at serial numbers 1,2,3 and 4. They were also required to answer whether another experiment was really necessary to answer the main problem. If there is necessity, then they were supposed to suggest that experiment diagrammatically.

## 1. THE FLOW OF LIQUID THROUGH A TUBE PROBLEM



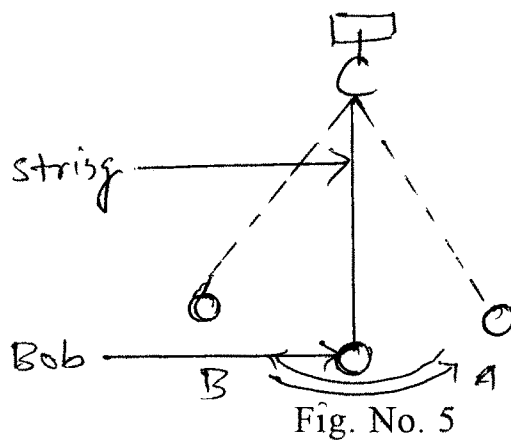
Liquid from beaker A flows through a glass tube and collects in the beaker B.

The amount of liquid collected in the beaker B in half an hour, say, depends on the following two factors alone.

1. Size of the hole in the glass tube
2. Levels of water in the beaker A.

Suggest experiments to test these two factors.

## 2. THE SIMPLE PENDULUM PROBLEM

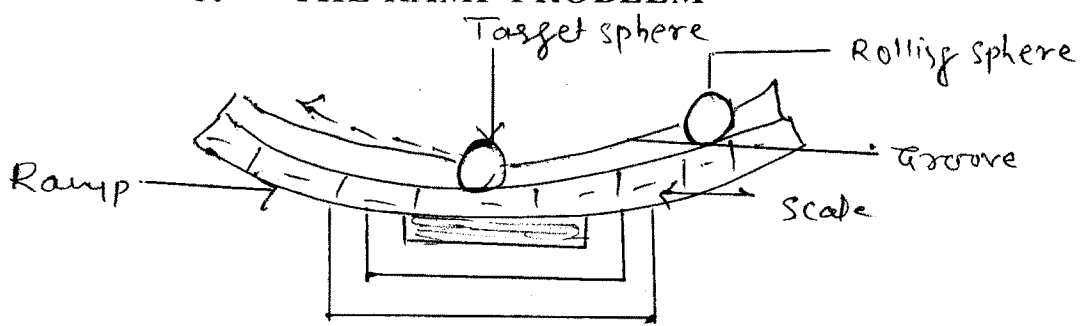


The time taken for one oscillation of the pendulum depends upon the following factors :

1. Volume of the bob
2. Weight of the bob

Suggest experiments to test these factors.

## 3. THE RAMP PROBLEM



The moving of the target sphere depends on the following factors :

1. The weight of the target sphere.
2. The nature of the surface of the groove.

Suggests experiments to test the above.

#### 4. THE WORMS PROBLEM

A student of your age wanted to know how the movement of worms more about in light and moisture.

To solve this problem, he placed 20 worms in the centre of each of the four glass boxes under different conditions of light and moisture. For moisture water was sprinkled on the bits of paper in the whole box or in half of the portion of the box is required.

Light was provided by the electric bulb to the required part of the box. His data are shown in the four diagrams given below. Your problem is to have a close look at each of these diagrams and reach a suitable conclusion. You are free to suggest any other experiment, if it might help to solve the problem clearly. It

is also possible that above mentioned student may have missed an experiment or two.

Fig. No.7

The movement of worms in light and moisture

1. What do you conclude from the diagrams 1 and 3?
2. What do you conclude from the diagram 2 and 4?
3. Is any other experiment necessary? If yes, suggest the experiment with diagram. As regard practice, the same practice problem (the drying up of handkerchief) was retained. It was presented as follows :

## PRACTICE PROBLEM

### THE DRYING UP OF HANDKERCHIEF PROBLEM

#### Example No. 1

One student 'A' said that length of the handkerchief was an important factor in its drying up. When asked to test this factor, he gave following experiment.

He said, "I shall take three cotton handkerchiefs of different lengths, say of 10 cms., 20 cms., 30 cms. In all other respects they will be exactly the same. I shall dip all the three in water and spread them out in the sun. I will then note down the time taken for each handkerchief to dry up to the same degree. If the handkerchief of smallest length (10 cms.) dries up first and that of the largest length (30 cms.) dries up the last, then it will conclude that, 'length' of the handkerchief is an important factor responsible for its drying up.

In case all the three handkerchiefs of different length dry up at the same time, then I shall conclude that length is not an important factor.

#### Example No. 2

Another student 'B' said that, the material of the handkerchief is an important factor. To test this, he must choose

handkerchiefs similar in all respects except the material of the cloth, e.g. cotton, wool and nylon.

He should then dip all the three in water and spread them on the ground. He should then note down the time they take to dry up. If all the three handkerchiefs dry up at the same time, it means that, the material of the cloth has no effect in their drying up. If time taken for each to dry up is different, it means that the material of the handkerchief is an important factor in the drying up.

#### **VERY VERY IMPORTANT INSTRUCTION**

You are free to change the experimental materials. You are also free to suggest an experiment in any way you like. Anything you need for your experiment is supposed to be available, you have only to write its name.

Remember that you do not have to perform the experiment. You simply have to describe it in writing. You can also draw diagrams for explaining your point of view. Incidentally, this will also reduce your amount of writing.

You can easily avoid repetitive writing. But at the same time, try hard to make your ideas as clear as possible for one.

This you can safely do by numbering them. Elements and aims of the problems.

Objectives of the first three problems are :

1. At what age level do the student-teachers begin to set up controlled experiments?
2. How in the solution of the problem attained as seen through the scoring key developed empirically?
3. How well can they test each of the given variables on each problem?

### SCORING

It was decided to use four points rating scale for the first three problems and a three points rating scale for the fourth problem.

- |   |   |  |
|---|---|--|
| 0 | - | Mark for totally incorrect answer  |
| 1 | - | Mark for partially correct but not reaching the correct experiment.  |
| 2 | - | Marks for correct but fails to describe it properly and,   |
| 3 | - | Mark for clear and logical answer where the student-teacher set up the right experiment and describe it properly |

Regarding the fourth problem, the scoring was done in the steps, that is, for the main problem and for the additional suggested experiments. The three points rating scale is as follows :

- |  |                          |
|--|--------------------------|
| 0 - Mark for drawing a wrong conclusions   | for<br>main<br>problem   |
| 1 - Marks for partially correct conclusions  |                          |
| 2 - Marks for correct and logical conclusions  |                          |
| 0 - Mark for failing to suggest the right experiment                                       | For<br>the<br>additional |
| 1 - Mark for attempting and partially succeeding in giving the right experiment experiment |                          |
| 2 - Marks for suggesting the right experiment for solving the problem posed                |                          |

When the scores were added for the three questions, on this problem, the final score was 6 marks when scored. This way the measure of the problem did represent the hypothesis testing ability of the student-teachers.

The total score of the testing of hypothesis is 24. The data is presented as below.

Table – 5  
 MEANS COLLEGE-WISE, SEX-WISE AS WELL AS  
 MEDIUM-WISE FOR THE FOUR PROBLEMS OF TESTING  
 OF HYPOTHESIS

Sr. No.	Problem	Sex	Government College of Teacher Education G.C.E.			Chouson College of Education (Private)		
			Mean			Mean		
			English	Kannada	Average	English	Kannada	Average
1.	The flow of liquid through a tube	M	2.5	2.32	2.35	1.31	2.02	1.82
		F	2.33	2.35	2.34	1.63	2.4	1.87
		M + F	2.37	2.33	2.34	1.44	2.06	1.83
2.	The simple pendulum problem	M	2.00	2.16	2.14	1.31	1.90	1.73
		F	1.83	2.15	2.00	1.18	1.80	1.37
		M + F	1.87	2.16	2.08	1.26	1.89	1.65
3.	The ramp problem	M	1.83	1.79	1.79	1.68	2.02	1.93
		F	2.11	2.05	2.08	1.00	2.00	1.31
		M + F	2.04	1.87	1.92	1.41	2.02	1.79
4.	The worm problem	M	2.67	2.37	2.41	1.87	2.75	2.50
		F	1.83	2.55	2.21	2.18	2.40	2.25
		M + F	2.04	2.43	2.32	2.00	2.71	2.44
	Total	M	9.60	8.93	8.94	6.18	8.92	8.14
		F	8.11	9.10	8.63	6.00	8.6	6.81
		M + F	8.33	8.98	8.80	6.11	8.88	7.85

### OBSERVATION AND INTERPRETATION

From Table 5, it is observed that,

Means scores,

1. For the problem, “The flow of liquid through a tube” ability of testing hypothesis of student-teachers of Government

college of teacher education is more than that of student-teachers of private non-aided college of education.

2. For the problems the simple pendulum and 'the ramp' testing hypothesis of student-teachers of Government college of teachers education is more than that of student-teachers of private non-aided college of education.
3. For the problem 'The worm' ability of testing hypothesis of student-teachers of private non-aided college of education is more than that of Government college of teacher education.
4. For all the problems under consideration, ability of testing hypothesis of male student-teachers of both the colleges – Government college of teacher education and private non-aided college of education is more than that of female student-teachers of both the colleges.
5. For all the four problems under consideration, ability of testing hypothesis of English medium student-teachers of Government college of teacher education is more than that of English medium student-teachers of private non-aided college of education.

6. For all the four problems under consideration, ability of testing of hypothesis of Kannada medium student-teachers of Government college of teacher education is more than that of the Kannada medium student-teachers of private non-aided college of education.

Table – 6

MEAN AND S.D. COLLEGE-WISE, SEX-WISE AS WELL AS MEDIUM-WISE FOR THE TOTAL SCORES OF TESTING OF HYPOTHESIS

Problem	Sex	Government College of teacher education						Private non-aided college of education (Chauson College of Education)					
		English		Kannada		Average		English		Kannada		Average	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Total scores of all four problems	M	9.60	1.67	8.93	1.59	8.93	1.58	6.18	1.27	8.92	1.80	8.14	2.07
	F	8.11	1.27	9.10	1.41	8.63	1.42	6.00	1.73	8.60	3.20	6.81	3.43
	M + F	8.33	1.40	8.98	1.52	8.80	1.51	6.11	1.45	8.88	1.95	7.85	2.27

### OBSERVATION AND INTERPRETATION

From table 6, it is observed that,

1. Mean scores of ability of testing hypothesis of all student-teachers of Government college of teachers education is more than that of all student-teachers of private college of education.

2. Mean scores of ability of testing hypothesis of male student-teachers of both, Government college of teacher education and private non-aided college of education is more than that of female student-teachers of both the colleges.
3. Mean scores of ability of testing hypothesis of English medium student-teachers of Government college of teacher education is more than that of English medium student-teachers of private non-aided college of education.
4. Mean scores of ability of testing hypothesis of Kannada medium student-teachers of Government college of teacher education is more than that of Kannada medium student-teachers of private non-aided college of education.

**SECTION – IV**  
**PRESENTATION AND INTERPRETATION OF NULL**  
**HYPOTHESIS TESTED IN CHAPTER I**

The following 't' test formula is employed and ability to state hypothesis and test hypothesis at student-teachers of Government college of teacher education and student-teachers of private non-aided college of education was decided.

$$t' = \frac{(X_1 - X_2) \times \sqrt{n_1 n_2}}{S \times \sqrt{n_1 \times n_2}}$$

$$S = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$$

**HYPOTHESIS NO. 1**

There is no significant difference in the formal operational reasoning ability of the student-teachers of Government college of teacher education and private non-aided college of education.

Table No. 7

College	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Student-teacher of Government college of Teacher Education	18.34	10.54	87	157	3.85	1.98 0.05 level
Student-teachers of private non-aided College of Education	14.26	7.72	72			2.61 0.01 level

The obtained 't' value is 3.85 which is greater than tabled 't' value (with df 157) at 0.05 and 0.01 level of significance. It is therefore concluded that, two groups differ significantly with respect to the variables under consideration. Therefore the Null hypothesis No. 1 'There is no significant difference in the formal operational rearing ability of the student-teachers of Government college of teachers education and private non-aided college of education' does not stand.

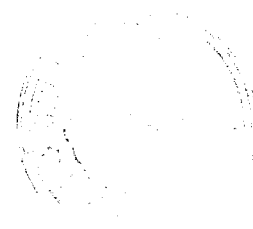
**HYPOTHESIS NO. 2**

There is no significant difference in the stating of hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education.

Table No. 8

College	Mean	S.D.	n	df	Calculate d 't' value	Table 't' value
Student-teacher of Government college of Teacher Education	27.88	6.11	87	157	7.61	1.98 0.05 level
Student-teachers of private non-aided College of Education	20.68	5.62	72			2.61 0.01 level

The obtained 't' value is 7.61 which is greater than tabled 't' value (with df. 157) at 0.05 and 0.01 level of significance. It is therefore, Concluded that, the two groups are differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 2 'There is no significant difference in the stating of hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education', does not stand.



**HYPOTHESIS NO. 3**

There is no significant difference in the stating of hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education.

Table No. 9

College	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Student-teacher of Government college of Teacher Education	26.25	3.59	87	157	5.20	1.98 0.05 level
Student-teachers of private non-aided College of Education	23.25	3.59	72			2.61 0.01 level

The obtained 't' value 5.20 which is greater than tabled 't' value (with df. 157) at 0.05 and 0.01 level of significance. It is, therefore, concluded that, two groups differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 3 'There is no significant difference in the testing of hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education' does not stand.

**HYPOTHESIS NO. 4**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers.

**Table No. 10**

College	Mean	S.D.	N	Df	Calculated 't' value	Table 't' value
Student-teacher of Government college of Teacher Education	24.58	7.13	51	157	0.03	1.98 0.05 level
Student-teachers of private non-aided College of Education	24.63	6.81	108			2.61 0.01 level

The obtained 't' value is 0.03 which is less than tabled 't' value (with df. 157) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 4. 'There is no significant difference in the stating of hypothesis ability of Kannada and English medium student-teacher', stands.

### HYPOTHESIS NO. 5

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers.

**Table No. 11**

College	Mean	S.D.	N	Df	Calculated 't' value	Table 't' value
English medium student-teachers of both the colleges	7.15	1.80	51	157	6.00	1.98 0.05 level
Kannada medium student-teachers of both the colleges	8.94	1.71	108			2.61 0.01 level

The obtained 't' value is 6.00 which is greater than tabled 't' value (with df. 157) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups are differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 5 'There is no significant difference in the testing of hypothesis ability of Kannada and English medium student-teacher', does not stand.

**HYPOTHESIS NO. 6**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education.

**Table No. 12**

Government college Teacher Education (12)	Mean	S.D.	n	df	Calculate d 't' value	Table 't' value
Kannada medium student-teachers (63) (Male+ female) (43) + (20)	27.68	5.70	63	85	0.0790	1.99 0.05 level
English medium student-teachers (24) (Male+ female) (6) + (18)	28.41	7.19	24			2.63 0.01 level

The obtained 't' value is 0.0790 which is greater than tabled 't' value (with df. 85) at 0.05 and 0.01 .level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 6 'There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers Government college of teacher education' stands.

**HYPOTHESIS NO. 7**

There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education.

**Table No. 13**

Government college Teacher Education (87)	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Kannada medium student-teachers (63 ) ( M + F ) ( 43 + 20 )	8.9841	1.5292	63	85	1.1848	1.99 0.05 level
English medium student-teachers (24) ( M + F ) ( 6 + 18 )	8.3333	1.4039	24			2.63 0.01 level

The obtained 't' value is 1.1848 which is less than the tabled 't' value (with df 85) at 0.05 level and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the null hypothesis No.7. 'There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education,' stands.

**HYPOTHESIS NO.8**

There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of Government college of teacher education.

**Table No. 14**

Government college Teacher Education (87)	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Kannada medium student-teachers (63 + 63) (Stating + Testing) 126	18.1693	10.26969	126	172	0.0214	1.97 0.05 level
English medium student-teachers (24 + 24) (Stating + Testing) 48	17.7608	11.1896	48			2.60 0.01 level

The obtained 't' value is 0.0214 which is less than tabled 't' value (with df. 172) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 8 . 'There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of Government college of teacher education,' stands.

**HYPOTHESIS NO. 9**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education.

**Table No. 15**

Government college Teacher Education (72)	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Kannada medium student-teachers (45) (Male+ Female) (40) + (5)	20.3777	5.9287	45	70	0.1010	2.00 0.05 level
English medium student-teachers (27) (Male+ Female) (16) + (11)	21.1851	5.1518	27			2.65 0.01 level

The obtained 't' value is 0.1010 which is less than the tabled 't' value (with df. 70) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 9 'There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education' stands.

**HYPOTHESIS NO. 10**

There is no significant difference in the testing of hypothesis ability of Kannada and English medium student-teachers of private non-aided college of education.

**Table No. 16**

Private non-aided College of Education (72)	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Kannada medium student-teachers (45) (Male+Female) (40) + (5)	8.8888	1.9566	45	70	3.4874	2.00 0.05 level
English medium student-teachers (27) (Male+ female) (16) + (11)	6.1111	1.4500	27			2.65 0.01 level

The obtained 't' value is 3.4874 which is greater than the tabled 't' value (with df. 70) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups are differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 10 'There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education' does not stand.

**HYPOTHESIS NO. 11**

There is no significant difference in the formal operational reasoning ability of Kannada medium and English medium student-teachers of private non-aided college of education.

**Table No. 17**

Government college Teacher Education (72)	Mean	S.D.	n	Df	Calculated 't' value	Table 't' value
Kannada medium student-teachers (45 + 45) (Male+ female) 90	14.5227	7.2682	90	142	0.1067	1.98 0.05 level
English medium student-teachers (27 + 27) (Stating+ testing) 54	13.4038	8.4928	54			2.61 0.01 level

The obtained 't' value is 0.1067, which is less than tabled 't' value (with df. 142) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 11 'There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of private non-aided college of education' stands.

**HYPOTHESIS NO. 12**

There is no significant difference in the stating of hypothesis ability between the Kannada medium and English medium total male student-teachers.

Table No. 18  
MALE STUDENT-TEACHERS (NO. = 105)

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together	Kannada medium (83)	23.9036	6.4856	83	103	0.1328	1.98 0.05 level
	English medium (22)	22.5454	6.3975	22			2.62 0.01 level

The obtained 't' value is 0.1328 which is less than tabled 't' value (with df. 103) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 12 'There is no significant difference in the stating of hypothesis ability between the Kannada medium and English medium total male student-teachers' stands.

**HYPOTHESIS NO. 13**

There is no significant difference in the testing of hypothesis ability between the Kannada medium and English medium total male student-teachers.

Table No. 19  
MALE STUDENT-TEACHERS ( NO.= 105)

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together	Kannada medium	8.9277	1.6877	83	103	2.7091	1.98 0.05 level
	English medium	6.9545	1.8638	22			2.62 0.01 level

The obtained 't' value is 2.7091, which is greater than the tabled 't' value (with df. 103) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups are differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 13 'There is no significant difference in the testing of hypothesis ability between the Kannada medium and English medium total male student-teachers', does not stand.

**HYPOTHESIS NO. 14**

There is no significant difference on the formal operational reasoning ability of Kannada medium English medium male student-teachers.

Table 20  
MALE STUDENT-TEACHERS ( NO.= 210)

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together	Kannada medium (stating + testing)	16.4156	8.8729	166	208	0.1219	1.97 0.05 level
	English medium (stating + testing)	14.75	9.1578	44			2.59 0.01 level

The obtained 't' value is 0.1219, which is less than the tabled 't' value (with df. 208) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 14 'There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium total male student-teachers', stands.

**HYPOTHESIS NO. 15**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium total female student-teachers.

Table 21

FEMALE STUDENT-TEACHERS ( NO.= 54)

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together	Kannada medium (25)	27.08	7.4213	25	52	0.0607	2.00 0.05 level
	English medium (29)	26.1379	7.3762	29			2.66 0.01 level

The obtained 't' value is 0.0607, which is less than the tabled 't' value (with df. 52) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 15, 'There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium total female student-teachers', stands.

**HYPOTHESIS NO. 16**

There is no significant difference in the testing of hypothesis ability of Kannada medium English medium total female student-teachers.

Table 22  
FEMALE STUDENT-TEACHERS ( NO.= 54)

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together	Kannada medium (25)	9.00	1.8257	25	52	1.8429	2.00 0.05 level
	English medium (29)	7.3103	1.7748	29			2.66 0.01 level

The obtained 't' value is 1.8429, which is less than the tabled 't' value (with df. 52) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 16, 'There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium total female student-teachers', stands.

**HYPOTHESIS NO. 17**

There is no significant difference in the formal operational reasoning ability of Kannada medium and English medium female student-teachers.

Table 23

Colleges	Medium	Mean	S.D.	n	df	Calculated 't' value	Table 't' value
Both the colleges together (stating+ testing)	Kannada medium (25 + 25)	18.04	10.582	50	106	0.0579	1.98 0.05 level
	English medium (29 + 29)	16.7241	10.8834	58			2.62 0.01 level

The obtained 't' value is 0.0579, which is less than the tabled 't' value (with df. 106) at 0.05 and 0.01 level of significance. It is therefore, concluded that, the two groups do not differ significantly with respect to the variables under consideration. Therefore, the Null hypothesis No. 17, 'There is no significant difference in the formal operational reasoning ability of Kannada medium and English medium female student-teachers', stands.

**FINDINGS**

1. There is no significant difference in the formal operational reasoning ability of student-teachers of Government college of teacher education and private non-aided college of education.
2. There is no significant difference in the study of hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education.
3. There is no significant difference in the testing hypothesis ability of student-teachers of Government college of teacher education and private non-aided college of education.
4. There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers.
5. There is no significant difference in the testing of hypothesis ability of Kannada medium student-teachers and English medium student-teachers.
6. There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium



student-teachers of Government college of teacher education.

7. There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education.
8. There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of Government college of teachers education.
9. There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education.
10. There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education.
11. There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of private non-aided college of education.

12. There is no significant difference in the stating of hypothesis ability between the Kannada medium and English medium total male student-teachers.
13. There is no significant difference in the testing of hypothesis ability between the Kannada medium and English medium total male student-teachers.
14. There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium male student-teachers.
15. There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium total female student-teachers.
16. There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium total female student-teachers.
17. There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium female student-teachers.

## **FINDINGS OF THE HYPOTHESES TESTED**

### **Hypothesis No. 1**

There is no significant difference in the formal operational reasoning ability of the student-teachers of Government college of teacher education and private non-aided college of education.

Hypothesis No. 1 is rejected based on 't' value of table 7. The obtained 't' value is greater than the tabled 't' value. Therefore, two groups differ significantly.

### **Hypothesis No. 2**

There is no significant difference in the stating of hypothesis ability of the student-teachers of Government college of teacher education and private non-aided college of education.

Hypothesis No. 2 is rejected based on 't' value of table 8.

The obtained 't' value is greater than the tabled 't' value. Therefore, two groups differ significantly.

### **Hypothesis No. 3**

There is no significant difference in the testing of hypothesis ability of the student-teachers of Government college of teacher education and private non-aided college of education.

Hypothesis No. 3 is rejected based on 't' value of table 9. The obtained is greater than the tabled 't' value. Therefore, two groups differ significantly.

#### **Hypothesis No. 4**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers.

Hypothesis No. 4 is accepted based on 't' value of table 10. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

#### **Hypothesis No. 5**

There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers.

Hypothesis No. 5 is rejected based on 't' value of table 11. The obtained 't' value is greater than the tabled 't' value. Therefore, two groups differ significantly.

**Hypothesis No. 6**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education.

Hypothesis No. 6 is accepted based on 't' value of table 12. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

**Hypothesis No. 7**

There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of Government college of teacher education.

Hypothesis No. 7 is accepted based on 't' value of table 13. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

**Hypothesis No. 8**

There is no significant difference in the formal operational reasoning ability of Kannada medium and English medium student-teachers of Government college of teacher education.

Hypothesis No. 8 is accepted based on 't' value of table 14. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

#### **Hypothesis No. 9**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education.

Hypothesis No. 9 is accepted based on 't' value of table 15. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

#### **Hypothesis No. 10**

There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium student-teachers of private non-aided college of education.

Hypothesis No. 10 is rejected based on 't' value of table 16. The obtained 't' value is greater than the tabled 't' value. Therefore, two groups differ significantly.

#### **Hypothesis No. 11**

There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium student-teachers of private non-aided college of education.

Hypothesis No. 11 is accepted based on 't' value of table 17. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

### **Hypothesis No. 12**

There is no significant difference in the stating of hypothesis ability between the Kannada medium and English medium total male student-teachers.

Hypothesis No. 12 is accepted based on 't' value of table 18. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

### **Hypothesis No. 13**

There is no significant difference in the testing of hypothesis ability between the Kannada medium and English medium total male student-teachers.

Hypothesis No. 13 is rejected based on 't' value of table XIX. The obtained 't' value is greater than the tabled 't' value. Therefore, two groups differ significantly.

**Hypothesis No. 14**

There is no significant difference on the formal operational reasoning ability of Kannada medium and English medium male student-teachers.

Hypothesis No. 14 is accepted based on 't' value of table 20. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

**Hypothesis No. 15**

There is no significant difference in the stating of hypothesis ability of Kannada medium and English medium total female student-teachers.

Hypothesis No. 15 is accepted based on 't' value of table 21. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

**Hypothesis No. 16**

There is no significant difference in the testing of hypothesis ability of Kannada medium and English medium total female student-teachers.

Hypothesis No.16 is accepted based on 't' value of table 22. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.

#### **Hypothesis No. 17**

There is no significant difference in the formal operational reasoning ability of Kannada medium and English medium student-teachers.

Hypothesis No. 17 is accepted based on 't' value of table 23. The obtained 't' value is less than the tabled 't' value. Therefore, two groups do not differ significantly.