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STUDENT CREATIVITY, INTELLIGENCE, ACHIEVEMENT, AND TEACHER CLASSROOM BEHAVIOR.

BY- STEVENS, JOHN C. AND OTHERS

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TO DETERMINE WHETHER STUDENTS WHO PERCEIVE THEIR TEACHERS DIFFERENTLY ALSO DIFFER IN CREATIVITY, A SAMPLE OF 197 STUDENTS (82 MALES AND 115 FEMALES) WAS RANDOMLY SELECTED FROM ONE HIGH SCHOOL. EACH STUDENT WAS GIVEN THREE TESTS OF COGNITIVE FACTORS--THE UTILITY TEST (LISTING DIFFERENT USES FOR A BRICK AND A WOODEN PENCIL), THE APPARATUS TEST (SUGGESTING TWO IMPROVEMENTS FOR EACH OF 10 COMMON ITEMS), AND THE PLOT TITLES TEST (COMPOSING DIFFERENT TITLES FOR FOUR STORY PLOTS)--AS WELL AS THE PUPIL OBSERVATION SURVEY (POS) (ON WHICH THE STUDENT RATED HIS ENGLISH TEACHER ON AMOUNT OF CONTROL, STIMULATION, AMIABILITY, AND KNOWLEDGEABILITY). RESULTS OF FACTOR ANALYSES OF THESE MEASURES AND CORRELATIONS WITH ACHIEVEMENT AND INTELLIGENCE DATA FROM SCHOOL FILES WERE--(1) THE THREE CREATIVITY TESTS YIELDED FOUR FACTORS CONSISTENT WITH PREVIOUS ANALYSES (COMMON PLOT TITLES, CLEVER PLOT TITLES, DRASTIC-MINOR APPARATUS, AND UTILITY), (2) AS IN EARLIER STUDIES, RELATIONSHIPS OF POS FACTORS WITH STUDENT CREATIVITY AND WITH ACHIEVEMENT RANGED BETWEEN LOW NEGATIVE AND LOW POSITIVE, (3) PERCEPTIONS OF THE TEACHER AS KNOWLEDGEABLE AND EXHIBITING DEMOCRATIC LEADERSHIP WERE SIGNIFICANTLY CORRELATED WITH THE THREE MEASURES OF DIVERGENT THINKING, AND (4) PERCEPTIONS OF THE TEACHER AS FRIENDLY, CHEERFUL, ADMIRED, AND STUDENT-CENTERED IN INSTRUCTION WERE EACH NEGATIVELY RELATED TO ONE OF THE MEASURES OF CREATIVITY. THIS PAPER WAS PRESENTED AT THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION CONVENTION (NEW YORK, 1967). (LC)

STUDENT CREATIVITY, INTELLIGENCE, ACHIEVEMENT, AND TEACHER CLASSROOM BEHAVIOR

John C. Stevens

Harry E. Anderson, Jr.

William F. White

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Student Creativity, Intelligence, Achievement, and Teacher Classroom Behavior

Abstract

Approximately 50 students were randomly selected from each grade, nine through twelve, and administered the following creativity tests: Plot Titles, Apparatus, and Utility. A factorial study of part scores suggested substantial reliability for the tests together with factorial validity for Major and Minor Plot Titles and the Utility Tests. Major and Minor Revisions in the Apparatus Test, however, determined a bipolar factor in the structure. The creativity factors were correlated with factors of student perception of teacher classroom behavior obtained from the Pupil Observation Survey, and both sets of factors were studied with regards to IQ, standardized achievement, and classroom achievement.

Student Creativity, Intelligence, Achievement, and Teacher Classroom Behavior

Introduction

The relationships between student creativity and teacher-student interaction has received attention from many researchers. Torrance (1962), for instance using a sample of university experimental school students, in the first through sixth grades, demonstrated that special training, or brainstorming, produced higher scores in creativity than those scores of children who were merely promised prizes for their work. Specific instructions to generate clever and unusual responses appeared to elicit a greater number of unusual responses than merely requesting a larger quantity of ideas. Torrance's results support previous findings with regard to brainstorming and directional cues (e.g., Meadow, et al, 1959; Parnes, 1961; and Gerlach, et al, 1964) but with specific implications for creative student behavior. Teachers can stimulate creative behavior in the classroom.

Whether or not teachers actually do stimulate or even desire, creative behavior in the classroom is another question. Negative findings have been published by Getzels and Jackson (1962), Torrance (1963), and MacKinnon (1962). Positive results, however, have been reported by Cline, et al (1963), and Sears (1963) found a positive correlation between creativity scores and teacher interest in student's ideas.

The above studies focused, in general, on teacher attitudes and behavior independent of student perception or assessment of that behavior. The present study was designed to investigate re-

lationships among factors of teacher behavior as perceived by the student and student creativity. Moreover, behavior and creativity factors were studied with regard to achievement and intelligence.

Method

Subjects. A sample of 197 students, 82 males and 115 females, were randomly selected from a high school with grades 9 through 12.

Variables. Three measures of creativity were obtained for each student: the Utility Test, the Apparatus Test, and the Plot Titles Test (French, Ekstrom, and Price, 1963). Test administration followed the instructions of the included manual. For the Utility Test, the subjects were required to list as many uses as possible for two common objects, a brick and a wooden pencil. Five minutes were allowed for each object and the score was the number of changes from one class of use to another. The Apparatus Test contained two lists each of 10 common items (e.g., toaster, clock, flashlight, etc.) and the subjects were asked to suggest two improvements for each item. Seven minutes were allowed for each list and both the number of Major and the number of Minor Revisions were scored for analysis. Four story plots are contained in the Plot Titles Test and the students were given three minutes to list as many clever titles as possible for each plot. The scores here were the number of High Quality and Low Quality titles for each story.

The Pupil Observation Survey (POS) (Veldman and Peck, 1963) was used to obtain ratings of teacher behavior by the students. Each student was asked to rate his/her current English teacher; thus, each student rated one of the six female English teachers

in the study. Each of the 38 POS items was used with a four-point scale ranging from (1) "always or completely false" to (4) "always or completely true."

Other data was made available for the study from school records. These data included the mid-year grade in English, the IQ scores from the California Test of Mental Maturity (CTMM), and the average grade placement for the reading and language sections of the CAT.

Procedures and analyses. The responses to the creativity and POS variables were obtained in a single administration period. The achievement and intelligence data were taken from the central file in the school.

The analyses of the creativity responses are based on the ratings of one judge. Three other judges, however, in a short scorer reliability study, were trained in the scoring procedures and criteria set forth in the manual and then they each independently rated the tests for a subsample of 50 students. The mean correlations between the three judges' ratings and the study judge's ratings were .77 for Plot Titles, .88 for Apparatus, and .98 for Utility.

Product-moment correlations were obtained for scores of the parts of each creativity test. The correlation matrix was factored by the principal axis method and all factors with eigenvalues greater than unity were rotated with the normalized varimax routine (Kaiser, 1958). Factor scores were obtained, following Harman (1960, p. 341) in matrix notation,

$$S_F = ZR^{-1} F \qquad (1)$$

where, for N persons, p variables, and k factors, S_F is the NXk

factor score matrix, Z is the NX_f standard score matrix, R^{-1} is the inverse of the p x p correlation matrix, and F is the p x k factor loading matrix.

Veldman and Peck (1963), using mean student response for ratings of 554 student teachers, found five major factors of teacher behavior in their analysis of the 38 POS items. White and Anderson (In Press), with individual responses of the present study sample, determined 10 interpretable factors, and similar results have been obtained at other age levels. The White-Anderson factor loading matrix, therefore, was used in equation (1), together with the appropriate Z and R^{-1} matrices, to compute POS factor scores.

In this study the POS and creativity factor scores were correlated to study creative ability in relation to student perception of teacher behavior. Finally, correlations were obtained between the factor scores and the achievement and QTMM variables.

Results

Means, standard deviations, and major rotated factor loadings for the creativity tests variables are presented in Table 1. The use of part scores of the three scales brings specific variance into the common factor space so that the total analysis may have more implications for reliability and factorial validity than anything else. Specifically, however, four factors were clearly defined and communalities range from .54 to .78.

Part scores for Common Plot Titles, Clever Plot Titles, and Utilities define three clear factors (viz., I, II, and IV) in the system. The part scores for these three creativity tests, then,

are shown to have factoria validity. Factor III is a bipolar factor with strong positive loadings for the two Major Revision parts and high negative loadings for the two Minor Revision parts.

The ten POS factors have been described seperately (White and Anderson, In Press) so they will not be treated in detail here. Of the 40 correlations between the 10 POS and the four creativity factor scores, only one was significant beyond the .01 level and three others beyond the .05 level. The Clever Plot Titles Factor correlated -.24 with the POS Friendly, Cheerful and Admired Factor, while the Common Plot Titles Factor had a correlation of -.20 with the POS Student Centered Instruction. The remaining two significant correlations were positive: Drastic-Minor Apparatus Factor and POS Democratic Leadership Factor correlated .20; and the Utility Factor and the POS Knowledgeable Factor correlated .18. Although the significant correlations are low, there is some evidence in this study for the relationship between student creativity and factors of teacher behavior as perceived by the students.

Significant correlations between CTMM-IQ, CAT, and mid-year English grades are presented in Table 2; also, the correlations between these variables and factors of creativity and in the POS are also included. The correlations between the achievement and intelligence variables are all positive and significant. Half of the significant correlations between the different creativity factors and intelligence and achievement are negative. Similarity, three of the seven significant correlations between the latter variables and the 10 POS factors are also negative.

Disucssion

The determination of creativity factors I, II, and IV were entirely expected in the analysis. Guilford and others (e.g., Guilford and Hoepfner, 1966; and Brown, Guilford, and Hoepfner, 1966) have found Common Plot Titles to be a measure of a factor called divergent production of semantic units; Clever Plot Titles, divergent production of semantic transformations; and Utility, divergent production of semantic classes. The consistency and independence of these factors in previous research provided no hypothesis with regard to the collapse of their several part scores into fewer dimensions.

The bipolar Drastic-Minor Apparatus Factor was not expected in the results. Guilford (1966) has reported in personal communication that the correlation between Drastic and Minor Revisions is typically .01 and inquired as to an administration or scoring artifact; e.g., if most students made two responses for each of the 10 items in each list, the Drastic-Minor Revision scores would sum to 20 for each list and their correlations would be -1.0. Administration timing was rigidly adhered to, however, and the part means and standard deviations suggest no such artifact. In an investigative analysis, five factors were extracted and rotated, but this solution seemed less clear than the four-factor solution. The full meaning of this finding must be held in abeyance for further research.

The relationship between creativity and perceived teacher behavior is low enough that it should be considered to indicate only tendencies. For instance, those students who did relatively well in producing common plot titles saw less student centered

instructional behavior in the teacher; likewise, the students producing relatively many clever plot titles perceive the teacher as being less friendly, cheerful and admired. These findings could then be rephrased in terms of Guilford's model. Student divergent production of semantic units and transformations had a low negative relationship to these teacher characteristics. Conversely, the more imaginative student in suggesting improvements for apparatus perceives more democratic leadership in the teacher while the student more divergently productive in semantic classes saw more knowledgeable characteristics in the teacher's classroom behavior. Combining our results with those of Torrance (1962) and Sears (1963), there is an implication that teachers might elicit more creative behavior from students in the classroom by brainstorming ideas with the students and actively displaying an interest in the student's ideas, but conducting such sessions with professional detachment in a democratic atmosphere.

The correlation between intelligence and achievement variables are quite similar to those found in other studies (e.g., Anderson, 1961a, 1961b, and Anderson and Slivinske, 1963). Most studies report a higher correlation of classroom grades with standardized achievement than with IQ, and a higher correlation of standardized achievement scores with IQ than with grades.

Production of common plot titles is negatively related to the CAT and the CTMM while production of clever plot titles is positively related to the CTMM and to English grades. This set of correlations seem entirely reasonable, and the correlation of the creativity Factor II and the CTMM of .40 is the largest of the four. Moreover, the positive and negative correlations suggest

something in the nature of bipolar characteristics in the relative number of clever and common plot titles not available from a factor structure of the creativity part scores. Factors III and IV from Table 1 are not significantly related to intelligence and achievement.

With regard to the POS factor correlations in Table 2, the Lively and Interesting Factor of teacher behavior is negatively related to both IQ and CAT scores. Similar to the correlations immediately above, the Democratic Leadership and Knowledgeable factors of teacher behavior are significantly and positively related to achievement as well as certain creative responses from the student. Student centered instructional behavior, however, is negatively related to classroom achievement but positively related to CAT scores. Other correlations were not significant.

Summary

The results of the present study support the factorial validity of the Clever and Common Plot Titles and the Utility creativity tests. Drastic and Minor improvements of apparatus, however, were determined to be bipolar in the present analysis, a finding inconsistent with previous studies with these variables.

Similar to other studies, factors of teacher behavior were found to have from low to moderate relationships with creativity as well as achievement of the students.

Perception of the teacher as knowledgeable and exhibiting democratic leadership were significantly correlated with different measures of divergent thinking while factors of teacher perception of friendly, cheerful and admired and student-centered in instruction were each negatively related to one of these measures of creativity.

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Table 1

Rotated Factor Loadings for Secondary School Students for Part Scores on the Plot Titles, Utility, and Apparatus Tests*

Tests	Means	Standard Deviation	Factors				h^2
			I Common Plot Titles	II Clever Plot Titles	III Drastic-Minor Apparatus	IV Utility	
1. Utility (Brick)	4.07	3.15				.84	.70
2. Utility (Wooden Pencil)	4.73	3.72				.80	.67
3. Apparatus (List One): Major Revision	5.11	3.19			.79		.69
4. Apparatus (List One): Minor Revision	7.22	4.14			-.67		.74
5. Apparatus (List Two): Major Revision	4.05	2.61			.81		.75
6. Apparatus (List Two): Minor Revision	9.95	4.48			-.58		.65
7. Plot Title (One): High Quality	1.40	1.56		.61			.58
8. Plot Title (One): Low Quality	3.75	2.34	.83				.71
9. Plot Title (Two): High Quality	1.50	1.45		.61			.54
10. Plot Title (Two): Low Quality	4.61	2.79	.87				.78
11. Plot Title (Three): High Quality	0.76	1.02		.80			.64
12. Plot Title (Three): Low Quality	3.92	2.04	.83				.73
13. Plot Title (Four): High Quality	0.65	0.99		.75			.56
14. Plot Title (Four): Low Quality	4.34	2.41	.83				.72

*All loadings below .35 omitted from table.

Table 2

Significant ($p < .05$) Correlations of POS and Creativity Factors

With Scores on the CTMM, the CAT and Mid-year English Grades

Variables	CTMM	CAT	English Grades	Creativity Factors*				POS Factors **									
				I	II	III	IV	I	II	III	IV	V	VI	VII	VIII	IX	X
CTMM		.55	.44	-.21	.40				-.30								
CAT	.55		.51	-.24					-.23		.26					.18	
English Grades	.44	.51			.19			.25			.33					-.20	

* I = Common Plot Titles, II = Clever Plot Titles, III = Drastic-Minor Apparatus, IV = Utility

** I = Democratic Leadership, II = Lively and Interesting, III = Friendly, Cheerful, and Admired, IV = Knowledgeable, V = Instructional, VI = Stimulating but Rigid, VII = Impartial Control, VIII = Amiable Control, IX = Student Centered Instruction, X = Demanding.