AN EXPERIMENTAL STUDY OF HUMAN
REASONING AND CONCEPTUAL BEHAVIOUR

JOHN E. TAPLIN B.Sc.(Hons.)

Department of Psychology,
University of Adelaide.
1971
CONTENTS

SUMMARY ........................................ 1
DECLARATION .................................... v
ACKNOWLEDGEMENTS ............................ vi

1. AN INTRODUCTION TO A STUDY OF CONCEPTUAL BEHAVIOUR . . . . 1
2. VARIABLES IN CONCEPTUAL TASKS .................................. 13
3. ATTRIBUTE IDENTIFICATION OF CONCEPTS EMBODYING DIFFERENT LOGICAL RULES ................................... 58
4. STRATEGIES AND MEMORY IN CONCEPT IDENTIFICATION ... .111
5. HYPOTHESIS TESTING ........................................ 159
6. RULE LEARNING ........................................ 259
7. LOGIC AND REASONING ....................................... 305
8. IMPLICATIONS FOR FUTURE RESEARCH ....................... 364

APPENDICES ................................ 359
REFERENCES ................................... 366
SUMMARY

The thesis begins by defining the meaning of concept and concept learning. A taxonomy of concepts is suggested, from which the family of nominal concepts is chosen for detailed investigation, and in particular those nominal concepts based on the rules of conjunction, inclusive disjunction, conditional, and biconditional. Two aspects of concept learning are distinguished: attribute identification in which the subject is given the rule relevant to the concept and required to find the attribute values which are combined by this rule; and rule learning in which the subject is given the relevant attribute values and set to determine the rule. An investigation of the effect of the rule on the difficulty of concept learning in each of these two tasks forms the major part of the thesis. This variable is considered alongside a number of other variables which have been found to influence performance in conceptual tasks.

A review of experiments conducted by other workers and an analysis of the results of experiments reported in this dissertation indicates that the effect of conceptual rule in attribute identification interacts with the type of instances encountered by subjects during learning. In particular, the type of initial instance seems to play
an important role in determining attribute-identification difficulty of different types of concepts.

A study of the process of concept identification is made beginning with the work of Bruner, Goodnow, and Austin (1956) on strategies. A critique of this work is put forward and alternative approaches considered. It is concluded that identification of strategies in concept attainment is not possible without recourse to subjective reports. Using this method an attempt to classify strategies following extensive training on attribute identification for four conceptual rules is made. The implications of the type of strategies employed for the effect of aids to memory on performance are considered in two experiments in which the form of the memory aid is varied.

Hypothesis-testing or concept-centred approaches to concept attainment are discussed in two parts - sampling and evaluation of hypotheses. Most research in the literature on hypothesis testing deals with sampling and a review of this work is made. On evaluation, the commonly accepted information-processing model is criticised and rejected and an alternative statistical decision model is postulated. Experiments investigating the number and type of instances selected in evaluating an hypothesis support the model proposed. The role of memory in hypothesis testing is
considered and an experiment shows differential recall of various rules and also of positive and negative instances. These findings are interpreted as being due to differences in the ease of classifying instances as positive or negative for the different rules.

In rule-learning tasks a review of the literature suggests a stable order of rule difficulty except for one study which differs from other studies primarily in that the selection procedure is employed. An experiment using the selection procedure is designed to replicate this finding, but fails to obtain an order of rule difficulty which is any different from that typically found in other studies. Possible accounts for these rule differences are considered; the most probable account seems to be in terms of a strategic tendency towards conjunction. Implications of rule-learning and attribute-identification studies for complete concept learning, in which both rule and attribute values are unknown, are assessed. The usefulness of the findings from concept learning studies for explicating problem solving is also discussed, with special reference to the solving of mathematical groups (Jeeves, 1968).

This work has essentially been concerned with aspects of inductive reasoning. Finally, a look at deductive reasoning is taken and the applicability of propositional
logic as a model of human performance considered. Several discrepancies between the logical model and performance are noted which suggest modifications required in the model. The problem generally with such a model seems to be to find linguistic expressions which are equivalent in meaning to the logical operations.

The thesis concludes by considering some general directions which future research may follow. The implications discussed are taken from a consideration of the role of rules in accounts of reasoning and conceptual behaviour.