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ABSTRACT

This research study investigated the effects of the teacher attributes of strength and sensitivity, as measured by situational tests, and the pupil attributes of intelligence and creativity or the production of divergent responses. It was hypothesized that sensitivity on the part of the teacher would be more telling than strength, and the creativity of the pupil more telling than intelligence. Pupil subjects were selected from the fourth, fifth and sixth grades of a private elementary school, and the total of 32 was divided into four categories of high IQ-creative, average IQ-creative, high IQ-low creative, and average IQ-low creative. A group of 16 student teachers were divided into four categories, of strong-sensitive, weak-sensitive, strong-insensitive, weak-insensitive. In a balanced incomplete box design, all pupils were taught by all four types of teachers on a rotating basis, and responses were coded utilizing primarily the Aschner-Gallagher category of divergent thinking. A four-factor analysis of variance was used to evaluate the data. The results strongly support the impact of pupil attributes of creativity and intelligence on divergent production, and the greater salience of creativity is exhibited in the significant trend analysis. The findings suggest that achievement may be too inclusive a term, and identification of discrete differences in performance between groups of varying cognitive styles would be of value. (MBM)

THE EFFECTS OF TEACHER STRENGTH AND SENSITIVITY AND PUPIL INTELLIGENCE AND CREATIVITY ON THE PRODUCTION OF DIVERGENT RESPONSES

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THE EFFECTS OF TEACHER STRENGTH AND SENSITIVITY AND PUPIL INTELLIGENCE AND CREATIVITY ON THE PRODUCTION OF DIVERGENT RESPONSES[1]

Productive thinking has become of increasing concern to educators in the past decade. At conferences on productive thinking in 1961 and 1963, Guilford delineated two main elements--convergent production and divergent production.[2] Research indicates that convergent production and cognitive memory functions predominate in the classroom, with divergent and evaluative thinking de-emphasized. Gallagher, et al. found that in some class situations teacher requests for thought operations dealing with divergent and evaluative thinking did not exist at all; whereas, at best the two categories combined might account for 20 per cent of total teacher solicitations. In contrast, requests for convergent thinking often exceeded 50 per cent.[3] Gallagher and his colleagues concluded: "It was clear that character and style of verbal expressions were mainly directed by the teacher."[4]

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[1] The writer expresses appreciation to Dr. Leonard S. Blackman, Dr. Ross A. Evans, Dr. Bruce R. Joyce and Dr. Abraham J. Tannenbaum of Teachers College, Columbia University for help in preparation of the dissertation on which this paper is based.

[2] J. P. Guilford. "Intellectual Factors in Productive Thinking," Productive Thinking in Education, Mary Jane Aschner and Charles E. Bish, editors (Washington, D. C.: The National Education Association and The Carnegie Corporation of New York, 1965), p. 5.

[3] James J. Gallagher, Mary Jane Aschner and William Jenné. Productive Thinking of Gifted Children in Classroom Interaction. The Council for Exceptional Children Research Monograph Series B, No. B-5 (Washington, D. C.: The Council for Exceptional Children, National Education Association, 1965), pp. 40-41.

[4] Ibid., p. 3.

If in fact the teacher directs the verbal flow in the classroom, it may well be asked: What teacher attributes influence the encouragement of certain patterns of thought expression, or more specifically encourages divergent production? A multitude of investigations on teacher effectiveness have probed this issue. Of interest has been the selection process of the Urban Teacher Preparation Program in Syracuse.[1] Two situational tests "The Control Task" and "The Communication Task" were devised to assess a candidate on the dimensions of strength and sensitivity. Operationally the terms may be defined as follows:

> Strength: The ability to initiate structure and effectively handle a variety of input.
>
> Sensitivity: The ability to perceive the learner's frame of reference with subsequent utilization of this information in the teaching process.

The constructs of strength and sensitivity might well serve as vehicles to further circumscribe the concept of effectiveness. Insight into teacher-pupil interactions may be forthcoming through exploration of the impact of strength and sensitivity on the encouragement of divergent production by children.

Despite the educator's proclivity to emphasize the impact of the teacher on a classroom situation, pupil attributes influencing production of divergent thinking can not be discounted. Traditionally since Binet, intelligence has been associated with productive thinking. More recently, interest in creativity sparked by the work of Guilford has encouraged inquiry into multiple talents. Research on tests of creativity and

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[1] Gerald Weinstein, David E. Hunt and Bruce R. Joyce. "Situational Assessment of Urban Teacher Candidates" (New York: Fund for the Advancement of Education, 1966). (Mimeographed.)

intelligence indicate that the two have an oblique relationship with the correlations being from .20 to .40 and even lower in high ability groups. It has been posited that an IQ threshold of about 120 exists beyond which an increase in IQ is not necessarily accompanied by an increase in performance on measures of creativity. The work of Getzels and Jackson brought into prominence the possibility of differing cognitive styles, that of the highly intelligent and the highly creative, resulting in comparable achievement by both groups.[1] Wallach and Kogan explored this possibility further, utilizing assessment of creativity in an individual game-like atmosphere.[2] They delineated profiles of four distinct groups--high creativity-high intelligence, high creativity-low intelligence, low creativity-high intelligence and low creativity-low intelligence. Aschner and Gallagher, exploring three of these groups, found that their high IQ-high divergent group produced a higher mean divergent responses than the low IQ-high divergent group which in turn produced a higher mean divergent responses than the high IQ-low divergent group.[3]

The present study was concerned with investigating the effects of the teacher attributes of strength and sensitivity, as measured by situational tests, and the pupil attributes of intelligence and creativity on the production of divergent responses. In addition to exploration of the four main effects, it was hypothesized that sensitivity on the part of the

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1 Jacob W. Getzels and Philip W. Jackson, Creativity and Intelligence (New York: John Wiley and Sons, Inc., 1962).

2 Michael A. Wallach and Nathan Kogan, Modes of Thinking in Young Children (New York: Holt, Rinehart and Winston, Inc., 1965).

3 James J. Gallagher, Mary Jane Aschner and William Jenné. Productive Thinking of Gifted Children in Classroom Interaction, p. 79.

teacher would be more telling than strength so that the expected rank order of teachers who would elicit proportionately greater divergent responses from pupils would be as follows: strong-sensitive, weak-sensitive, strong-insensitive and weak-insensitive. Similarly, creativity of the pupil was felt to be more salient than intelligence in influencing the production of divergent responses; therefore, the predicted rank order of pupils producing greater divergent responses was as follows: high Iq-creative, average IQ-creative, high IQ-low creative and average IQ-low creative.

The pupil subjects were selected from the sixty-three fourth, fifth and sixth graders of Agnes Russell School, a private elementary school with an enrollment drawn primarily from the families of the staff and students of Teachers College, Columbia University. Scores from The Lorge-Thorndike Intelligence Tests, Level Three, administered to the population by the classroom teachers in the spring of 1967 were used. During the first week of May, 1967, the writer administered and scored The Torrance Tests of Creative Thinking, Verbal Test A and Figural Test B. On the basis of scores on the two instruments, thirty-two subjects were selected. Eight subjects, four boys and four girls, were chosen for each of the following categories: high IQ-creative, average IQ-creative, high IQ-low creative and average IQ-low creative. High IQ was defined as those students who scored better than 120 on the intelligence measure with average IQ being those who scored below 120. Creatives were defined as those who scored above the grade median on the total creativity test. T-scores for the figural and verbal forms were averaged to derive the total creativity score. Due to absences during the experiment and the elimination of non-English speaking children, two subjects were included in the high IQ-low creative group though they were above the median for

their grade in creativity. Table 1 tabulates the means, standard deviations and ranges for scores of intelligence and creativity of the groups of pupils.

The student teachers were selected from a group of thirty in the Preservice Program of Curriculum and Teaching, Teachers College, Columbia University. Adaptations of "The Communication Task" and "The Control Task" were administered in January, 1967, yielding indices for strength and sensitivity. On the basis of these indices, sixteen females were selected, four in each of the following categories: strong-sensitive, weak-sensitive, strong-insensitive and weak-insensitive. Scores above and below the median were used to determine classification. With the limited population, it was necessary to include three subjects who were not clearly in a category. The means, standard deviations and ranges of the four teacher categories are tabulated in Table 2.

A balanced incomplete block design was used with repeated measures across pupil categories and student teacher categories. Each of the four blocks consisted of four student teachers, one from each student teacher category, and eight pupils, two from each pupil category. Pupils in each category were paired, a boy and a girl constituting each pair. All four pairs of pupils were taught by all four types of teachers on a rotating basis. The four lessons, each fifteen minutes in length, dealt with a comparison of oriental and occidental modes of perception as reflected in works of art. The criterion measure primarily utilized the Aschner-Gallagher category of divergent thinking.[1]

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[1] Mary Jane Aschner, James J. Gallagher, et al. "A System for Classifying Thought Processes in the Context of Classroom Verbal Interaction." (Institute for Research on Exceptional Children, University of Illinois, February, 1965) (Mimeographed.)

The children's responses were coded from tape recordings of the lessons producing a score reflecting the proportion of divergent responses to the sum of convergent and divergent responses. The means and standard deviations of the proportion of divergent responses for the four pupil categories under the student teacher categories are presented in Table 3. A random sampling of ten of the sixty-four lessons was taken for an inter-judge reliability check. Pearson product-moment correlation coefficients between judges were .91 for divergent responses and .95 for convergent responses.

A four factor analysis of variance specially designed to account for repeated measures across both pupil and student teacher categories was utilized.[1] Scores were converted by the arcsin transformation prior to the analysis to compensate for the lack of normality in the distribution of proportions. The analysis is presented in Table 4. As can be seen in Table 4, the pupil attributes of intelligence and creativity yielded highly significant values. The F value for the main effect of pupil intelligence was 9.02 (df=1,9) which was significant beyond the .025 level. The main effect of pupil creativity attained a F value of 32.64 (df=1,9) which was significant beyond the .0005 level. The teacher main effects of strength and sensitivity were not significant at the .05 level. All interaction effects were also not significant. The results of the rank ordering for both student teacher and pupil categories were in the predicted direction as illustrated in Figures 1 and 2. An analysis for trends utilized to measure the magnitude of the trend yielded a F value of 41.66 (df=1,9)

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[1] The writer would like to thank Dr. Rosedith Sitgreaves, Teachers College, Columbia University, who designed the statistical model and served as consultant on the study.

which was significant beyond the .0005 level.[1] The analysis of trends to indicate the magnitude of the trend across teacher categories was not significant with a F value of 1.32 (df=1,9).

If one accepts the premise that there is a direct relationship between teacher questions and pupil responses, the present sample of student teachers failed to utilize divergent-type questions extensively. An inspection of the exchanges between teachers and pupils revealed that the teachers did in fact employ a majority of questions restricted to fact-stating. In addition, the general preoccupation with conveying the objective of each lesson seemed to insensitize the teachers to the divergent production of the pupils. It has been reported that the population of thirty from which the present sample of student teachers were selected had a low and constricted range in conceptual levels.[2] There is some indication that this restricted range is related to the restricted question-asking behavior of the student teacher subjects. The confirmation of the predicted rank ordering of the teacher categories, though not significant in magnitude, indicates that strength and sensitivity may have had some effect on the production of divergent responses, though this influence has been mitigated by one or a combination of reasons stated above.

The results strongly support the impact of the pupil attributes of creativity and intelligence on divergent production. With the close relationship between creativity and divergence, it can be expected that

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1 B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill Book Co., Inc., 1962), pp. 70-77.

2 Clark C. Brown, "The Relationship of Initial Teaching Style and Selected Variables in Student Teaching" (unpublished Doctoral dissertation, Teachers College, Columbia University, New York, 1968), p. 101.

creativity would be an efficient predictor of divergent responses. Intelligence too would be expected to influence divergent production. The greater salience of creativity as expected is exhibited in the significant trend analysis. The threshold of 120 IQ did not appear of relevance to divergent production since the low IQ-high creatives produced more divergent responses than the high IQ-low creatives. The finding suggests that achievement may be too inclusive a term. Identification of discrete differences in performance between groups of varying cognitive styles would be of value.

Several limitations of the study are apparent. The instruments constructed to assess the teacher attributes would benefit from further refinement. The small group situation may have given a distorted representation of the interaction of the four main effects as they might interact in a classroom. The short lesson may have provided insufficient time for the teacher attributes to be felt. The inadequate separation of groups and the possibility of confounding variables make the findings far from definitive. Future research compensating for these limitations may yield additional information on the prominence of the pupil attributes found in the present study and indicate further directions in the investigation of teacher behavior.

TABLE 1

MEANS, STANDARD DEVIATIONS AND RANGES OF
INTELLIGENCE AND CREATIVITY MEASURES
FOR PUPIL CATEGORIES

Category	Intelligence			Creativity		
	Mean	S.D.	Range	Mean	S.D.	Range
HiIQ-Cr.	136.63	7.13	126-145	56.50	6.68	49-69
A.IQ-Cr.	113.00	2.62	110-117	48.75	3.77	42-54
HiIQ-LC	131.88	6.81	124-142	42.50	4.60	34-47
A.IQ-LC	103.38	7.41	96-116	39.25	4.74	30-45

TABLE 2

MEANS, STANDARD DEVIATIONS AND RANGES OF
STRENGTH AND SENSITIVITY MEASURES
FOR STUDENT TEACHER CATEGORIES

Category	Strength			Sensitivity		
	Mean	S.D.	Range	Mean	S.D.	Range
St.-Sen.	6.89	0.26	6.56-7.17	7.23	1.59	5.6-9.0
W.-Sen.	5.03	0.72	4.42-5.84	5.50	1.01	4.8-7.0
St.-Ins.	5.84	0.24	5.50-6.00	3.35	0.47	3.0-4.0
W.-Ins.	3.17	0.50	2.56-3.70	3.25	0.44	2.8-3.8

TABLE 3

MEANS AND STANDARD DEVIATIONS FOR PROPORTION OF DIVERGENT RESPONSES BY STUDENT TEACHER AND PUPIL CATEGORIES

Pupil Category	Student Teacher Category							
	St.-Sen.		W.-Sen.		St.-Ins.		W.-Ins.	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
HiIQ-Cr.	0.14	0.12	0.14	0.13	0.10	0.09	0.09	0.07
A.IQ-Cr.	0.09	0.04	0.09	0.12	0.09	0.05	0.06	0.05
HiIQ-LC	0.10	0.08	0.03	0.04	0.05	0.04	0.04	0.03
A.IQ-LC	0.03	0.03	0.04	0.06	0.04	0.04	0.04	0.03

TABLE 4

ANALYSIS OF VARIANCE FOR TRANSFORMED DIVERGENT RESPONSE SCORES

Source	Mean Square	Degrees of Freedom	F
Strength	16.99	1	1.01
Sensitivity	18.44	1	1.09
St. X Sen.	0.26	1	----
Teachers Within Blocks (Error a)	16.86	9	
Intelligence	72.97	1	9.02*
Creativity	264.09	1	32.64**
IQ X Cr.	0.95	1	----
Pupils Within Blocks (Error b)	8.09	9	
St. X IQ	1.26	1	----
St. X Cr.	0.02	1	----
Sen. X IQ	15.64	1	1.62
Sen. X Cr.	4.81	1	----
St. X Sen. X IQ	5.57	1	----
St. X Sen. X Cr.	6.17	1	----
St. X IQ X Cr.	19.97	1	2.06
Sen. X IQ X Cr.	0.21	1	----
St. X Sen. X IQ X Cr.	4.42	1	----
Residual (Error c)	9.67	27	
Blocks	38.93	3	
Total		63	

* Significant beyond the .025 level.
** Significant beyond the .0005 level.

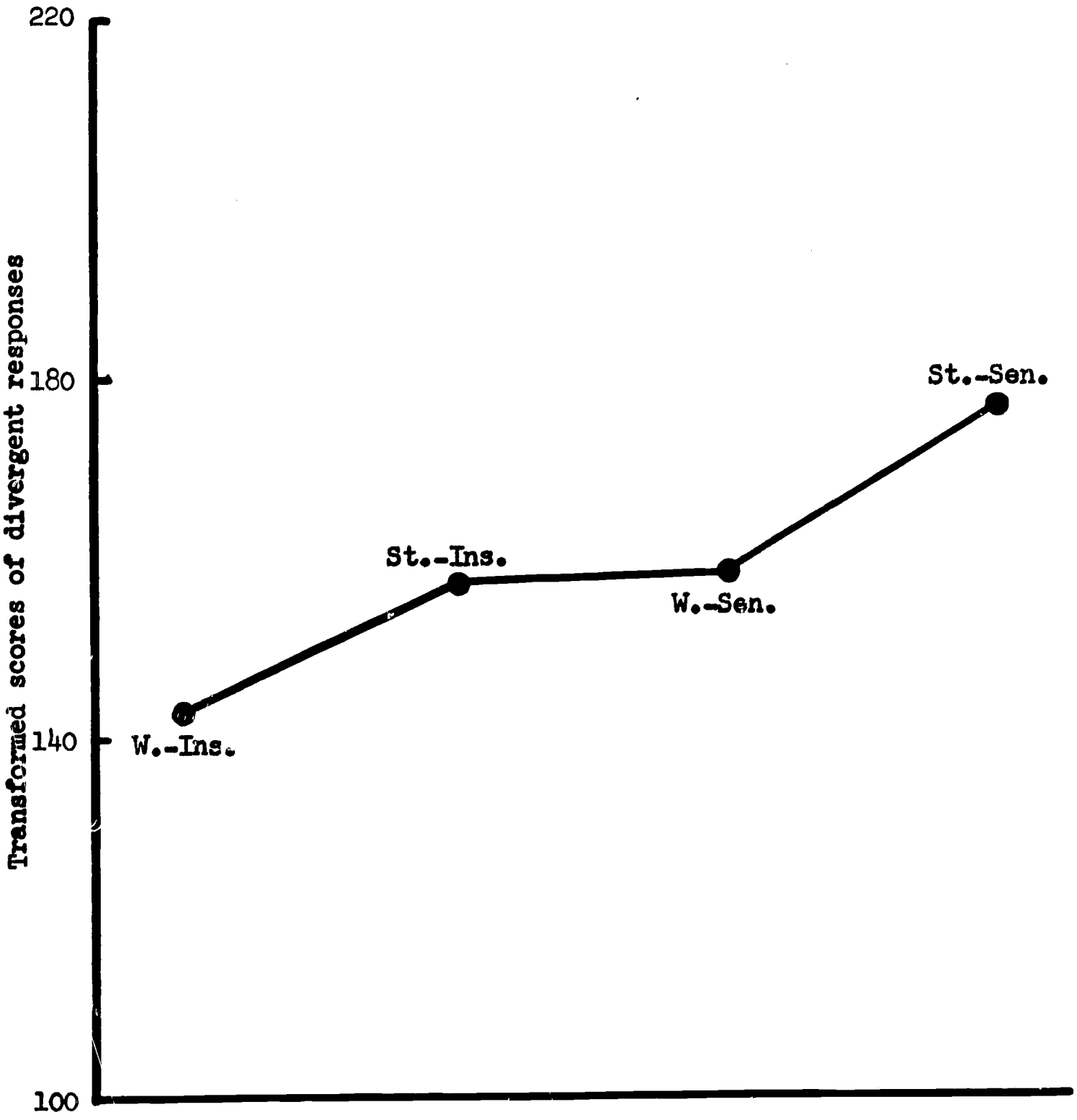

FIGURE 1

LINEAR TREND ACROSS STUDENT TEACHER CATEGORIES

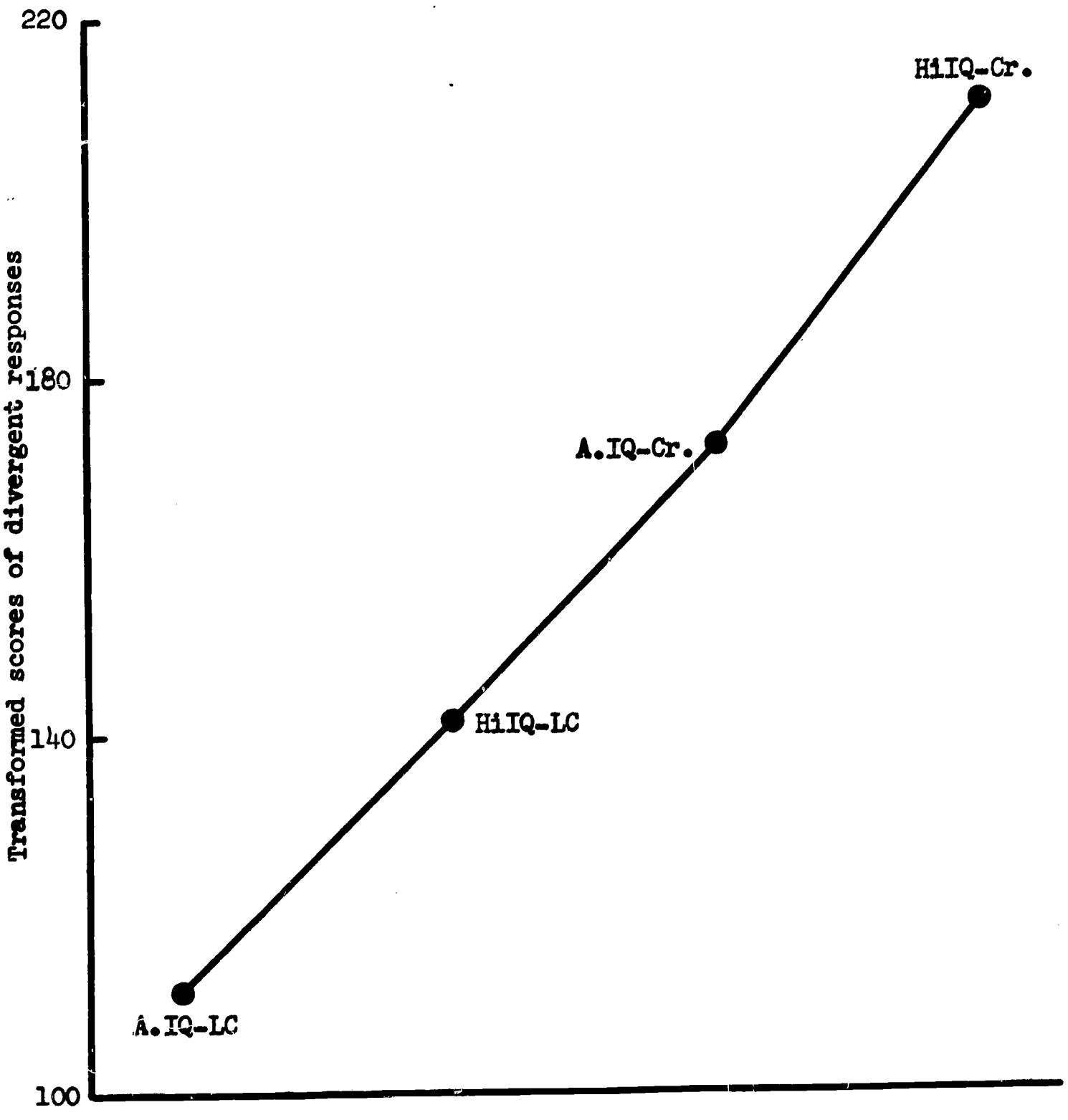

FIGURE 2

LINEAR TREND ACROSS PUPIL CATEGORIES

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