

**COGNITIVE ABILITIES AND INSTRUCTIONAL
TREATMENTS IN A REASONING UNIT
FOR SENIOR PRIMARY SCHOOL:
A STUDY OF APTITUDE TREATMENT INTERACTION**

by

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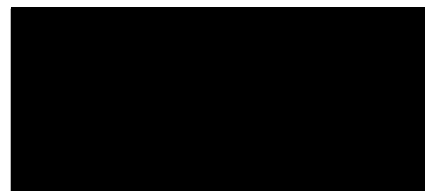
A thesis submitted for the degree of
Doctor of Philosophy of The University of New England

March, 1993

DECLARATION

I certify that the substance of this thesis has not already been submitted for any degree and is not being currently submitted for any other degree.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.



C.E. Woodley

ACKNOWLEDGMENTS

I am particularly indebted to Professor Donald Fitzgerald of the University of New England for his expert guidance in all aspects of the design, implementation, analysis and reporting of this research. His unstinting devotion of time and expertise to doctoral students and the progressive development of his line of research, further pursued in this thesis, is widely recognised.

Special acknowledgments are due to the Principals, teachers and students of the eight schools who were enthusiastically involved in either of the two trial studies or the three main studies conducted.

I would also like to acknowledge formally my appreciation for the entering of the voluminous data by my wife Diana, and her unqualified support during the research.

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ABSTRACT

The research was concerned with the general proposition that if instructional treatments are specifically tailored to suit students grouped according to individual aptitude patterns, learning performances will be improved. The Luria model, providing the theoretical underpinning for the measurement of individual differences in cognitive abilities, proposes that two information processing aptitudes underlie learning, namely simultaneous analysis / synthesis and successive analysis / synthesis. Studies were conducted using female subjects in Year 6 at schools in the northern suburbs of Sydney. In Study 1 (N=296) and the preliminary phase of Study 3 (N=251), data from psychometric tests were analysed using principal component analysis to identify the dimensions of the Luria model and describe the aptitude profile of each subject.

The instruction materials for Study 2 covered a unit in elementary reasoning involving Set theory and syllogistic reasoning, and for the main phase of Study 3 a more detailed exposition of Set theory. Two treatments of each were designed, one intended to advantage students with high simultaneous information processing aptitudes, the other to advantage students with high successive information processing aptitudes. Post and delayed tests were conducted to determine performance in the learning tasks 'acquisition of knowledge and understanding', 'Set manipulation' and 'syllogistic reasoning'. Study 2 involved the administration of self-administered instruction booklets in class groupings, whereas Study 3 involved observation of each individual as she worked through the allocated treatment, allowing structured probes and clinical interviewing techniques to explore more closely the underlying attitudes and learning processes of each subject.

Study 2 findings supported the hypothesis that disordinal aptitude x treatment interaction did occur when the task content involved syllogistic reasoning. Students high in simultaneous and low in successive aptitude were significantly advantaged by learning from the treatment tailored to suit this aptitude profile, and correspondingly those students high in successive and low in simultaneous aptitude were advantaged by instruction employing solely a verbal treatment of material. It was concluded that this interaction was facilitated by the nature of the task being amenable to the development of a disparate solution strategy for each of the two treatments - one a "spatial" strategy using Venn diagrams and necessitating spatial *reasoning*, and the other a verbal treatment emphasising step-wise procedures necessitating successive information processing. On the other hand, the finding of both Studies 2 and 3 confirmed an absence of aptitude x treatment interaction for those learning tasks involving 'understanding and knowledge' and 'Set manipulation', and the relevant hypotheses with respect to these criteria were not supported. It was observed that the content of these tasks was not conducive to a disparate "spatial" treatment that would advantage students with high simultaneous ability. It was evident that "spatial" presentations to teach knowledge of terms and symbols, a majority of the content in the 'understanding and knowledge' category, was better characterised as verbal material supplemented with diagrams and pictures that did not require spatial reasoning. It was observed that subjects, regardless of aptitude profile, tended to perceive the pictorial and diagrammatic adjuncts in the non-verbal treatment as simple decoration and ancillary to their learning strategies and procedures, and thus not demanding active processing. Performance on the 'Set manipulation' tasks suggested that achievement predominantly related to the level of aptitude for simultaneous processing and was not influenced significantly by either the spatial or verbal treatments.

It was concluded from the findings of Study 2 and Study 3 that the nature of the task demands placed upon the learner by the *content* appears to be a major primary consideration in the

justification for the design and administration of alternative instructional treatments to capitalise on individual information processing aptitudes. It was suggested that topic material should firstly be assessed carefully for its amenability to the development of alternate treatments before curriculum development following the ATI paradigm is attempted.

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