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An Investigation into the effects of Certain Cognitive Styles and Cognitive Abilities on Strategies of Concept Attainment

Thesis submitted to
Jnana Bharati, Bangalore University,
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for the degree of
Doctor of Philosophy in Psychology

By

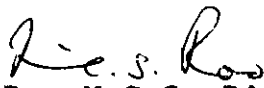
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April 1983.

The thesis entitled 'An investigation into the effects of certain cognitive styles and cognitive abilities on strategies of concept attainment', submitted by Guru Pada Chattopadhyay in fulfilment of the requirements for degree of Doctor of Philosophy in Psychology has been conducted under my supervision. It embodies the research work and it is a record of candidate's personal effort. To the best of my knowledge, this work has not been submitted anywhere else or has formed the basis for the award of any other degree or diploma to the candidate.

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DECLARATION

I hereby declare that this research is conducted by me at the Department of Psychology, Bangalore University, under the guidance of Dr. N.C.S. RAO, (Retd.) Professor and Head, Department of Psychology. This thesis is submitted to the Bangalore University for the award of the degree of Doctor of Philosophy in Psychology in the month of *April* 1983. This thesis or part thereof has not been submitted by me to any other University for any other purposes.

Date: *15 April*

Place: *Bangalore*

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CONTENTS

	Page
Acknowledgements	
Abstract	i
List of Tables	viii
List of Figures	xi
Abbreviations	xii
1. INTRODUCTION	
HISTORICAL BACKGROUND AND THE PROBLEM	1
Objectives of the Strategy	3
Effects of Dispositional Variables	4
Review of Studies on Concept Formation	5
Composite Photograph Theory	6
Concept Formation of Children	7
Study with Adult Subject	12
Inductive Concept Formation	14
Hypothesis Testing Process	16
Factors Affecting the Process of Concept Attainment	23
Reinforcement, Motivation and Anxiety	37
Mental Ability	40
Creativity	43
Age and Sex	46
Personality Approach	51
Abnormality and Conceptual Learning	52
Non-Verbal Cognitive Structure	54
2. RATIONALE AND HYPOTHESES	
Scientific Analysis of Human Abilities	58
Concept Formation	67
Hypothesis of the Present Investigation	70
Field Dependence and Independence	72
Category Width as Cognitive Variable	76
Problem Solving Ability	83
The Importance of Set	87
Creativity	88
Creativity and Intelligence	96

3. METHODOLOGY

Two Factor Design	..	104
The Sample	..	105
Details of Procedure for Experiment I	..	109
Description of H.F.T.	..	110
Estimation Questionnaire	..	111
Experiment 2	..	115
Test for General Mental Ability	..	115
Verbal Test of Creative Thinking	..	117
Experimental Procedure	..	121
Inference Concept Problem	..	124

4. ANALYSIS OF RESULTS

Analysis of Result - Experiments I & II	..	130
Analysis of Introspective Report	..	131
Experiment I - Section A.	..	132
Performance - Selection Problem	..	133
Performance - Reception Problem	..	140
Experiment I - Section B.	..	143
Relation between Strategy and Variables	..	144
Experiment I - Section C.	..	149
Strategy Analysis - Reception Problem	..	150
Experiment II - Section A.	..	164
Performance on Selection Problem	..	165
Performance on Reception Problem	..	172
Experiment II - Section B.	..	175
Relation between Strategy and Variables	..	176
Experiment II - Section C.	..	180
Strategy Analysis - Reception Problem	..	181
Analysis of Introspective Report	..	195

5. DISCUSSION

The Effect of Field Dependence and Independence..	202
The Relation between EFT and Tests of Intellectual Functioning	.. 205

.. contd.

Category Width as Cognitive Style	..	208
Generality of Strategy Across Types of Concept Problem	..	214
6. SUMMARY AND SUGGESTION FOR FUTURE WORK	..	216
7. BIBLIOGRAPHY		
8. APPENDIX		

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ABSTRACT

The process of concept attainment demonstrates that there are individual differences in the kinds of strategy adopted by the individual. Bruner (1956) has demonstrated that situational variables play a very important role in determining the type of strategy. Although situational variables are important, these cannot account for all the observed differences in individuals in strategy measures. The present investigation seeks to find out the role played by certain cognitive styles and cognitive abilities on strategies in concept attainment.

Two cognitive styles namely field-dependence and independence and category-width, and two cognitive abilities namely problem solving ability and creativity were used as criterion variables in this investigation.

It was hypothesized that the kinds of strategy adopted by the individual and the efficiency of performance in a concept attainment task would be related to all the four variables.

Methodology:

The plan for the experiment consisted of a two factor design with two levels of each factor carried out upon two groups of subjects as two separate experiments.

Experiment I

For measuring field dependence and independence, Jackson's

Hidden Figure Test was used while for quantifying category width Pettigrew's Estimation questionnaire was adopted. These two tests were administered on a sample of 200 students studying in various post-graduate departments of Bangalore University. Individuals scoring 25% and below in each test were separated as 'low' group while subjects obtaining 75% and above were identified as 'High' group. From these groups, four categories of individuals were identified such as (1) Those who had scored high on both the tests, i.e., HH group, (2) Those who had scored high on the first test but low on the second, i.e., HL group, (3) Those who had obtained low score on the first test but high score on the second test, i.e., LH group, and (4) Those who were low on both the tests, i.e., LL group. From each of the four categories 10 subjects were chosen on random basis for concept experiment.

Experiment II

In this experiment Jaleta's test of Intelligence and Baquer Mehdi's test of Creativity were used. The sample of 200 girl students was drawn from various undergraduate classes of Maharani's College, Bangalore. Four categories, i.e., HH, HL, LH and LL were identified as was done in the previous experiment. Ten subjects were picked up from each of these four groups as was done in Experiment I.

Concept Tasks:

Two types of Concept attainment tasks were administered

on subjects namely selection problems and reception problems. Selection problems involved the principles of conjunctive concept formation. In these problems, the subject was presented with a concept card and had to explore the correct concept with the help of array of 81 cards presented before him.

In the Reception concept problem, however, a series of cards were presented in succession and he had to hypothesize the nature of the concept after observing each card for a limited amount of time. Each subject was tested individually. Post experimental questionnaire was also administered.

Analysis of Data:

For finding out the main trend, computations were done in accordance with statistical technique of Analysis of Variance for analysing the kind of strategy adopted in the selection problem. Chi-square test of independence was used, since the distribution of measure of the variables did not confirm to normal type.

Results:

1. Those who were high in the field dependence and independence and category width, adopted conservative focussing as their main approach in solving the problem. In contrast, those who had scored low on these variables had adopted scanning as their predominant strategy. In the second experiment also it was found that the subjects who had scored high on variables of

Problem Solving Ability and Creativity adopted conservative focussing, while the low-scorers had adopted scanning.

2. When criteria of success was the number of trials or time taken to solve the problem, efficiency in performance in concept learning task was found to be related to all the four criterion variables.

3. In the reception problem, it was found that high scorers in all the four variables had employed Wholist strategy, while low scorers had adopted Partist strategy.

Implications:

It appears that factors determining strategy adopted by the individual for tackling concept formation task are multi-dimensional in nature. Bruner (1956) demonstrated that task variables like thematic and abstract materials, random and orderly presentation of instances play important role in determining the factors. Rae (1971) had concluded from his study that dispositional variables like Intelligence, Attitude and Eye strength are equally important in determining the strategy. This investigation has carried this trend of the research further in the same direction and has shown that cognitive styles and cognitive abilities play an important role in determining kind of strategy adopted in concept learning.

The Relation between Performance and Strategy:

For optimum efficiency in a complex mental task, the means

at the disposal of the organism should be well-adapted to the end in question, specifically, in the concept task, the end is the solution to the problem in as few trials as possible. Assuming that Ss has been well motivated, it may be expected that the means must be related to the ends. In selection problem, focussing strategy, while in reception problem, wholist strategy are related to efficient performance. If we analyse the focussing strategy and wholist strategy, we find that in both the aspects of the stimulus situation is separated and considered. Individuals who had scored higher had adopted focussing strategy in Selection problem while in Reception problem, they had adopted wholistic strategy. As Hunt (1962) has said 'The appropriate strategy can be determined only with reference to the cost functions involved. These in turn are determined by the requirements of the problem and the capabilities of the problem solver.'

Generality of Strategy and Criterion Variables:

An individual, given similar type of work had adopted the strategy he had already used. This was observed in both the selection tasks and Reception tasks. To be more specific, an individual who had adopted conservative focussing strategy to handle first selection task, had adopted the similar strategy when he encountered second selection task. Similarly, in the reception tasks also, those who had adopted wholist strategy in tackling first reception problem, had adopted wholist strategy when he encountered the second problem.

The generality of strategies and of criterion variables can explicitly be shown when we examine from the standpoint of function. After all, the strategies in concept attainment might be conceived as systems or programmes for processing information. Hence a functional unity is the basis of all strategy and conservative focussing and wholist strategy are similar while scanning and partist are parallel ones.

Field Dependence and Independence and Category Width:

The efficiency in dealing with a complex mental task depends on how well the individual has understood the stimulus-situation. In order to have a grip over the stimulus situation, the individual may need to analyse the situation, take it out of the embedding context, reason out the nonessentials from essentials, systematize the essentials. This is what is required in the Hidden Figure Test, which measures Field dependence and independence. In Category Width, however, for making categorization, the individual needs to divide the stimulus-situation into various segments or various functions, verify the similarity and discard the dissimilarities, and then make an abstraction. So there is much similarity in these two processes.

Problem Solving Ability and Creativity:

Problem solving ability is shown in a problem situation. A problem has three components, the givens, the operations and the goal. Understanding the given is not all or none entity.

It is a process. It may dawn upon an individual slowly or in parts. On the other hand, an individual may be quick and grasp the stimulus-situation in its entire entity. The 'Given' serves as a board from which a bridge is to be built between the goal and the 'given'. Sometimes goal is reached step by step, sometimes steps are integrated into larger chunks, the individual looks for meaning, wants to know whether the step undertaken is essential or it is redundant, taking a stock of situation. In creativity, there appears to be two critical phases - generation of ideas and evaluation of ideas. In the generation phase, the individual asks the question, searches out his store of knowledge and tries to fit in the present stimulus situation. This corresponds to taking stock of the situation, which is the first phase, i.e., 'given' in the problem solving situation. Guilford (1961) had differentiated two types of thinking - convergent thinking and divergent thinking. According to him Creativity is divergent thinking while Problem Solving Ability shows convergent thinking.

In this connection, Spearman's 'G' factor encompassing in its fold cognitive abilities of varied nature, including the capacity for inductive reasoning, ability for developing suitable techniques for information processing, adaptiveness of cognitive functions to the needs of problem situation has provided us to visualize all mental processes in terms of unitary conception of mental ability.

LIST OF TABLES

<u>Table No.</u>	<u>Description</u>	<u>Page</u>
A	Dimensions and attribute values in each problem of the inference task. ..	127
B	Dimensions and attribute values in each of the inference problem. ..	128
1	The effects of field dependence and independence (FDI) and category width (CW) on performance (trials), selection problem 1, Experiment I. ..	133
2	The effects of FDI and CW on performance (trials), selection problem 2, Experiment I. ..	134
3	The effects of FDI and CW on performance (time) - selection problem 1, Expt. I. ..	136
4	The effects of FDI and CW on performance (time) - selection problem 2, Expt. I. ..	137
5	The effects of FDI and CW on performance (trials) - reception problem 1, Expt. I... ..	140
6	The effects of FDI and CW on performance (trials) - reception problem 2, Expt. I... ..	141
7	Incidence of focussing and scanning strategies in relation to FDI - Expt. I... ..	147
8	Incidence of focussing and scanning strategies in relation to CW - Expt. I.... ..	148
9	Effects of FDI and CW on wholist-partist strategy taking initial hypothesis as criterion - Expt. I. ..	153
10	Effects of FDI and CW on wholist-partist strategy taking deviation of the observed from expected - Expt. I. ..	156
11	Effects of FDI and CW on wholist-partist strategy - Expt. I. ..	157
12	Effects of FDI and CW on wholist-partist strategy taking efficiency in utilization of information as criterion. Expt. I. ..	161

.. contd.

<u>Table No.</u>	<u>Description</u>	<u>Page</u>
13	Effects of FDI and CW on wholist-partist strategy taking efficiency in utilization of information as criterion. - Expt. I ..	162
14	Effects of problem solving ability and creativity on performance (trials) - Selection problem (SP) I, Expt. II. ..	166
15	Effects of problem solving ability and creativity on performance (trials) - SP II, Expt. II. ..	167
16	Effects of problem solving ability and creativity on performance (time) - SP I, Expt. II. ..	169
17	Effects of problem solving ability and creativity on performance (time) - SP II, Expt. II. ..	170
18	Effects of problem solving ability and creativity on performance (trials) - Reception Problem (RP) I, Expt. II. ..	172
19	Effects of problem solving ability and creativity on performance (trials) - RP II, Expt. II. ..	173
20	Incidence of focussing and scanning in relation to problem solving ability - Experiment II ..	177
21	Incidence of focussing and scanning in relation to creativity - Expt. II ..	178
22	Effects of problem solving ability and creativity on wholist-partist strategy taking initial hypothesis as criterion. - Expt. II. ..	182
23	Effects of problem solving ability and creativity on wholist-partist strategy taking deviation of the observed from expected. - Expt. II ..	184
24	Effects of problem solving ability and creativity on wholist-partist strategy - Expt. II ..	185
		.. contd.

<u>Table No.</u>	<u>Description</u>	<u>Page</u>
25	Effects of problem solving ability and creativity on wholist-partist strategy taking efficiency in utilization of information as criterion - Expt. II ..	187
26	Effects of problem solving ability and creativity on wholist-partist strategy taking efficiency in utilization of information as criterion - Expt. II ..	188
27	Relation between systematic approach and FDI ..	191
28	Relation between systematic approach and CW ..	192
29	Relation between systematic approach and problem solving ability (PSA) ..	193
30	Relation between systematic approach and creativity ..	194
31	Relation between strategy and criterion group - Analysis of question No.2 - Introspective Report ..	196
32	Relation between strategy and criterion group. CW - Analysis of question No.2 - Introspective Report. ..	196
33	Relation between strategy and criterion group. PSA - Analysis of question No.2 - Introspective Report. ..	197
34	Relation between strategy and criterion group. Creativity - Analysis of question No.2, Introspective Report. ..	197
35	Relation between strategy and criterion Memory - Expt. I. ..	198
36	Relation between strategy and criterion Memory - Expt. II ..	198

LIST OF FIGURES

<u>Figure No.</u>	<u>Description</u>	<u>To page page</u>
1	Guilford's model of structure of Intellect.	64
2A3	Interaction between FDI and CW - Experiment I	137
4&5	Interaction between problem solving ability and creativity - Expt. II	170

ABBREVIATIONS

FDI	: Field Dependence and Independence
CW	: Category Width
PSA	: Problem Solving Ability
SP	: Selection Problem
RP	: Reception Problem
