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ABSTRACT

The performance of 131 urban sixth-grade students on the Uses Test of creativity was studied in four environments to determine the effects of testing condition variables and to find optimal testing procedures. Testing condition variables included the giving of grades vs. no grades and individual vs. group administration of the task. The four test environments included combinations of the above alternatives, all with the subjects doing independent written work. Both group testing and the giving of grades were associated with higher scores, and the Group-Grades combination was especially favorable. Of the two variables, grading had the stronger influence. Subjects given grades, when compared to those not given grades, had higher scores for total number of uses, unique uses, non-unique uses, and total time spent. Subjects tested in groups generated more non-unique uses and spent more time than those tested individually; differences on the other two measures were not significant. Interactions, where present, favored the Group-Grades testing condition. The Group-Grades condition also appears to have advantages over test environments used in previous studies. However, validation of the Uses Test in the Group-Grades environment has yet to be tried. Under the time-free conditions of the present study, time spent on the Uses Test correlated highly with all three performance scores; creativity scores also were independent of IQ. It is suggested that voluntary concentration time may be a key variable differentiating creative and uncreative students on a measure which is independent of IQ. (Author)

THE EFFECTS OF ENVIRONMENT ON PERFORMANCE DURING CREATIVITY TESTING

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ABSTRACT

Student performance on the Uses Test of creativity was studied in four environments to determine the effects of testing condition variables and to find optimal testing procedures.

Ss were 131 urban sixth-grade pupils. The Uses Test of creativity called for a subject to list all the uses he could think of for a common object.

Testing condition variables included (a) the giving of grades vs. no grades; and (b) individual vs. group administration of the task. The four test environments included combinations of the above alternatives, all with Ss doing independent written work.

Both variables affected performance: both group testing and the giving of grades were associated with higher scores, and the Group-Grades combination was especially favorable. Of the two variables, grading had the stronger influence. Ss given grades, when compared to Ss not given grades, had higher scores for total number of uses, unique uses, non-unique uses, and total time spent. Ss tested in groups generated more non-unique uses and spent more time than Ss tested individually; differences on the other two measures were not significant. Interactions, where present, favored the Group-Grades testing condition.

The Group-Grades condition also appears to have advantages over test environments used in previous studies. In comparison to Wallach & Kogan's (1965) and Ward's (1956, 1968) individual testing environment, it is less time-consuming and it lacks the social pressures peculiar to the individual environment, pressures which may make test results socially biased. In comparison to Wallach & Wing's (1969) mailed-test situation, it has greater control over the possible problems of non-response and cheating and it permits the gathering of time data. However, validation of the Uses Test in the Group-Grades environment has yet to be tried.

Under the time-free conditions of the present study, time spent on the Uses Test correlated highly with all three performance scores; creativity scores also were independent of IQ. It is suggested that voluntary concentration time

may be a key variable differentiating creative and uncreative students on a measure which is independent of IQ.

1. Background

For detailed reviews of problems in creativity testing, see Edwards (1970) and Wallach (1970).

A major problem for students of creativity has been to devise tests that are adequate measures. For a test to be considered a measure of creativity, it should meet these criteria:

1. Tests of creativity should intercorrelate highly among themselves, but have a low or zero correlation with IQ. This ensures that the tests measure an independent construct and are not simply IQ tests.

2. Tests of creativity should predict to an outside criterion of creativity. An example of such a criterion would be a professor's rating of a student's creativity. Use of a criterion helps to ensure that the variable being measured actually is creativity.

Guilford and colleagues have had very limited success in establishing an independent measure of creativity. They administered the Uses test and other measures of fluency in classrooms and used rigid, short time limits on each item. Of the studies reviewed by Edwards (1970), the average of the correlations among the fluency measures was only .30, and the average of the correlations between IQ and the fluency measures was .15.

Wallach, Ward, and colleagues employed fluency tests very much like Guilford's, but changed the conditions under which the tests were given. Their testing conditions were time-free and involved either permissive individual testing (Wallach & Kogan, Ward) or a mailed-test procedure (Wallach & Wing).

Ward (1966, 1968) indicated that under time-free conditions, students who took the longest were the ones who did the best. (The average of the correlations between time voluntarily spent and total fluency was .77 for kindergarten children and .81 for third graders.) Time spent on the tasks also proved to be independent of IQ.

By changing the testing conditions, Wallach, Ward, and colleagues developed creativity measures which are independent

measures (i.e., they correlate rather highly among themselves and are independent of IQ), and which relate somewhat to an outside criterion, extracurricular creative involvement.

The key to the success of Wallach, Ward, and colleagues was their change in testing conditions. However, they arrived at their particular testing conditions without previously doing any systematic investigation of the effects of testing conditions on creative behavior.

In particular, Wallach and colleagues have emphasized the permissiveness of their testing conditions as being important to their success in establishing measures of creativity. In all studies, some attempt was made to do away with the non-permissive testing atmosphere under which most school tests are given. Wallach and colleagues, however, did not actually investigate the effect of permissive vs. non-permissive conditions.

The present study compares the work of students who know that their scores count toward a report card grade to that of students who know their scores do not count for anything and will not be given to the teacher.

The testing conditions of Wallach & Kogan and Ward differed from those of Guilford not only in increased permissiveness but also in a change from group to individual testing. Individual testing was assumed to be worth the extra work to the experimenter but was never actually shown to be an improvement. The greater success of the Wallach studies could have been due solely to removal of time limits or to other alterations, and not to the introduction of individual testing. In the present study, individual and group testing are compared to show their effects on creativity in a time-free environment.

The two testing condition variables to be studied, then, are Grades vs. No Grades and Individual vs. Group testing. The study serves to show which of the above alternatives maximize creative behavior in time-free environments and to indicate any differences between the natural classroom environment (the Group-Grades condition) and various other environments used for testing (e.g., the Individual-No Grades Condition).

II. Method

Subjects

Ss were 131 sixth-grade public school students from Fall River, Massachusetts. The majority were from low-income families. Mean IQ was 100.59.

Six classes were tested: two under each of the group conditions and one under each of the individual conditions. The classes were selected by the assistant superintendent as being similar in scholastic ability. Covariance adjustment for IQ was unnecessary because IQ differences among groups proved to be slight and because IQ was shown to be independent of creativity scores.

Test Materials

Creativity was measured by one item from the Uses Test. Each S was asked to list as many uses as possible for that item. To guard against cheating, every other S in each test condition was given the item cup and the others were given the item shoe. (Pilot testing indicated that Ss generated approximately the same number of uses for each item.) In the group conditions, Ss seated next to each other were given two different items; in the individual conditions, Ss tested on succeeding days had different items.

Procedure

Students in the No-Grades conditions were told that their scores would not be sent to the teacher and would not count toward a grade in school, while students in the Grades conditions were told that their scores would be given to the teacher and would count toward their grade. Scores of the latter students were sent to their teachers; the teachers previously had agreed to include these scores in the weekly averages. (All teachers who were asked agreed to give grades; assignment of a class to a graded condition was not made on the basis of teacher willingness to give grades.)

Equivalent directions were used for the group and the individual administrations of each test. (See Edwards, 1970, for details of this and other procedures.)

The time each student took on his item was recorded. Each S was scored for total uses, unique uses, non-unique uses, and total time spent on the task.

III. Results

Preliminary Analyses

Classrooms tested under the same conditions were highly similar in creativity scores, indicating that main effects were due to differences in treatments and not to differences among classrooms.

IQ and the four creativity measures were substantially unrelated; e.g., for all conditions, the average of the correlations between IQ and total number of uses was only .16.

The scores were highly time sensitive. The average of the correlations between time and each creativity score was .61 across the four conditions.

The correlation between the number of unique uses and the number of non-unique uses for each condition is as follows:

Individual-No Grades	(N=24)	r=.65	($p < .01$)
Individual-Grades	(N=21)	r=.51	($p < .05$)
Group-No Grades	(N=39)	r=.18	N.S.
Group-Grades	(N=46)	r=.78	($p < .01$)

Effects of Testing Condition Variables

A two-way analysis of variance was used to determine the effects of the condition variables (Grades vs. No Grades and Individual vs. Group) on each creativity measure. See Table 1 for a description of means.

The Grades vs. No Grades variable significantly affected all measures of creativity. The giving of grades was significantly associated with more total uses, more unique uses, more non-unique uses, and a longer work time.

The Individual vs. Group variable affected some measures and not others. Group testing resulted in significantly more non-unique responses and significantly longer time spent on the task than did individual testing. Differences in total number of uses and number of unique uses were not significant.

The Group-Grades condition appeared to be the condition associated with the highest scores and times. For two measures, non-unique responses and total time spent, there was an interaction favoring the Group-Grades environment. For all four measures, the means were outstandingly high for this condition, as shown in Table 1.

The group test results seemed important because they were particularly relevant to questions about grades vs. no grades in a conventional classroom setting. Additional analyses were done on the group data, comparing the Group-Grades condition (considered most like a standard classroom environment) to the Group-No Grades condition. As before, the Group-Grades students had significantly higher scores and times: they generated more uses, more unique uses, and more non-unique

Table 1

Means and Standard Deviations
for All Test Conditions

Condition		Creativity Measures			
		Total Uses	Unique Uses	Non-Unique Uses	Total Time in Seconds
Individual-No Grades N=24	$\bar{X}$	10.92	2.58	8.46	555.00
	S.D.	9.33	3.97	6.14	387.55
Individual-Grades N=21	$\bar{X}$	10.71	3.19	7.52	534.90
	S.D.	8.21	3.71	5.67	493.52
Group-No Grades N=39	$\bar{X}$	11.18	2.72	8.46	763.08
	S.D.	4.65	2.29	3.66	352.88
Group-Grades N=46	$\bar{X}$	17.65	5.04	12.61	1105.43
	S.D.	14.77	5.72	8.90	365.24

uses. They also spent more time at the task. Results for the group analysis thus paralleled results of the general analyses, discussed earlier. Under classroom conditions, the giving of grades apparently induces students to take longer and to do better in terms of all creativity scores.

A further analysis was done to compare the two group conditions for variability of scores and times. Box's procedure was used (Cooley & Lohnes, 1962, pp. 62-63). There was significantly greater variability under the Group-Grades condition on all performance scores: total uses ($F=45.2236$, $p < .001$), unique uses ($F=40.2672$, $p < .001$), and non-unique uses ($F=29.5525$, $p < .001$). Only the time taken showed no significant difference in variability. Thus under group testing conditions, the presence of grades is associated not only with higher scores on creativity tests, but also with greater individual variation in scores.

IV. Discussion

Not only is group testing much less cumbersome than individual testing; it also seems more generalizable to the classroom environment. In addition, group testing appears to result in somewhat better performance and much longer work times, as shown in the present study.

Possibly the longer work times of Ss tested in groups were due to differences in social pressure between the group and individual environments. In the group environment, Ss were somewhat anonymous: the experimenter spent little time talking to or observing any one S, and Ss could not readily tell who was the last one to finish working. By contrast, an S who was tested individually may have felt some discomfort at being alone with an adult or he may have felt he must hurry so as not to keep the adult waiting. For whatever reason, Ss tested individually took much less time; in this connection it should be noted that Wallach & Kogan felt it necessary to precede their individual testing sessions by three weeks of acquainting themselves with the students in order to ensure a "permissive" test environment and prevent rapid termination of the test session by Ss.

Whatever the reason, group testing appears to optimize performance and its results probably are more generalizable to the classroom environment.

As can be seen from Table 1, above, the Group-Grades condition was the highest of the four conditions on all four creativity measures (total uses, unique uses, non-unique uses, and total time). In the two-way analyses of variance, the Group-Grades condition was favored, in terms of either main effects or interactions, in all eight significant findings of the twelve comparisons.

McClelland (1963) indicated that established creative scientists concentrate long and productively on their respective areas of creative endeavor. The present study is concerned with length as well as productivity of students' involvement on the Uses Test of creativity. Times spent on the task were much longer in the group than in the individual conditions. Of the two group conditions, the graded condition was the one in which students spent much more time. While the time spent was much longer in the Group-No Grades condition than in the two individual conditions, the productivity (total number of uses) was not particularly different. However, in the Group-Grades condition, both the time and the total number of uses were much higher than in the other three conditions. These findings suggest that in both individual conditions, the students worked hard for a short time; that in the Group-No Grades condition, students worked less hard for a long time; and that in the Group-Grades condition, the students worked hard for a very long time -- as the latter were outstanding both in time spent and in number of uses generated.

To speculate about what pressures may be operating on students under the four conditions, one possible explanation is that the individual vs. group conditions constitute a difference in social pressure while the no grades vs. grades conditions constitute a difference primarily in performance pressure.

The group condition students spent markedly longer than did the individual condition students. Perhaps the individual condition students spent so short a time because they were uncomfortable about being alone with an adult experimenter or perhaps they were being polite in not keeping the adult waiting too long while they worked. In any case, the individual-condition pressures which discouraged the students from taking a long time seem quite powerful, as Ss in the individual conditions did not take any longer even when they were being graded on the test. However, under the group conditions, the students who were being graded took significantly longer than Ss not being graded. Thus performance pressure (grades) seemed to be highly effective in the group conditions, where the students felt free to take a long time, but was ineffective where students were under the subtle time constraints of the individual testing conditions.

In addition to the advantages of being more nearly like the natural classroom environment, of optimizing performance, and of fully meeting the independence criterion, the Group-Grades condition may have certain other advantages over conditions used in previous studies.

As was noted earlier, Guilford's group procedure, with stringent time limits, was deficient in meeting the first criterion for successful measures of creativity, that of independence from IQ. While Wallach & Kogan had greater success using measures similar to Guilford's under a permissive, individual, time-free procedure, the procedure is cumbersome and perhaps socially biased to disfavor Ss who are more vulnerable to social pressure. In their study, the experimenters felt it necessary to spend three weeks acquainting themselves with the students in order to ensure a "permissive" test environment and prevent rapid termination of the test session by students.

Although Ward did not spend as much time preparing Ss for testing, he used the same procedure as Wallach & Kogan, with the same disadvantages.

Wallach & Wing, using a mailed-test procedure, did manage to predict, with some success, involvement in creative extracurricular activities. This may be because the college students who were willing to spend more time voluntarily on a mailed creativity test battery were the same students who were willing to spend more time on voluntary extracurricular creative activities. Wallach & Wing did not consider this possibility, however, despite the fact that Ward had earlier established the time sensitivity of the measures.

Wallach & Wing's procedure has the disadvantage of a very high non-response rate (60% non-response in their study) as well as a lack of controls for cheating (getting help from parents, roommates, etc.). These two disadvantages could be even greater in attempts to test at levels below the college level. The very high non-response rate also would be a severe problem in any future studies attempting to relate creativity to other batteries of tests. The Wallach & Wing procedure has an added disadvantage in that it does not allow the recording of data on work times.

In comparison to a mailed test procedure, the group procedure used in the present study has the advantages of keeping non-response and outside help to a minimum, since the tests are administered in the classroom, and of restricting possible cheating. The group procedure also allows for precise time measurements and the establishment of time sensitivity. In comparison to individual testing, the group procedure is less cumbersome and perhaps less socially biased. It also resembles everyday classroom procedure more closely than either the mailed-test or the individual procedures.

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