THE IDENTIFICATION OF MENTALLY GIFTED, "DISADVANTAGE" STUDENTS AT THE EIGHTH GRADE LEVEL

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The Identification of Mentally Gifted, "Disadvantaged" Students at the Eighth Grade Level[1]

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For as long as special funds have been provided for gifted programs, these funds have gone largely to affluent schools, rarely to inner-city schools. One reason for this must be sought in the method of defining the "mentally gifted" student. The criterion has generally been a score at or above the 98th percentile point on an individual intelligence test such as the Wechsler Intelligence Scale for Children (WISC) or the Stanford-Binet (i.e., an IQ score of about 130+). Thus, all students were evaluated against the same kind of yardstick, a test standardized on a white population and subject to cultural influence. Few inner-city students qualified as mentally gifted. Moreover, since few were expected to qualify, programs for gifted students were rarely planned and counselor time and effort were directed elsewhere. The mentally gifted students in "ghetto" schools were ignored.

Recently, however, concern for mentally gifted "disadvantaged" students has grown. In hearings on the gifted conducted by the United States Department of Health, Education and Welfare, answers were sought to the question "How can disadvantaged gifted children be identified?" In California a change in the State Code[2] now allows up to 2 per cent of the "culturally disadvantaged" students in a school district to be designated mentally gifted under separate criteria which do not require a full-scale score above 130.

[2]California Administrative Code, Title 5 (Education) section 3822.

Such developments are especially welcome at a time when professional opportunities for minorities are at last expanding. Equality of opportunity for professional careers will not really exist until the preparations which students receive for the professions are equal. The top 2 per cent of students in white schools often receive special funds, presumably because their needs cannot be adequately met in the regular classroom. The top 2 per cent of students in inner-city schools are as deviant in their schools as are the identified gifted within theirs. They also need special programs—programs which encourage excellence and send the students on to college well-prepared to meet the academic competition provided by more privileged students.

The need for programs for mentally gifted black students was persuasively argued by Martin D. Jenkins as long ago as 1950.[3] Jenkins recognized that, "the identification of talent is an essential prerequisite to the conservation of talent. Schools and colleges need to develop functional testing programs which have as a major objective the identification of superior students."[4] The research to be described herein had just such a major objective, the development of a practical, fair method for identifying the top 2 per cent in ability of the eighth grade of an inner-city junior high school.

The choice of junior high school level is deliberate. Henry Chauncy, noting that prediction of college success at the age of 14 years is practically as good as at the age of 18 years, wrote:

> It seems ... that the junior high school years are an especially timely period for administering a standardized testing program. Prediction at this point is practical and appropriate in terms of (a) the psychological development of individuals and (b) the organization of our educational system.[5]

DESIGN OF THE STUDY

It was necessary to choose a criterion measure by which to identify the top 2 per cent in ability. The concern was to use a measure which would not be heavily influenced by cultural variables and it was assumed that such influences would be most apparent in verbal tests. The separate criteria in California specified a nonverbal (performance) score at or above the 98th percentile on an individual test as an indication that a disadvantaged student was "mentally gifted." The individual intelligence test has long been the criterion measure for regular gifted programs. The WISC

[3]M. D. Jenkins, "Intellectually Superior Negro Youth: Problems and Needs," *Journal of Negro Education*, XIX (1950), 322-332.

[4]*Ibid.*

[5]Henry Chauncy, "Measurement and Prediction - Tests of Academic Ability" in *Identification and Education of the Academically Talented Student in the American Secondary School* (Washington, D.C.: National Education Association, 1958), p. 33.

performance scale was therefore chosen as the criterion measure. The top 2 per cent on this scale would be designated mentally gifted.

Having chosen a criterion, the problem of identification might seem to be solved—simply administer the WISC to all students and choose the top 2 per cent on the performance scale. Unfortunately, this is impossible due to the expense in time and money involved in giving the WISC. Group measures are needed to select students to take the individually administered WISC. This problem of selection for individual testing is a recurrent one in all efforts to locate gifted students and has been the subject of research, notably by Pegnato.[6] The problem is to find a selection procedure which does not overlook any gifted students and yet does not involve the testing of a prohibitively large number of students. Pegnato defined efficiency and effectiveness as two measures of selection procedure. Reference to both will be made in this paper. The effectiveness of a procedure is the percentage of gifted students located by the procedure. The efficiency is the ratio of gifted students located to the total number tested, expressed as a percentage. Thus, if 16 students are selected for individual testing by some procedure and eight of them test as gifted, then the procedure had an efficiency of 50 per cent. In this study an efficiency of about 50 per cent was considered to be acceptable and the aim was to maximize the effectiveness of the selection procedure.[7]

The following methods of selecting students for the WISC were chosen for investigation: (1) a conventional group IQ test, the *California Test of Mental Maturity* (CTMM), 1963 edition, Short Form, level 3; (2) a "culture-fair" intelligence test, the Raven *Standard Progressive Matrices* (SPM); (3) the *California Achievement Tests* (CAT), 1970 edition, level 4, form A, in mathematics and reading; and (4) teacher nominations.

Of these measures the SPM seemed, *a priori*, the most desirable. Being an entirely nonverbal test,[8] involving no reading or arithmetic, the SPM should give a child whose schooling or background has been deprived his best chance to score high. This supposition finds support in the work of Elley and MacArthur who used the test widely in Canadian schools. They reported that the correlation of the SPM with socioeconomic status (SES) was lower

[6] C. Pegnato. *An Evaluation of Various Initial Methods of Selecting Intellectually Gifted Children at the Junior High School Level* (Doctoral Dissertation. Pennsylvania State College, 1968).

[7] In California the State refunds $40.00 to the school district for each gifted child identified. Since the individual test costs about $20.00 the district can afford to test about twice as many students as are finally identified as gifted. This, however, is a minimum estimate of the cost.

[8] The items are row and column patterns (matrices) with a piece missing. The examinee must select the missing piece from six or eight choices.

than that of several other commonly used tests, including the CTMM.[9] Correlation of SPM with SES was .23 as compared to a correlation of .38 between CTMM scores and SES. The CTMM contains a vocabulary test and a mathematics test both of which are essentially achievement tests. Performance on such tests cannot fail to be influenced by cultural and educational variables. While this influence probably increases the predictive validity of the CTMM, the aim in this study was to measure ability as little influenced by achievement as possible. Even the nonmathematical parts of the CTMM nonlanguage section are probably subject to cultural influences since they involve the recognition of pictures.[10]

The use of achievement tests to select students would likewise be expected to discriminate against the child who is underachieving because of adverse circumstances of background or schooling.

The fourth selection measure, teacher nominations, has repeatedly been shown to be both inefficient and ineffective in locating gifted students but it continues in use in many schools. Its validity in a "disadvantaged" population needed investigation.

In addition to its being a "culture-fair" test[11] the SPM is to be preferred as being exceptionally simple to administer as a thirty-minute classroom test. Instructions are brief and quickly comprehended. There is only one item format throughout the test. However, the test author, J. C. Raven, stated in the manual that "the scale is intended to span the whole range of intellectual development rather than to differentiate clearly between individuals."[12] In the hope of increasing the differentiation of students in the upper ability range, and thus improving the efficiency of the selection procedure, it was decided that the *Advanced Progressive Matrices* (AdvPM, 1962 edition) would be given to students who scored high on the SPM. The AdvPM is designed, according to the

[9]W. B. Elley, and R. S. MacArthur, "The Standard Progressive Matrices as a Culture-Reduced Measure of General Intellectual Ability," *Alberta Journal of Educational Research*, VIII (1962), 54-65; W. B. Elley, "The Reduction of Socioeconomic Bias in Intelligence Testing," *British Journal of Educational Psychology*, XXXIII (June, 1963), 107-119.

[10]For example, several students asked the examiner to identify one of the pictures in the non-language section. Depicted was a valley surrounded by mountains and seen from a high vantage point. The lack of recognition was possibly due to the fact that the students had spent their lives in a flat urban area and had never looked down on a valley.

[11]The concept of a culture-fair test as used here is a relative one. "Culture-fairer" might be more appropriate. The SPM is likely to be fairer than the CTMM but "culture" as expressed in child-rearing practices, school experiences, etc., probably exerts an influence on nonverbal reasoning abilities and test-taking attitudes as well as on more obvious areas such as vocabulary, information and mathematics skills.

[12]J. C. Raven, *Guide to the Standard Progressive Matrices* (New York: The Psychological Corporation, 1960).

test manual, to "differentiate clearly between individual persons of even superior ability."[13]

PROCEDURES

A junior high school in a predominantly Black, urban area of California participated in the study. The eighth grade consisted of approximately 400 students and about eight students (2% of 400) were to be designated gifted.

Before any tests were administered, teacher nominations were collected by asking teachers to name "off-the-cuff" the eight students they considered to be of highest ability. Scores were assigned to the nominations according to the student's rank on the teacher's list. A simple linear assignment of score to rank was used and the scores for each student were then added to yield a "teacher nomination score."

The SPM was administered in the classrooms to all eleven eighth grade classes. Two months later the CTMM was administered. The sample was then reduced, for reasons of economy, to seven classes. The four classes dropped had not contained any students scoring in the top 2 per cent of the sample on the SPM or CTMM. The reduced sample of seven classes took the CAT reading (vocabulary and comprehension) and the CAT mathematics (concepts and problems) tests the following month, which was January.

The AdvPM was given to students scoring above 48 on the SPM, to students in the top 2 per cent of the sample on the CTMM, CAT or teacher nominations and to a random sample of 48 students.

To select students for the WISC the scores on the CTMM, SPM, CAT and on teacher nominations were rank ordered. The top eight students, (i.e., the top 2%) on each of these measures were scheduled for a WISC. This produced a group of 18 students. Additionally two students were selected for WISC testing because of high AdvPM scores, one because of a high CAT mathematics score and one for a high CTMM nonlanguage score.

The WISC tests were administered by a school psychologist working with a rather tight scheduling of students on Saturdays at the students' school. No student failed to appear for testing.

The experimentor interviewed all students who took the WISC, asking questions relating to school experiences, favorite subjects and career plans. A rough assessment of SES relative to the sam-

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[13]J. C. Raven, *Advanced Progressive Matrices, Sets I and II* (London: H. K. Lewis and Co., Ltd., 1965), p. 1.

ple was made based on father's occupation as listed in guidance records.

RESULTS

The seven eighth grade classes which took all screening tests consisted of approximately 230 students ranging in age from 151 to 175 months at the beginning of the school year. Mean age was 13 years, 4 months with a standard deviation of 5 months. The sample was 50 per cent male. Ethnic composition was 87 per cent Black, 10 per cent Chicano and 3 per cent other. Average raw scores for the total group are shown in Table I.

TABLE I
Scores on the Cognitive Tests

TEST		N	MEAN RAW SCORE $\bar{X}$	PERCENTILE RANK OF $\bar{X}$ IN NORMS	SD	SKEWNESS
CTMM	lang.	193	22.5	14	8.4	n.s.
	nonlang.	193	31.5	21	9.7	neg.*
	total	193	54.1	14	16.4	n.s.
SPM		208	39.9	37	7.1	neg.**
CAT	math.	207	18.1	19	7.4	pos.**
	reading	179	39.8	25	13.8	pos.*

**$p < .001$
*$p < .05$

The WISC scores: In Table II the 22 WISC scores are reported, rank ordered by the performance scale score. Students are designated by letters which were assigned according to the rank order of their full scale scores. Thus, student A had the highest full scale score and student B the second highest full scale score. B's performance scale score, however, ranked him twelfth. The range of scores on the performance scale was 94 to 136 and the cut-off score for the top eight students was 114. At this score, 114, there was a tie; therefore, the group representing the top 2 per cent was expanded to include nine students, hereafter called the gifted students. Seven of these gifted students were also among the top eight as measured by full scale scores. Thus, the use of the performance scale as criterion, rather than the full scale, dropped only one student, student B. It is interesting to note that this student came from one of the few relatively high SES homes in the sample (father is

an administrator) and it might have been difficult to consider him "disadvantaged."

Performance scores were generally higher than verbal scores, particularly among higher total scores. Large discrepancies of ten points or more (twice the standard error of measurement for the WISC) occurred five times in favor of performance scores (discrepancies of 28, 26, 24, 24 and 13 points) but only three times in favor of verbal scores (discrepancies of 19, 13 and 10 points).

TABLE II
Results on the Wechsler Intelligence
Scale for Children (WISC)

STUDENT	SEX	PERFORMANCE	VERBAL	FULL SCALE
A	M	136	110	125
G	F	131	103	117
C	F	127	113	121
D	F	121	118	121
E	M	118	119	120
H	M	118	109	115
I	M	117	108	113
F	M	114	121	120
J	M	114	110	113
M	M	113	100	107
T	F	111	87	99
B	M	110	129	122
K	M	110	109	110
R	M	106	97	101
L	F	104	113	109
N	F	104	109	107
O	F	104	105	105
S	M	104	96	100
P	M	100	109	105
Q	M	97	110	104
U	F	97	100	99
V	F	94	104	99

The gifted group consisted of seven Black students, one Chicano and one other. There were three females and six males. One student was of relatively high SES, three medium (fathers were technicians, clerks, etc.) and four of low SES (manual workers, unemployed, etc.).[14] All but one of the gifted students came from

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[14]In the total WISC group the ratio of high to medium to low was 4 to 8 to 10. It must be remembered that the designations "high," "medium," and "low" refer only to *relative* status within the sample.

a two-parent home. Either mathematics or science was mentioned as the most favorite subject by seven of the nine gifted students.

Before moving on to consider the effectiveness of the screening measures in selecting students to take the WISC it is necessary to look a little more closely at the gifted group, since qualitative as well as quantitative considerations must enter into an assessment of the selection procedure—considerations, for example of which students were overlooked by a given procedure, not just how many. Students A and G, who will be called Albert and Gail, had WISC performance IQs above 130. An IQ of 130+ has traditionally been accepted as evidence of giftedness. Furthermore, as mentioned above, the California State Code specifies a performance score at or above the 98th percentile as evidence which can be used to designate a student mentally gifted under the separate criteria. It thus seems reasonable to state that Gail and Albert should definitely be considered gifted and it would be a serious count against any selection procedure if it overlooked either one of them.

These two students presented quite a contrast to each other and the case of Gail sounds a cautionary note about testing in a "disadvantaged" population.

Student A. (WISC performance IQ 136.): Albert was irrepressible. He scored in the top 2 per cent of the sample on each cognitive screening measure (the SPM, the CTMM total score, the CAT total score), and was nominated as possibly gifted by his mathematics, science, English and music teachers. He was in the top track classes and in the school's accelerated Algebra program. He liked school and planned to go to college and enter a profession. He communicated easily with adults, participated in the classroom and was generally good-natured. His favorite subject was mathematics. He especially liked word problems but did not like adding numbers.

Albert's CTMM scores in this study were 108 language IQ and 120 nonlanguage IQ. His CAT scores ranked him at the 73rd percentile in the norms on mathematics and 74th percentile in reading.

Student G. (WISC performance IQ 131.): Gail's high nonverbal ability was well established by several scores. On the SPM, a timed test, she ranked ninth in the sample with a raw score of 51 and on the AdvPM, which was untimed, she made the second highest score, 25. Her CTMM nonlanguage IQ score was 131, highest in the sample.

Gail's scores on verbal ability tests presented a contrast. On the CTMM language test she scored an IQ of 85. Her WISC verbal

score of 103 was prorated from five subtests; the vocabulary sub-test had to be invalidated since she declined to attempt any of the items. These low verbal ability scores, possibly the result of cultural disadvantages, are reflected in her school work. She does not like to read and this leads her to dislike school much of the time, especially classes in which she must read and write. Mathematics is her favorite subject and she would like to be a mathematics teacher.

On the CAT mathematics "problems" test in this study, she ranked tenth in the sample with a score of nine out of 15, the highest score being 13 out of 15. The "concepts" part of the mathematics test pulled her score down, however, as it involved reading definitions of mathematical terms. Her score on "concepts" and "problems," combined, ranked her at the 50th percentile in national norms. On the CAT reading tests she ranked at the 25th percentile on national norms, about average for the school.

Gail was not in the top track, nor in the accelerated Algebra program and was not nominated by any teacher. She had come new to the school in the eighth grade and by the middle of the school year her guidance folder had still not been forwarded from a neighboring school system.

One might speculate that Gail, very much in need of special help to enable her to reach her potential, was the kind of student who might very easily be overlooked by a conventional testing procedure, particularly if only total scores were examined.

Teacher Nominations

Five of the gifted students were nominated by two or more teachers. The remaining four (Gail and students D, H and J) were not nominated at all. What distinguished the recognized from the unrecognized students? Apart from Gail, the unrecognized students were achieving at about the same level as the recognized students, indeed they occupied second, third and fourth place in CAT reading among the gifted group. It was necessary to look for more subtle effects than scores to find a distinguishing trait and the impression is consequently subjective. It seemed that the distinguishing trait might be called affability. Three of those over-looked were somewhat taciturn in the way of children who do not feel comforable with adults. The fourth had "immature behavior" noted in guidance records. One might hazard the generalization that when teacher judgments are relied upon for placement or identification it is likely to be the child who does not relate to the teacher who gets overlooked despite the fact that his achievements

and ability are equal to or higher than those of the students recognized as bright.

Socioeconomic status is usually a factor in interpersonal relationships so the SES of students who were in the top 2 per cent on the various measures was checked. The WISC, SPM, CTMM and CAT all showed four or more students of low SES among the top eight. On the teacher nomination scores, however, only one student of low SES was in the top eight. By contrast there were no significant differences in the ethnicity, sex, academic or citizenship grades between the top eight nominated by teachers and the top groups on the several cognitive tests.

The Selection Procedure

In Table III intercorrelations are shown for the screening measures. It should be recalled that sections of the CTMM and CAT are of very similar content. The SPM, by contrast, contains not a word nor a number. Its manifest mathematical content is restricted to counting up to three. Nevertheless it showed a correlation of .60 with CAT mathematics and a .49 with CAT reading. One interpretation is that the SPM is truly an ability measure which, unlike the CTMM, does not "surreptitiously contain in itself most of the criterion it is claiming to predict."[15] This point is made because it is especially important in seeking "disadvantaged" gifted children who will be administered to use an ability measure

TABLE III

*Intercorrelations (Spearman's RHO) Among
the Screening Measures*

N = 200

MEASURE	2	3	4	5	6
1. SPM	.42	.51	.60	.49	.26
2. CTMM language		.63	.65	.82	.42
3. CTMM nonlang.			.65	.60	.33
4. CAT math.				.70	.44
5. CAT reading					.38
6. Teacher nomination score					

Note: p < .001 for all figures.

[15] R. B. Cattell, "Fluid and Crystallized Intelligence," *Journal of Educational Psychology*, LIV, No. 1, 1963.

uncontaminated by achievement factors. Yet in seeking gifted children for academic programs it is also important that the ability measured is relevant to academic work. It seems that the SPM meets these needs.

The correlation coefficients in Table III were based on a full range of scores from some 200 students. However, of major concern here is the nature of the SPM at the extreme upper end of the scale. In particular, we need to know if the SPM picked out students who did well on the criterion, the WISC performance scale.

Eight of the nine gifted students were among the top 16 on the SPM (in fact, of the top eight on the SPM, five were gifted). The CTMM language and nonlanguage tests each had six of the gifted students among the top 16 students and the CAT reading and mathematics tests each had eight gifted students in the top 16. From these results it would seem that the achievement tests were as effective as the SPM and the CTMM tests were less effective. However, when it is noted that neither achievement test selected Gail, it seems that the SPM was to be preferred. The one student who would have been overlooked had the SPM been used was student I.

The selection procedure dealt with very small numbers and analysis of its effectiveness gives information only on the chance occurrence in this sample. A method of analysis which takes into account probabilities and the variance in scores is discriminant analysis. In what measures were the gifted students significantly different from the nongifted students?

The WISC scores were divided into two groups, the high-WISC and the low-WISC groups.[16] The high-WISC group consisted of the nine students with performance scores at or above 114, i.e., the gifted group. The low-WISC group consisted of nine students who scored below 114. (Three students, M, S and R had to be omitted due to missing data.) A step-wise discriminant analysis was performed using program BMD07M.[17]

Table IV shows the mean scores of the high and low WISC groups on the SPM, AdvPM, CTMM language and nonlanguage tests and the four CAT tests. Except for the mathematics concepts test (which, as a test of mathematical vocabulary, involved much reading) all means were higher for the gifted (high-WISC) group but only three reached the .05 significance level. The most signifi-

cant difference in mean scores was on the AdvPM. This lent support to the original supposition that the AdvPM, would better discriminate among high ability students.[18] The other two tests which showed significant differences between means were the SPM and mathematics "problems." Thus the students who scored highest on the WISC performance scale were most different from other high ability students in their performance on the matrices tests and in solving mathematical word problems.

TABLE IV
Mean Scores of the High-WISC and Low-WISC
Groups on Other Measures

TEST		MEAN SCORE OF HIGH-WISC GROUP	MEAN SCORE OF LOW-WISC GROUP	F
SPM		51.0	45.0	5.12*
AdvPM		22.1	17.7	13.56**
CTMM	Lang.	35.9	34.4	0.14
	Nonlang.	47.3	43.5	1.66
CAT	Concepts	21.0	22.1	0.47
Math	Problems	11.1	7.8	6.69*
CAT	Vocabulary	32.7	29.2	3.19
Reading	Comprehension	32.3	29.2	0.92

Note: $F_{.01,1,16} = 8.53$; $F_{.05,1,16} = 4.49$
*$p < .05$
**$p < .01$

In the discriminant analysis, functions were developed which when applied to the scores for each case placed that case in either the high-WISC or low-WISC group with certain probabilities. At each step in the analysis the variable is introduced which provides the best discrimination when used in the discriminant functions. In the first step in this analysis the AdvPM was the first variable entered since it was the most discriminating. The functions were: High-WISC: 3.4 (AdvPM) - 37.3; and Low-WISC: 2.7 (AdvPM) - 23.8. These functions would have misplaced just one gifted student, placing him in the low-WISC group. Two nongifted students would have been placed in the high-WISC group.

At the second step the two functions were: High-WISC: 3.4 (AdvPM) + 1.6 (CAT problems) - 46.3; and Low-WISC: 2.7 (AdvPM) + 1.1 (CAT problems) - 28.3

[18]All nine gifted students scored in the top 16 on the AdvPM, with raw scores of 19 or better.

These resulted in no gifted student being misplaced and only one nongifted student being classified as gifted. Ten students could have been selected for testing by the AdvPM and the CAT problems test and nine of these would have been the gifted students, an effectiveness of 100 per cent and an efficiency of 90 per cent. That such efficiency and effectiveness could be achieved in practice is not suggested. The discriminant functions produced the best possible hindsight results from this very small sample. That such good discrimination was found, however, was a very promising result. Moreover the probabilities with which students were assigned to groups by the discriminant functions were high (10 out of the 18 were above .90) indicating good discrimination even among this group of students of generally high abilities.

Because the SPM and AdvPM have not been widely used in schools, a check was made of their reliability in this sample. A retest of 77 students with the SPM yielded a reliability coefficient of .86. Analysis of variance of 96 AdvPM scores yielded a Kuder-Richardson formula 20 reliability of .83.

DISCUSSION

With the increasing use of computers in school management it may eventually become feasible for discriminant functions to be used at the local level to select students for testing. However, at present a much simpler method must be available. The following procedure would have worked well in this group.

Stage 1: Screening: administer the SPM to all students as a 30-minute classroom test.

Stage 2: Selection: administer the AdvPM as a power test to the top 6 per cent on the SPM and to any students strongly recommended by parents or teachers.[19]

Stage 3. Identification: administer the WISC to:
   (a) students whose AdvPM scores were in the top half of the sample.
   (b) students who were in the top 2 per cent on the SPM.
   The top students on the WISC performance scale are the gifted group.

The SPM could be used alone but the addition of the AdvPM permits an increase in the efficiency and fairness of the selection procedure. Use of the AdvPM gives many students a second

[19]The inclusion at this stage of students strongly recommended by parents or teachers is made because it is difficult and disquieting to ignore strong recommendations and students can be included at this stage at little extra expense in time or money. In the present sample since student I was nominated by no less than three teachers he would have been included in the AdvPM testing. Since he scored in the top eight of the AdvPM he would certainly have received a WISC, thus making the selection procedure 100 per cent effective.

chance and ensures one uniform test administration. Moreover in the full procedure performance is measured under both timed conditions (on the SPM) and untimed (on the AdvPM).

It is hoped that the recommended selection procedure, being quick, justifiable, and inexpensive, will encourage school districts to implement special programs for the top 2 per cent of the "disadvantaged" students. Both in terms of human happiness and national need it is imperative that gifted students in urban areas be located early and be prepared for college entrance.