

CHAPTER III

PLAN AND PROCEDURE OF THE STUDY

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### PLAN AND PROCEDURE

#### Introduction

This study was undertaken to determine the acquisition of problem solving processes during adolescence and to identify the model of adolescent thought in problem solving ability. The world famous experimenter Prof. Jean Piaget developed a method of investigating the problem solving ability of children called the Methode Clinique or the Critical method of the exploration. According to him, in a problem solving process, thinking is dominated more by the possibility rather than the reality.

Thirty-eight variables and individually collected data are included in this study. All the statistical calculations were done by computer at Council for Social Development, 53 Lodi Estate, New Delhi-110003.

#### Statement of the Problem

The purpose of the study, in broader terms, is to investigate adolescence scheme of thought in problem solving

processes. The plan is designed to study the problem solving ability. In a broader sense, the proposed study may be stated as :

"The Acquisition of Problem Solving Processes  
During Adolescence"

#### Aims and Objectives of the Study

The study entitled aims at achieving the following objectives :

1. To determine incidence of achievement in problem solving ability of adolescent pupils on certain pre-determined key processes within the individual problems.
2. To determine the relationship between scores on problem solving processes and some outside variables like grade and sex.
3. To study the relationship between the scores of different problems.
4. To identify adolescent scheme of thought on certain pre-determined processes of problem solving, using factor analysis.
5. To point out the main educational implications based upon findings of the study.

#### Hypotheses

The following hypotheses were proposed and tested :

1. Scores on problem solving do not increase with age and grade.
2. Complex problem solving processes arise from simple problem solving processes.

3. There are no significant differences in means from grade to grade.
4. There are no significant sex differences in problem solving.
5. Using constant difference, proportion, insight, summation, applying comparative difference and grasping the essence of the problem are not distinguishing characteristics of Piagetian Thought during adolescence.

#### Method of Procedure

##### Selection of Schools :

Selection of the schools and the sample was obviously the first step for the present study. The investigator adopted the following criteria while selecting the school and the sample :

- i) As this study was designed to control grade, age and sex simultaneously, the school should provide good sample for the success of the present investigation. For administering the tests the investigator was free to select the schools randomly.
- ii) The availability of records of dates of birth of all students studying in different grades.
- iii) It was felt that the researcher himself should be able to administer the tests. So the convenience and the co-operation of the school Headmaster and class teachers in providing the necessary facilities for the administration of the tests and to enable the investigator to visit the school as often as required for the present study.

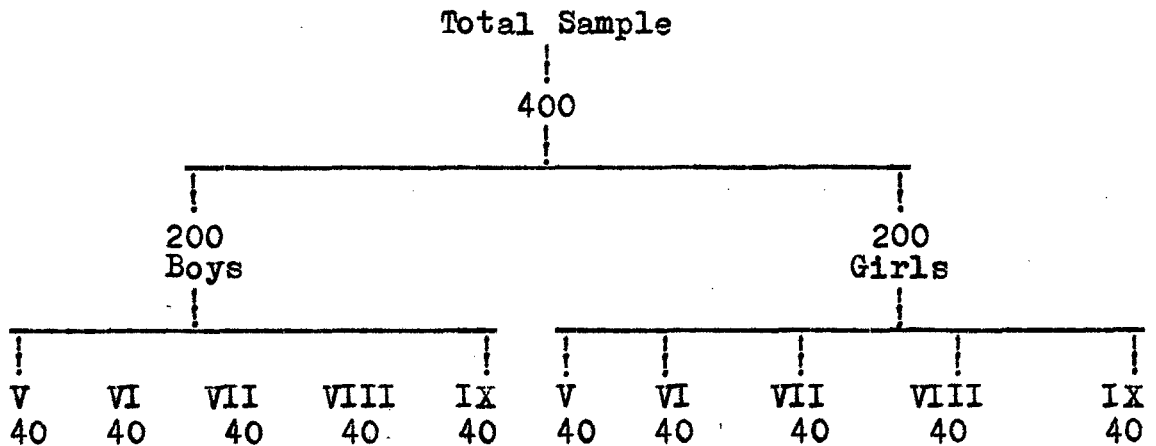
- iv) To select the sample, the following two secondary schools were chosen from two districts of Kathmandu Valley, Nepal.
- (a) Paropakar Adarsa Secondary School, Kalimati, district Kathmandu.
  - (b) Sharada Secondary School, Balakhu, district Bhaktapur.

Both schools, situated in the city area followed the same curriculum prescribed by the Ministry of Education and Culture, His Majesty's Government of Nepal and administered by concerned District Education Committee and District Education Office, H.M.G. of Nepal. The sample students drawn for this study had Nepali as their medium of instruction.

Sample and Subject :

Among the 1200 students of two urban secondary schools (co-education) of two districts of Nepal, a sample of 640 students, 320 boys and 320 girls were initially drawn randomly in this field experiment. From each grade equal number of boys and girls were taken from classes V, VI, VII, VIII and IX. In order to get a homogeneous sample, grade and age were controlled simultaneously, on the basis of the dates of birth of the pupils maintained in the school's registers, only the students of 12.1 to 12.11, 13.1 to 13.11, 14.1 to 14.11, 15.1 to 15.11 and 16.1 to 16.11 years corresponding to the grades V, VI, VII, VIII and IX were selected carefully. 200 boys and 200 girls were included in the final sample. All the 400 students appeared in the test.

The frame of the final sample was as given below :



Tools

Problems used :

Various relevant problems were surveyed in order that the present research study should yield fruitful result. Initially eleven problems were framed, were discussed with the concerned experts and were revised and modified according to their suggestions. After surveying several problems, and in consultation with some faculty members, finally it was decided to select seven problems consisting of 29 processes, for investigation. As the test was to be administered on Nepali Medium students, the researcher translated all the problems and processes into Nepali language dealing with the familiar objects and events in Nepali situations. While framing the problems for the present study, it was also kept in mind that the sentence framed are of minimum possible lengths, the vocabulary used in the problems is within the level of 5th graders, the notions, symbols and the term were

used in their simplest form. Each of the seven problems, was divided into problem solving processes. Their brief description is given below.

The symbol 'R' against any one of the items means that it relates to the reading aspect of the problem. Or alternatively, the answer to the test items based on this (R) process is contained within the body of the problem itself. All such processes are not given process No. and have not been scored.

Contd.

Problem No. 1 - Height Problem

S. No.	Statement of problem and the underlying process	Process No.	Scoring Key	Maximum score	Code	Variable No. used in the study
	Ram is taller than Shyam by 2 cms. Ram is taller than Mohan by 6 cms. Ram is shorter than Sohan by 6 cms. If Ram's height is 200 cms, then answer the following questions :					
1.	What is the height of Ram?	-	R - 200 cm.	4	-	-
2.	What is the height of Mohan?	1	0 Any other 1 194 cm.		Pr1	3
3.	What is the height of Sohan?	2	0 Any other 1 206 cm.		Pr2	4
4.	What is the height of Shyam?	3	0 Any other 1 198 cm.		Pr3	5
5.	How much is Mohan shorter than Shyam?	4	0 Any other 1 4 cm.		Pr4	6
6.	Total score of problem No. 1				P1	7

Problem No.2 : Positive Constant Difference Problem

S. No.	Statement of problem and the underlying process	Process No.	Scoring Key	Maximum score	Code	Variable No. used in the study
<p>We have written some figures against each other in two columns. As you go down the columns, there appear some relationship. Try to understand it. Then fill in the blanks indicated by the question mark :</p>						
1.	0            5	-	R -			
2.	5            10	-	R -			
3.	10           15	-	R -			
4.	15           20	-	R -			
5.	20           25	-	R -			
6.	25           ?	5	0 Any other 1 30	6	Pr5	8
7.	?            35	6	0 Any other 1 30		Pr6	9
8.	?            40	7	0 Any other 1 35		Pr7	10
9.	40           ?	8	0 Any other 1 45		Pr8	11
10.	?            50	9	0 Any other 1 45		Pr9	12
11.	50           ?	10	0 Any other 1 55		Pr10	13
12.	Total score of Problem No. 2				P2	14

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Problem No. 3 : Time Problem

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S. Statement of problem and the  
No. underlying process

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Kathmandu and Lalitpur are two towns. The distance between them is 5 Kilometers. If you take an hour to reach from one town to the other on foot, then answer the following questions :

1. How much time will you take to go from one town to the other town?
2. How much time will you take if you go on bicycle five times at more

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Pro- cess No.	Scoring Key	Maxi- mum score	Code	Variable No. used in the study
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- R 1 hour

11 0 Any other 2 Pr11 15  
1 12 minutes

12 0 Any other Pr12 16  
1 24 minutes

P3 17

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Problem No. 4 : Rectangle Problem

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S. Statement of problem and the  
No. underlying process

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There is a rectangle which is 25 cm. long and 15 cm. wide. A man goes four times around it at the rate of 4 cm. per second. Now answer the following questions.

1. Draw a diagram
2. Show the distance on it.
3. What is the total distance when the man goes once round the rectangle?
4. What is the total distance when the

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Pro- cess No.	Scoring Key	Maxi- mum score	Code	Variable No. used in the study
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-	R -			
-	R -			
13	0 Any other 1 80 cm.	4	Pr13	18
14	0 Any other 1 320 cm.		Pr14	19
-	R 1 second			
15	0 Any other		Pr15	20

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Problem No. 5 : Hotel Problem

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S. No.	Statement of problem and the underlying process	Process No.
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Ten persons from a village went to a hotel for an evening meal. They ate 4 Rotis per head at the rate of 10 paise per Roti, 10 plates of vegetables at the rate of 50 paise per plate, one cup of milk, each costing a rupee per cup. After meals each one of them drank a cup of tea costing 50 paise each. At the end of their meals, they gave two ten rupees notes to the Manager of the hotel. Now answer the following questions :

1. How much in all did they spend on Roties? 17
2. How much in all did they spend on vegetable plates? 18
3. How much in all did they spend on milk? 19
4. How much in all did they spend on tea? 20

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Scoring Key	Maxi- mum score	Code	Variable No.used in the study
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0	Any other	7	Pr17	23
1	Rs.4/-			
0	Any other		Pr18	24
1	Rs.5/-			

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Problem No.6 : Questions Inviting Wrong Answer

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S. Statement of problem and the  
No. underlying process

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Read the questions given below and then answer them carefully.

1. A blindman with one eye can see upto a distance of 100 ft. How far can he see with two eyes?
2. It takes 10 minutes for a boy to reach his school. How much time will it take for ten boys if they start for the school at the same time?
3. A stick is 10 cm.long. It is cut by a cm.per minute. In how much time will

Per Problem					
Pro- cess No.	Scoring Key	Maxi- mum score	Code	Variable No. used in the study	
24	0	200 ft	6	Pr24	31
	1	100 ft			
	2	0 ft			
25	0	100 minutes or any other time		Pr25	32
	1	10 minutes			
26	0	10 minutes or any other time		Pr26	33
	1	9 minutes			
27	0	No horns		Pr27	34
	1	If then			

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Problem No. 7 : Counting Maximally Rectangles Problem

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S. No.	Statement of problem and the underlying process	Pro-cess No.	Scoring Key	Maxi-mum score	Code	Variable No. used in the study
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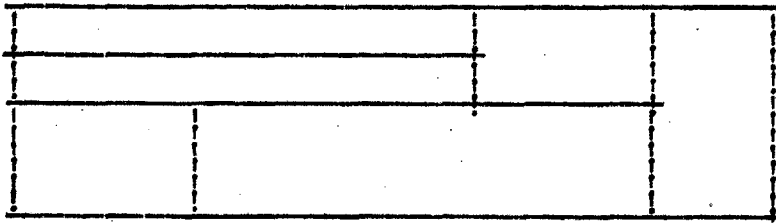
Have a look at the diagram given below.  
Count the maximum number of rectangles that you can make.

29

8

Pr29

37



0 Giving 6 or 7 rectangles

2 Giving 8 rectangles

4 Giving 9 rectangles

6 Giving 10 rectangles

8 Giving 11 rectangles

Total score of all problems

PL

38

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### Administration of Questionnaire

Regular classrooms were used to administer all the questionnaire. There was no time limit. Students were allowed to think as long as they required. To complete all the questionnaire, the time taken by students of grade V to IX ranged between 40 minutes and 1 hour 50 minutes. Generally less time was taken by higher grade students in comparison to lower grade.

The questionnaire was administered on each grade separately in separate. Students were asked to fill in the required information in the outer cover page of the questionnaire distributed to them. Name, age, date of birth etc were mentioned in the outer cover page. Then the attention of the students were drawn towards instructions which were read out loudly by the investigator along with the examples, and children were asked to follow what is read in their questionnaire. They were asked to raise their hands if they had any difficulty to proceed.

Practice problem practised repeatedly among the students. After making sure that all pupils had followed what they are supposed to do, they were asked to go ahead with other problems.

### Delimitations

The present study is delimited with regards to the following :

- i) The pupils of grade V to IX were considered, ranging within the age limits of 12<sup>+</sup> to 16<sup>+</sup> years.
- ii) They are of average socio-economic status.
- iii) They were selected from the average learners Nepali Medium students of the same school.
- iv) Due to physical limitations of time and availability of tools, psychological data in terms of I.Q. and personality test could not be gathered. Even if this has been done, the study would have become unwieldy because it was to be completed within six to eight weeks in Nepal.
- v) Even if the time had been available, suitable psychological tests were conspicuous by their absence in the department of education, Tribhuvan University, Kathmandu, Nepal.