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Achievement As A Function of Assigned Grades

This comparative study used as its subjects two matched groups of Grade VIII students whose science achievement placed them between the 10th and 35th percentile. The experimental subjects received science grades inflated by 20 per cent of earned grades on ten successive bi-monthly science tests. These subjects showed a significantly greater gain in actual science achievement over the five-month duration of the experiment than did the control subjects.

The Problem

The supposition that the awarding of low or high school grades will motivate pupils to more productive effort seems to constitute one of the chief reasons why teachers award such grades. A host of studies of which, Sears[1], Lewin *et al.*[2], and Wright[3] might serve as examples seem to vindicate the belief that frustration does in fact increase endeavour. However, most studies of this nature use artificially induced frustration over short periods of time and thus leave the question as to the efficiency of grade induced frustration unanswered.

More extensive work like that done by McClelland *et al.*[4] pertains in part to the current problem. However, while these studies are successful in generating theories and hypotheses around the effects of such phenomena as school grades, they provide little information as to their actual motivational value in the classroom situation. Perhaps Atkinson's formula: "Motive arousal = f (motivational disposition x incentive x expectation)"[5] is more to the point for it provides a device into which the supporter of low or high grades can plug his research data. Such data would, it is assumed, replace incentive in the formula since grades are alleged to provide incentive through the withholding or providing of reward thus increasing motivation or "motive arousal."

If research has provided little evidence to vindicate the low or punitive grade enthusiast, it has done no better for the educator who might advocate more lenient grading. Yet, the more lenient grade approach would seem to be a more fruitful direction in which to seek vindication for, since Thorndike rescinded the negative aspects of his law of effect, learning theorists have generally been suggesting, and research has been confirming, that learning can be maximal in the presence of reward alone. Indeed it can be argued that the whole motivational structure underlying programmed instruction rests on this assumption.

Unfortunately, however, it is as yet impossible to measure or quantify a student's motivation for doing school work; nor is it possible to measure the incentive induced by high or low grades. About the best one can do is to award given grades under given conditions and measure the subsequent achievement and infer from this achievement whether or not the grades awarded induced motivational change.

The present study, then, is designed to test the hypothesis that given grade changes will not affect the actual achievement of the recipients of these grades.

Subjects

All subjects used in the study were drawn from the 10th to 35th percentile achievement group enrolled in Grade VIII Science at Calgary's Colonel Irvine Junior High School for reasons which include:

1. Colonel Irvine was the only school available where — due to a team teaching approach — curriculum, instructional method, and teachers were held constant for all students in science for sufficient time to conduct the present experiment.
2. Grade VIII was chosen because at this level the student is beyond the "new school"atmosphere peculiar to Grade VII and has not yet reached the possible tensions created by the anticipation of final Grade IX Department of Education examinations.
3. Science was chosen as a curriculum area minimally affected by background knowledge obtained in previous grades, i.e., an area of study where changes in motivation could be most readily detected.
4. Students below the 10th percentile in achievement were excluded because (a) the school did not want its potential failures interfered with, and (b) students who had despaired of improvement were most likely to be located in this group.
5. Students above the 35th percentile in achievement were excluded because (a) the potential for increased achievement and the

possibility of bonusing grades became increasingly limited beyond this level, and (b) a sufficient number of subjects were obtained between percentiles 10 and 35.

6. The decision to use low achieving subjects with the resultant necessity of raising grades rather than using high achieving subjects whose grades could be lowered was made (a) on the assumption that, since the low achievers had been under the motivational influences of poor grades for an extended period of time, achievement would be maximized if poor grades are in fact an incentive, and (b) to avoid the heterogeneous effects of lowered achievement feedback decribed by Sears, and (c) to avoid the pupil and parental ill-will latent in lowering school grades.

Procedure and Data

In November of 1965, either form A or B of the *Sequential Test of Educational Progress Science 3 A* was administered to randomly selected halves of the 254 students comprising the Grade VIII science population of Colonel Irvine Junior High School. Those students scoring from percentile 10 to 35 inclusive were identified and matched as nearly as possible in pairs on the bases of age, sex, I.Q. and science achievement. One member of each pair thus obtained was then randomly assigned to the experimental and the other to the control group.

Table I describes the two groups in terms of these phenomena.

Neither the teachers nor students involved in the study were informed of the S.T.E.P. scores or of the purpose of the study. On the same day as the S.T.E.P. was given, the 254 Grade VIII science students also responded to a locally developed forty-item, four-distractor, multiple-choice test based on the science work just completed. After item analysis and the discarding of poor items, the scores on this achievement test were converted to percentages and returned to the science teachers for distribution to the students. The single variant of this procedure involved a 20 per cent bonusing of earned scores for those students in the experimental group.

A similar curriculum-based, forty-items achievement test was administered to the 254 Grade VIII students every two weeks thereafter until a total of ten such tests had been given. In each case the percentage scores on the good items were returned to the students via the teachers. In each case the scores earned by the experimental subjects were bonused by 20 per cent.

Table II gives the actual mean percentage scores earned by the control and the experimental groups on each of these tests.

TABLE I

COMPOSITION OF THE CONTROL AND EXPERIMENTAL GROUPS

Girls

Control				*Experimental*			
Subject	*Age*	*Otis I.Q.*	*S.T.E.P.**	*Subject*	*Age*	*Otis I.Q.*	*S.T.E.P.**
1	13-0	129	64	1	12-6	128	61
2	12-11	116	59	2	12-7	118	61
3	13-1	131	59	3	13-1	130	62
4	13-3	133	75	4	12-10	141	64
5	13-0	114	59	5	13-4	112	62
6	13-2	114	55	6	13-3	111	62
7	13-5	111	55	7	13-0	108	64
8	13-5	122	62	8	13-1	117	62
9	13-5	102	64	9	13-1	106	61
10	13-5	108	54	10	13-3	107	59
11	13-9	111	58	11	13-7	108	54
12	13-8	104	56	12	13-8	102	61
13	13-9	114	62	13	13-9	112	54
14	13-10	111	56	14	13-9	111	55
15	13-11	114	35	15	13-10	118	64
16	14-3	102	58	16	14-5	114	54
	X 13-5	114.87	58.19		X 13-4	115.18	60

Boys

17	13-2	141	61	17	12-2	141	54
18	13-5	102	64	18	13-2	97	64
19	13-0	118	59	19	12-11	118	56
20	13-1	127	64	20	13-1	123	64
21	13-0	106	62	21	13-2	104	56
22	13-2	110	55	22	13-3	111	64
23	13-2	118	61	23	13-5	117	54
24	13-2	113	58	24	13-5	118	64
25	13-7	106	61	25	13-6	106	64
26	13-7	119	64	26	13-7	123	62
27	13-8	123	54	27	13-9	131	59
28	13-11	106	58	28	13-8	102	54
29	13-8	120	62	29	13-8	120	56
30	13-5	114	62	30	13-11	111	62
31	14-0	118	58	31	13-11	118	62
32	14-1	100	62	32	14-5	96	55
N 32	X 13-5	115.06	60.31	N 32	X 13-5	114.75	59.38
Combined N64	X 13-5	114.97	59.25	N 62	X 13-5	114.97	59.69

*in percentages

TABLE II

SUCCESSIVE TEST SCORES BY GROUP AND SEX

Group	*Test*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Exp. Girls	X	64.7	60.1	59.6	64.1	54.7	56.6	59.0	60.1	65.1	59.5
	S	10.8	8.8	11.0	10.2	13.8	7.4	7.1	8.9	6.0	8.5
	N	16	14	16	15	14	15	14	14	15	16
Cont. Girls	X	65.5*	57.7	57.2	59.5	56.4*	51.9	58.9	57.4	60.	61.2*
	S	7.3	10.3	11.4	10.3	9.9	4.2	9.7	7.5	7.2	7.9
	N	16	13	15	15	14	15	16	16	16	15
X diff.		.8	2.4	2.4	4.6	1.7	4.7	.1	2.7	5.1	1.7
P. of diff.		>.05	>.05	>.05	>.05	>.05	<.05	>.05	>.05	<.05	>.05
Exp. Boys	X	68.8	58.9	59.2	61.5	59.2	60.7	66.0	65.9	65.2	62.9
	S	12.0	7.1	10.5	10.4	10.3	5.7	7.8	8.9	5.7	7.6
	N	16	15	16	14	14	15	14	14	14	14
Cont. Boys	X	67.8	57.5	57.2	54.1	53.5	54.9	62.8	60.0	63.3	60.6
	S	15.2	10.8	8.4	7.2	11.6	9.3	8.2	8.6	7.9	4.9
	N	16	15	15	16	13	15	16	16	16	15
X diff.		1.0	1.4	2.0	7.4	5.7	5.8	3.2	5.9	1.9	2.9
P. of diff.		>.05	>.05	>.05	<.05	>.05	<.05	>.05	<.05	>.05	>.05
Exp. total	X	66.8	60.0	59.4	62.8	57.0	58.7	62.5	63.0	65.2	61.2
	S	11.4	8.0	10.7	9.2	12.0	6.4	7.3	9.0	6.0	8.
	N	32	29	32	29	28	30	28	28	29	30
Cont. total	X	66.7	57.6	57.2	56.8	55.0	53.4	60.9	58.7	61.7	60.9
	S	11.2	9.8	9.9	8.7	10.7	6.3	8.6	7.4	7.3	7.2
	N	32	28	30	31	27	30	32	32	32	30
X diff.		.1	2.4	2.2	6.0	2.0	5.3	1.6	4.3	3.5	.3
P. of diff.		>.05	<.05	>.05	<.01	>.05	<.01	>.05	<.05	<.05	>.05

*Control group score higher than experimental group.

At the termination of the experimental period, control and experimental subjects responded to the alternate form of the S.T.E.P. administered at the outset of the study. Table III summarizes the data collected through this and the earlier administration of the S.T.E.P.

TABLE III

PERCENTAGE S.T.E.P. SCORES BEFORE AND AFTER EXPERIMENTAL TREATMENT

		Before	*After*
Exp. Group	X	59.25	70.45
	S	7.83	5.44
	N	32	32
Cont. Group	X	59.38	64.91
	S	8.61	7.41
	N	32	32
Diff.		.13	5.54
P. of diff.		<.05 (t <1.96)	<.01 (t = 3.42)

Discussion and Conclusion

An examination of Table II (test one) confirms the equality of the science achievement of the two groups established by the first S.T.E.P. scores. In each of the nine subsequent tests the total experimental group scored higher than the control group. In five of these cases the difference proved to be statistically significant as did the overall achievement of experimental boys ($P<.01$) and girls ($P<.05$) separately as well as for the total experimental group ($P<.01$).

The data given in Table III permits a similar conclusion in favor of the experimental subjects ($P<.01$) where the before and after S.T.E.P. scores are concerned.

It is to be noted, however, that the differential gain in favor of the experimental group was more pronounced in the case of boys than girls ($P<.01$ and $<.05$ respectively). The same phenomenon is evident if the mean per test gain of the experimental over the control group is determined for boys (3.96) and girls (2.07) separately for the final nine achievement tests. It would appear that, within the limits of the technique employed in the present study, motivation to achieve in science is more easily induced in Grade VIII boys than girls.

In conclusion then, the data obtained through the present procedure makes it impossible to accept the hypothesis that given grade changes will have no effect on actual achievement. The implications for the classroom would seem to be that poor achievers increase their achievement for no other reason than that they are informed that they are improving, thus undermining the supposition that the awarding of poor grades will motivate the recipients of such grades to maximum effort.

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