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Fluency and Flexibility of Thinking

A study of open-ended thinking with pupils of high ability in Science.

A dissertation presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Education at Massey University

by

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This study explored some aspects of fluency and flexibility of thinking with a sample of 13 to 15 year old pupils of high ability in science drawn from England, U.S.A. and New Zealand. Stimulus material within the general field of science was presented for response in the open-ended idiom. This procedure established a closer alignment between the nature of the task and the interests and abilities of the subjects than hitherto obtained for such pupils.

Tests included three measures of open-ended thinking employing science stimuli, an intelligence test, an attitude scale, a personal preference questionnaire, and teacher and peer rating scales.

Scoring procedures and interscorer reliabilities for the open-ended measures were determined, and scores from all tests converted to normalized T-scores. Then a series of correlational studies was undertaken which examined relationships between measures of fluency, flexibility, intelligence and personality. Two centroid factor analyses - one in the cognitive, the other in the personality domain - were carried out in an effort to seek further evidence of the internal structure of matrices.

Results from total sample data (by country) were employed for the majority of statistical analyses, although selected samples incorporating high-low scorers (±1SD) and other selected groups based on sex, age, and classroom differences were utilised on other occasions.

Within the limits of sample selection some inter- and intra-cultural differences in cognitive and personality
behaviours were observed, although the major result was one of variation on a theme rather than of striking contrasts. Scores on either fluency or flexibility of thinking were seen to be less correlated across tests (e.g. generally between .30 to .45 for fluency, and between .25 to .35 for flexibility) than with each other within tests (e.g. generally between .65 to .75). This tendency was supported by factor analysis which suggested a composite fluency-flexibility factor anchored to each test. Although some measure of stable cognitive style was seen to be operating, it was overshadowed in the present study by a tendency for pupils to be task-specific even within the science domain.

Correlations between intelligence and fluency and flexibility of thinking were generally low and positive.

Differences on some attitude factors suggested that within this sample of pupils of superior ability in science high scorers in flexibility (and to some extent in fluency) of thinking tended to approve more of such traits as running risks, doing dangerous experiments, teasing people and investigating the unusual, and approve less of being obedient, accepting expert advice, and getting everything correct.

While the study was not primarily concerned with the wider issues of divergent or creative thinking, nor with the academic bias of science/arts students, they were briefly discussed when the educational implications of the study were considered.
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TABLE OF CONTENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTERS IN TEXT

1 Introduction
2 Theoretical Background and Instrumentation
3 Scoring Responses
4 Statistical Methodology and Results
5 Reliability and Validity
6 Discussion
7 Conclusion: Some Limitations and Suggestions for Further Research

APPENDIXES

A Taxonomies for scoring the remaining responses for Test 2, 'TIME'; Test 3, 'ACID', 'OXYGEN', 'MAGNET', 'WHEEL'
B Interscorer Reliability Data: Raw Scores for Three Tests by Three Scorers
C Computer Information and Statistical Formulae
APPENDIXES contd

D F Tests for Homogeneity of Variance on 15 Test Variables for Three Countries. England, U.S.A. and New Zealand 239

E Distribution Curves for Raw Scores for Tests 2A, 2B, 3A, 3B, 3C and 3D (Figures 1-12) 240

F Between-country Differences. Analysis of Significance of Difference Between Means (t-tests) on 45 Sets of Scores for Test Variables (Intelligence: 1; Fluency: 7; Flexibility: 7) for England, U.S.A., New Zealand 246

G Sex Differences and Probabilities (Chi-square) for Hi-Lo Scorers on Fluency and Flexibility. U.S.A., New Zealand 247

H Observed Frequencies and Expected Frequencies by Classrooms and Schools for High (+1SD) and Low (-1SD) Scorers on Fluency and Flexibility. England, U.S.A., New Zealand 248

I Observed Frequencies for Teacher and Peer Rating Categories for Hi-Lo Fluency and Flexibility Groups. England, U.S.A., New Zealand 249


K Means, Standard Deviations and t-test Results for Retest Data. N = 74 (New Zealand) 251

L Means, Standard Deviations, and t-test Results for Males (N = 40) and Females (N = 34) on Retest. (New Zealand) 252

BIBLIOGRAPHY 253
LIST OF TABLES

1. Distribution of Sample by Geographic Location, Size and Sex........... 9
2. Distribution of Sample by Age and Country............................. 12
3. Interscorer Reliability Data: Raw Scores for Three Tests by Three Scorers..... 69
4. Interscorer Reliability Data: Means, and S.D.'s for Three Scorers on Three Tests.... 70
5. Interscorer Reliability Data: Correlation Coefficients for Three Scorers on Three Tests.... 71
6. Basic Statistics for Samples by Country.................................. 79
7. The Effect of Age on Scores from Cognitive Variables: Within-Country Differences.... 87
8. Analysis of Between-Country Differences................................. 90
12. Correlation Coefficients for Intelligence Against Fluency and Flexibility on Tests for England, U.S.A. and New Zealand........... 95
14 Factor Analysis Results for Intelligence (1) Fluency (3) and Flexibility (3). England 104
15 Factor Analysis Results for Intelligence (1) Fluency (3) and Flexibility (3) U.S.A. 104
16 Factor Analysis Results for Intelligence (1) Fluency (3) and Flexibility (3) New Zealand 104
17 Percentage of Variance Contributed by Major Fluency-Flexibility Test-Composite for Each Factor for Each Country 105
18 Factor Analysis Results for Attitude Scale: England 109
19 Factor Analysis Results for Attitude Scale: U.S.A. 110
20 Factor Analysis Results for Attitude Scale: New Zealand 111
21 Items with Factor Loadings Above .3 Grouped Under the Appropriate Four Factors for Test 4, Attitude Scale. England, U.S.A. and New Zealand 113
22 Factor Analysis and Phenomenological Approaches on Attitude Scales: England 115
23 Factor Analysis and Phenomenological Approaches on Attitude Scales: U.S.A. 116
24 Factor Analysis and Phenomenological Approaches on Attitude Scales: New Zealand 117
25 Distribution of Number of Items Per Factor Scale for Attitude Scale (Test 4) 120
26 Hi-Lo Flexibility and Fluency Scorers on Attitude Factors (t-tests) 122
<table>
<thead>
<tr>
<th>TABLES</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Classroom and School Contributions to Hi-Lo Scorers on Fluency and Flexibility (Chi-square Analysis) England, U.S.A. and New Zealand</td>
<td>131-3</td>
</tr>
<tr>
<td>28</td>
<td>Teacher and Peer Rating Probabilities (Chi-square) on the Basis of Hi-Lo Fluency and Flexibility England, U.S.A. and New Zealand</td>
<td>137</td>
</tr>
<tr>
<td>29</td>
<td>Analysis of Selected Sample of High Peer Rated Pupils</td>
<td>141-2</td>
</tr>
<tr>
<td>30</td>
<td>Coefficients of Stability for 74 New Zealand Pupils on Eight Test Variables with a Retest Interval of Eight Weeks</td>
<td>143</td>
</tr>
<tr>
<td>31</td>
<td>Coefficients of Stability for Extreme Scorers (New Zealand, N = 28 for -1SD) on Eight Test Variables with a Retest Interval of Eight Weeks</td>
<td>149</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Diagrammatic Representation of Three Category Widths</td>
<td>53</td>
</tr>
<tr>
<td>2</td>
<td>Smooth and Sharp Response Gradients Representing Different Patterns of Response-Category Change</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>Graphical Record of Responses Indicating Position of Category Change and Number of Categories for Original and Re-mark Scoring</td>
<td>59</td>
</tr>
<tr>
<td>4</td>
<td>Distribution of Raw Scores on MH5 (Part I) Test of Intelligence for Test Samples. England (N = 130), U.S.A. (N = 139), New Zealand (N = 134)</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>Frequency Polygon for the Distribution of Raw Scores, Test 1, Fluency. England (N = 132), U.S.A. (N = 140), New Zealand (N = 134)</td>
<td>82</td>
</tr>
<tr>
<td>6</td>
<td>Frequency Polygon for the Distribution of Raw Scores, Test 1, Flexibility. England (N = 132), U.S.A. (N = 140), New Zealand (N = 134)</td>
<td>83</td>
</tr>
</tbody>
</table>