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AUTHOR Piburn, Michael; Enyeart, Morris
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ABSTRACT

A sample of 217 students (from grades 4 to 8) who were enrolled in an elementary school science-oriented gifted and talented program were compared to 91 mainstreamed subjects in grades 7 through 10. Assessement instruments included: a battery of Piagetian measures designed to assess combinatorial reasoning, probabilistic reasoning, and the ability to isolate and control variables; the Propositional Logic Test; and a variation of the four-card hypothesis testing task. Results show that the gifted and talented sample was accelerated over the comparison group by two to three grade levels, suggesting that the former students are truly gifted in regard to very basic reasoning skills. The criteria for inclusions in gifted and talented programs vary from case to case, and are rarely well defined. Standardized aptitude tests may be appropriate for an academically-oriented acceleration program, but are probably not for local pullout enrichment programs. A more general battery of reasoning tasks, such as those used in this study, should be included in the selection of students for such gifted and talented programs. (Author/JN)

A Comparison of the Reasoning Ability of Gifted and Mainstreamed Science Students

Michael Piburn

and

Morris Enyeart

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A COMPARISON OF THE REASONING ABILITY OF GIFTED AND MAINSTREAMED SCIENCE STUDENTS

The criteria for the selection of students for inclusion in Gifted and Talented education programs vary substantially from program to program. The use of standardized aptitude tests, such as the SAT may be quite appropriate for an academically oriented acceleration program such as the Johns Hopkins Talent Search, but is probably not for local pullout enrichment programs. In such cases, the criteria for identification of students are more diverse and poorly defined. In addition to standardized test scores and school success, recommendations from teachers, parents and others are commonly used. This study represents an attempt to identify some variables that might be useful, and acceptable for screening participants at the local level.

Methodology

Subjects for this study were selected from students in a large suburban school district in New Jersey. They include 217 students, ranging from grade 4 to 8, who were participants in a science-oriented G&T program, and a comparison group of 91 mainstreamed subjects in grades 7 through 10.

Assessment instruments include a battery of Piagetian measures designed to assess combinatorial and probabilistic reasoning, and the ability to isolate and control variables, the Propositional Logic Test (Enyeart and Pilburn, 1981), and a variation of the four-card hypothesis testing task of Wason and Johnson-Laird (Bady, 1979).

Results

In terms of success rate, the G&T sample was accelerated over the comparison group by 2 to 3 grade levels.

The majority of the G&T students became successful on the controlling variables tasks by the 6th grade, and on the combinatorial tasks by the 7th grade. The comparison group was not as successful until the 9th grade. This success rate was reached on the probability tasks by the 8th grade in the G&T group and the 10th grade in the comparison group.

Both the G&T and comparison group became successful with the logical operator of the conjunction by the 7th grade. However, the G&T group next accessed the disjunction by the 7th or 8th grade, while this was not true of the comparison group until the 10th grade. Success rates with the material equivalence (biconditional) and material implication were similar in the 7th grade G&T and 10th grade comparison groups, although neither were successful with the majority of the items.

Performance on the four-card task was coded to indicate whether the subject used a verifying of a falsifying strategy. By the 6th grade , equal numbers of G&T students were falsifying and verifying, and by the 8th grade more than 75% were using the falsifying strateggy. Although the results are a little less clear cut for the comparison group, this proportion did not begin to use the falsifying strategy until the 9th grade.

Conclusions

It would appear, from these data, that the G&T students included in this study are accelerated in their reasoning skills over their mainstreamed counterparts. We would suggest that the selection of future students for inclusion in the program be based, in part at least, upon the application of measures such as those used in this study.

BIBLIOGRAPHY

Enyeart and Piburn, "The Growth of Logical Reasoning Ability During the Junior High School Years," annual meeting NARST, Grossinger's, NY (1981)

Bady, "Students' Understanding of the Logic of Hypothesis Testing," JRSI V. 16, no. 1, pp. 61-65 (1979)

GRADE		GIFTED AND TALENTED		
		COMBINATIONS	VARIABLES	PROBABILITY
4	(n = 51)	29%	--	--
5	(n = 55)	36	29%	--
6	(n = 68)	43	53	21%
7	(n = 18)	56	56	28
8	(n = 25)	68	60	64

	MAINSTREAM		
	COMBINATIONS	VARIABLES	PROBABILITY
EARTH SCIENCE (n = 42)	67	58	43
BIOLOGY (n = 37)	49	65	59
(n = 53)	25%	38%	--
(n = 49)	22	31	--

GRADE		GIFTED AND TALENTED			
		CONJUNCTION	DISJUNCTION	BICONDITIONAL	IMPLICATION
4	(n = 51)	1.8	1.8	1.0	0.5
5	(n = 55)	2.9	2.4	1.1	1.0
6	(n = 68)	2.7	2.8	1.6	1.3
7	(n = 18)	3.0	2.9	2.2	1.8
8	(n = 25)	3.4	3.5	2.5	1.7

	MAINSTREAM			
	CONJUNCTION	DISJUNCTION	BICONDITIONAL	IMPLICATION
(n = 53)	3.4	1.4	0.6	0.3
(n = 49)	3.3	1.0	0.2	0.1

EARTH SCIENCE	(n = 42)	3.5	1.2	0.2	0.3
BIOLOGY	(n = 37)	3.4	3.3	2.4	1.1

GIFTED AND TALENTED							
GRADE		FALSIFY	VERIFY			MAINSTREAM	
						FALSIFY	VERIFY
4	(n = 51)	30	21				
5	(n = 55)	24	31				
6	(n = 68)	34	34				
7	(n =18)	12	6		(n = 53)	25	28
8	(n = 25)	19	6		(n = 49)	13	36
		EARTH SCIENCE			(n = 42)	30	12
		BIOLOGY			(n = 37)	23	14