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Fluency and Flexibility of Thinking

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

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in Education at Massey University

by

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ABSTRACT

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 ($\pm 1SD$) 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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