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Full Name of Author — Nom complet de l'auteur

Deborah Pauline Clarke Engram

Date of Birth — Date de naissance

November 3, 1949

Country of Birth — Lieu de naissance

England

Permanent Address — Résidence fixe

Box 103 Musquodoboit Harbour Halifax County

Title of Thesis — Titre de la thèse

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Name of Supervisor — Nom du directeur de thèse

Dr. B. Davis

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Bonus Points as Tokens: Their Effect
On Academic Performance

A Thesis Submitted in Partial
Fulfillment of the Degree of

Master of Arts

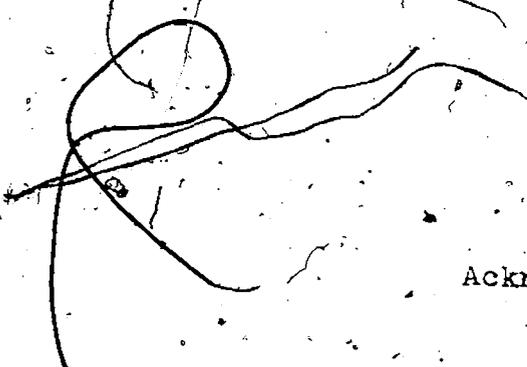
by

Deborah Pauline Clarke Engram

Saint Mary's University

March 9, 1979

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Abstract

The effects of bonus points as tokens was investigated in two high school social studies classes. The target activity was academic performance based on the results of daily test scores. A reversal design was employed. After establishing baselines of grades on the daily test, an experimental phase incorporating bonus points was systematically introduced, withdrawn and reintroduced in both classes. The awarding of bonus points was made contingent upon students' test grades remaining above the 70 percent level for five consecutive days. Introduction of bonus points led to significant increases in test scores over the bonus points condition in both classes.

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Introduction

The problem of increasing academic performance is an important area for educators and students. Van Houten, Morrison, Jarvis and MacDonald (1974) showed that it is possible to improve the rate and quality of performance of an entire class of elementary school students using techniques of explicit timing and feedback.

Using a design similar to that utilized by Van Houten et al. combined with a timed mini lesson, daily testing and public posting chart, Engram (1976, unpublished) showed that low stream social studies students could achieve and maintain passing grades. Back-up reinforcers such as movies and games were introduced in an attempt to further raise the grades, but these types of reinforcers were inconvenient to use.

The classroom teacher, however, adopted the timed mini lessons, daily test and feedback as his usual method of teaching in subsequent years. The use of public posting charts was discontinued at the request of the students who expressed that they found its presence in the room humiliating.

The classroom teacher wished to find a method of raising the low but passing grades of students.

Brigham, Graubard and Stans (1972), Maloney and Hopkins (1973) awarded points to students as tokens in an attempt to improve academic performance. The tokens in these studies were exchanged for nonacademic back-up reinforcers.

For the purposes of this present study, an academic reward was preferable. There was no budget for back-up reinforcers. It was decided that a token economy would be used. Bonus points on daily tests would serve as tokens, and points added directly to the final examination of the term would serve as back-up reinforcers. (see table 2 and table 2)

A baseline mean of test results was established in both classes. Bonus points were systematically introduced, withdrawn and reintroduced to the students.

The mean daily test scores of the students in both classes improved significantly during the first bonus points condition, dropped during the

second baseline condition and increased with the reintroduction of bonus points.

It was concluded that awarding bonus points led to the significant increases in daily test scores. Further experimentation is necessary to determine the effects of bonus points on examination grades.

Chapter I

A Brief History of Grades

5

The first recorded evidence of the use of grades in North America was at Yale in 1785 (Smallwood, 1935). The scale used at Yale included only "Optimi" (first), "Second Optimi" (second best), "Inferiores" (inferior), and "Peiores" (bad). Smallwood reports that this system of rating was very similar to that used by the University of Louvain where the categories were labelled "Rigerosi", "Transibiles", "Gratiosi", and a fourth category which was not given a name. The descriptive terminology of contemporary English universities incorporated "Honour Men", "Pass Men", "Charity Passes", and "what might be facetiously called unmentionables since their names were not published" (p. 108).

In 1813 the first numerical marking scale was introduced; this also was at Yale. Students were rated on a scale from one to four. "These numbers were supposed first, to lessen individual bias; second, to furnish a standard with group approval; and third, to increase the possible range of marks by the use of decimals" (p. 108).

6

Harvard University's first numerical marking system used a scale of 20 points. Later Harvard converted to a scale of 100 points in an attempt to allow for more exact measures. Smallwood cites 1850 as the date after which this grading system was generally considered adequate in most American universities. In addition to these numerical grades, apt epithets describing the student's performance were often assigned by professors.

Since 1850, the use of numerical examination grades has spread to all levels and subject areas of public schools in an attempt to impartially evaluate the efforts and educational attainments of students.

Smallwood states that grades are intended to convey to students, a professor's idea of how well a student performed on a particular examination.

Feldmesser (1971) states that grades provide useful information to students.

He will want to know what it all adds up

to...whether all things considered he did
"well" or "poorly". (p. 3).

We are success and academic oriented and
believe that unless someone decides how
well you are doing, you function in a vacuum
(Arlington National School and Public Relations
Association, p. 8, 1972).

Adams and Torgerson (1968) maintain that
grades have four functions: administrative, for
purposes of promotion and selection; motivational,
as incentives to the students to try harder;
guidance, for planning vocational futures; and
informational functions, reporting progress to
parents.

This thesis will be concerned mostly with
the motivational function of grades.

Hilgard and Russell (1950) define motivation
as "a very general term for describing need
satisfying and goal-seeking behavior. It
includes physiological drives, unconscious
motives, clearly formulated purposes, ideals,
etc. (The Forty-Ninth Yearbook of the National

Society for the Study of Education, p. 38).

For students the grade is the focal point of the educational reward system. The good student will find out what the expectations are for receiving good grades and will tend to conform whether the expectations are directly applicable to the learning process or not (Kirschenbaum, Napier and Simon, 1971, p. 201).

If the grade is to have motivational function, then a high grade must be an ever-present but never guaranteed outcome; the corollary is that a low grade must be an ever-present but avoidable outcome (Feldmesser, 1971, p. 14)

The use of grades to motivate students may be attacked on the grounds that the motivation furnished by grades is extrinsic rather than intrinsic. Educators who oppose the use of grades on these grounds argue that awarding grades teaches children to expect rewards for learning when in actuality learning should be its own reward.

This argument can be questioned.

It is the goal object of the learner which determines whether educational motivation is intrinsic or extrinsic. If, for example, the goal object in a learning situation is to gain free time to pursue other interests, the learner is said to be extrinsically motivated. If, in contrast, the goal of a student is the satisfaction associated with mastery of a task, the learner's motivation is known as intrinsic.

The relation between task and goal may be said to be intrinsic if the incentive conditions are functionally or organically related to the activity... The relation between task and goal may be said to be extrinsic if the incentive conditions are artificially or arbitrarily related to the task. (The Forty-Ninth Yearbook of the National Society for the Study of Education, P. 39).

Historically, the results of examinations have been considered to be extrinsic motivation

and for that reason they have been viewed as somewhat undesirable.

It is the task of the school to provide the goal and the stimulus, in the most appropriate way to it, without the aid of an external examination which pervades the consciousness of pupil and teacher.... pupils assess education in terms of success in the examination; they minimize the importance of the non-examinable and assign a utilitarian value to what they study....

The mind of the examiner supersedes that of the teacher; every effort is subservient to the examination, in order that a hall-mark, estimated by those to whom the pupil is an examination number, may be stamped upon a pupil on the result of a single judgement on the examinable portion of his work at a particular moment (Report of the Committee of the Secondary School Examinations Council, 1941, p. 32).

Feldmesser (1971) contends that the extrinsic

function of grades is not necessarily undesirable.

A great many people object to grades because they are 'extrinsic' rather than 'intrinsic' rewards . In the minds of these people, some sort of moral stigma seems to be attached to extrinsic rewards. I confess that I fail to see the grounds for this revulsion. Perhaps it is true that something is amiss with the person who behaves exclusively in response to extrinsic rewards; we are apt to call him an unscrupulous opportunist. But there's something unpleasant about the person who responds exclusively to intrinsic rewards, we would call him ritualistic, or maybe fanatic! It seems to me that commendable character, as well as healthy personality, consists of a balance of responses to both kinds of rewards and in such a balance grades would have a legitimate place. I know of no evidence showing that learning cannot take place under conditions of extrinsic reward; and I would add that

except for the satisfactions connected with a few primitive bodily urges, all intrinsic rewards begin as extrinsic ones. - But what is crucial in the last analysis is not whether rewards are intrinsic or extrinsic, but the kinds of behaviour they induce... and in the present case, that is the matter of the validity of grades as a measure of academic performance. (Feldmesser, 1971, p. 11).

In a classroom learning situation, it is often difficult to distinguish between intrinsic and extrinsic motivation.

Anticipated tests are sometimes regarded as extrinsic motivators of learning efforts, less desirable and less effective than intrinsic motivators would be. Learning should be its own reward, it is said. Fortunately, no choice need be made between extrinsic and intrinsic motivation. Both contribute to learning. Withdrawal of either would be likely to lessen the learning of most students. For a fortunate few,

intrinsic motivation may be strong enough to stimulate all the effort to learn that the student ought to put forth. For the great majority, however, the motivation provided by tests and other influential factors is indispensable (Ebel, 1972, p. 42).

Because motivational situations are complex, the relationship between task and goal is often at once intrinsic and extrinsic (The Forty-Ninth Yearbook, p. 39).

Whether grades and examinations are a source of intrinsic or extrinsic motivation to students remains an important issue for educators. For the purposes of this thesis it is sufficient to establish that grades motivate students.

One advantage of using grades as a means of motivating students lies in the fact that grades can easily be used in classrooms. For this reason grades can be called intrinsic classroom motivators. Some other intrinsic classroom motivators include beating chalk brushes, and holding open the door during fire drills. These things are

intrinsic to most classroom situations.¹

¹ The term "intrinsic classroom motivators" is similar to the term "intrinsic motivation". The terms should not be confused.

Chapter II
Classroom Token Economies: Some Areas
Of Success and Some Associated Drawbacks

, Gillett (1966) cites Joseph Lancaster (1778-1838) as the first educator to use token economy systems in the schools of England. Lancaster awarded tickets to students for good work and for symbols of promotion. These tickets could be exchanged for trinkets which were displayed in the school to serve as motivation. "Two tickets could be redeemed for a paper kite, three for a ball four for a wooden horse.... Winners were encouraged to parade about the school boasting their honours to stimulate other to greater efforts" (p. 207). Older students were awarded silver medals to wear around their necks as a sign of their diligence.

Modern token economies were introduced into the schools of the midwestern United States in the 1960's (Kazdin, 1976).

In recent years, token economies have achieved a great deal of success in schools. Tokens are conditioned or secondary reinforcers,¹ usually

¹Madsen and Madsen (1975) define "secondary reinforcers" as stimuli which acquire the power to reinforce (strengthen or maintain) behavior through being paired with the delivery of primary or stronger conditioned reinforcers within the experience of the organism. These are called secondary or conditioned reinforcers. Ex. Money is useless unless one can exchange it for goods. To many people, however, money is a conditioned reinforcer because it has become the reward (p. 202).

given to subjects to reinforce the emission of a target behavior. Common tokens include stamps and poker chips because these items are portable and easy to dispense (Barrish, Saunders and Wolf, 1969). Kazdin (1976) reports that tokens are reinforcing because they can be exchanged for a wide range of back-up reinforcers. Craighead, Kazdin and Mahoney (1976) conclude that token economies teach people to work for symbolic rewards and accept delayed gratification.

Rewards or incentives, when they are used to regulate school learning, are almost exclusively secondary or derived rewards. That is, the goal objects are those which would not have reward in themselves except for what they stand for. Gold stars, school marks and rank orders derive their reward value from such learned motives as the desire for prestige, recognition, and so on. The characteristics of the goal object are relatively unimportant. What the reward signifies is much more important (Forty-Ninth

Yearbook, p. 47).

MacLaughlin and Malaby (1972) devised a token economy for use in the classroom. Students were instructed to award themselves points for appropriate behavior and to deduct points for inappropriate behavior. This token economy improved significantly the rate of assignment completion of the students involved in the study. When the token economy was withdrawn, the rate of assignment completion dropped. The authors of the study report that their system of token reinforcement in the classroom is advantageous for the students in that it elicited favorable comments and was popular with the teacher because it was not time consuming. It required only twenty minutes extra per week on the part of the teacher and eliminated discipline problems.

Token economies can be used to alleviate a wide range of problems in various classroom settings.

Wolf, Giles and Hall (1968) used slash marks on graph paper as tokens in a successful attempt

to teach academic skills to inner city children in a summer school program. Clothing, second hand bicycles and field trips served as back up reinforcers.

O'Leary and Becker (1971) used a token economy to reduce the disruptive behavior of emotionally disturbed children. The tokens consisted of points on a scale of one to ten which could be exchanged for candy and toys.

Brigham, Graubard and Stans (1972) and Mahoney and Hopkins (1973) found that awarding points that could be exchanged for non academic rewards improved the academic performance of elementary school children.

Price and D' Ippolito (1975) used a token economy to improve the poor attention span of a nine year old boy. Madakacherry (1974) awarded stars for appropriate behavior. These stars could be exchanged for a wide range of back-up reinforcers including free time, toys and trinkets. This procedure eliminated wetting and thumb sucking in a

preschool child within twenty-four days.

The studies cited have illustrated the effectiveness of token economies in classroom situations. All of these studies required the use of expensive back-up reinforcers. Wolf et al. reported that their study cost an average of \$ 225. 00 per student. Many classroom teachers do not have a budget for rewards.

In an attempt to reduce the cost of a classroom token economy, McKensie, Clark, Wolf, Kothera and Benson (1968) used school grades as tokens. The back up reinforcer in this study was the weekly allowance of the student involved. This study eliminated the need for the school to provide expensive rewards but required close cooperation and involvement with the parents.

Barrish, Saunders and Wolf (1971) devised a program which they called a good behavior game in which a token economy-like atmosphere utilized intrinsic classroom activities as back-up reinforcers. These intrinsic classroom reinforcers included free time and special games. This study

proved effective in reducing disruptive behavior, noise and out of seat behavior. It was thus shown that costly back-up reinforcers are not always necessary. Free time and special games are intrinsic classroom reinforcers but are not appropriate to all classroom settings.

Madsen and Madsen (1975) state that some reinforcers intrinsic to the classroom fall into five categories: 1) words, either spoken or written 2) facial expression and bodily gestures 3) being close by proximity or actual touching 4) social or individual activities and 5) material things, play things, things to eat and awards.

Many of the reinforcers listed by Madsen and Madsen are not appropriate to a high school setting: 1) a teacher may not have enough contact with individual students to use reinforcing words or gestures effectively 2) touching such as a "quick squeeze" (p. 183) might be dangerously misinterpreted by the student (regardless of sex) 3) some high school administrations do not allow teachers to award free time or time for games 4) material things

and field trips are expensive.

Awards are the only remaining category suggested above. Madsen and Madsen cite the following list of possible intrinsic classroom rewards:
" citations, plaques, pens, subject matter prizes, medals, cups, report cards, good-deed charts" (p.188).

For the purposes of the study presented in this thesis, report cards seem to be the most appropriate of the above awards to consider.

Closer examination of the problem showed that report card grades would not be suitable as token reinforcement.

Mackenzie, Clark, Wolf, Kothera and Benson (1968) states that report card grades are not successful tokens because the delay between the emission of the report card (pay off) is often several weeks. In order to be successful, tokens must be given as soon after the target behavior as possible. Tokens must also have a predetermined and specific value.

Token systems also ensure a systemic relationship between the number of tokens

which are earned and the products for which the tokens may be exchanged.

This is in contrast to report card grades, in which such a relationship is often unsystematic or nonexistent (Axelrod, 1977, p. 17).

In summary, token economies provide a means for teachers to effectively eliminate classroom problems.

The drawback of the traditional token economy system is the cost of back-up reinforcers. Recent experimentation has provided evidence that many classroom activities can serve as back-up reinforcers for elementary school children. The use of intrinsic classroom reinforcers is more limited in high schools.

Although grades are reinforcing to high school students, grades are inadequate as tokens because of the delay of the payoff. Tokens if they are to be effective must be given immediately after the behavior that is to be reinforced. It was thus decided that bonus points awarded on the basis of daily test results would serve as tokens for the present study.

Chapter III

The Background of the Bonus

Points Experiment

What constitutes a reward?~ That which
the students will work towards." (Madsen and
Madsen 1971, p. 39)

It was shown in the last chapter that a major problem with the use of token economies in the classroom is the high cost of back-up reinforcers. This cost limits the use of token economies by teachers who are not provided with a budget.

Axelrod (1977) states that reinforcers are effective in changing behavior for two reasons: 1) they serve as motivators (see chapter II) and 2) they provide feedback to students. Feedback is defined as "information that they (the students) have performed the right behavior." (p. 19).

Feedback is often used as reinforcement. Programmed learning uses feedback as motivation. Feedback has also been found effective when used in combination with charts on which the teachers post the scores of the students' daily assignments. In these studies students are instructed to try to beat their previous score. "The scores of many children improve as they try to surpass their previous high score" (Axelrod, p. 19).

The students involved in the study presented

In this thesis were receiving immediate feedback on the results of their daily tests as a source of reinforcement prior to the experimental condition. The classroom teacher wanted to provide additional incentive for the students to raise their daily test grades by combining some other acceptable form of motivation with this feedback.

Van Houten, Morrison, Jarvis and MacDonald (1974) showed that public posting and feedback could improve the quality of performance and increase the response rate of an entire class of children. The target activity was composition writing. Students were instructed to try to beat their own previous scores as it was not the intent of the study to be competitive. Feedback of this nature was the only form of reinforcement used in this study. Van Houten et al. thus improved the overall quality and length of the compositions written by the children during explicitly timed periods, using feedback charts.

Using a design similar to that used by Van Houten et al. in combination with a timed mini lesson and a timed daily test, Engram (1976, unpublished) showed that low stream social studies students could achieve and maintain passing grades. These students, however, complained that they found the public posting chart a source of embarrassment since the classroom was used by other students and teachers who did not understand the purpose of this chart.

The introduction of back-up reinforcers including field trips, movies, and games was successful in raising the mean class score, but was disallowed by the administration of the school on the grounds that these kinds of rewards are time consuming, impractical and expensive.

These studies formed the basis of the present study. The students were not the same students used by the same author in previous studies. The procedure of mini lesson followed by exchanging papers, scoring papers and having the results read aloud by the teacher, was the

regular social studies class procedure. Public posting was at no time used by the teacher with these students. The bonus point economy was introduced as added incentive for the students to raise their social studies grades, which were already adequate in terms of minimum school standards.

It was decided that the bonus points, calculated on the basis of daily test scores would serve as tokens. Tokens would be awarded after every five tests but each test would provide additional feedback. The bonus points would accumulate and be added to the grade received in the term examination. This procedure would assure a systematic relationship between the tokens (bonus points) and the back-up reinforcers (examination grades).



Chapter IV

Method

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Method

Subjects and Setting

The subjects were two classes of history students in a consolidated high school in Halifax County. Class I consisted of 13 non-academic, remedial grade 10 students. Class II was an unstreamed non-academic, grade 10 history class of 23 students. The students in both classes were bussed daily from suburban and rural areas and were from diverse socioeconomic backgrounds.

General Procedure

During every history class (50 minute periods) approximately five periods per week, students were given a twenty minute lecture/discussion followed by a ten minute twenty item test. During the lecture/discussion or mini lesson as it was called, the teacher used the blackboards, audio-visual aids, slides and movies as required. Prior to the test, students who were sitting too close together were asked to move their seats. The teacher walked around the classroom during the test watching students carefully to ensure that

no cheating occurred. After this ten minute test which the teacher timed surreptitiously with his wristwatch, papers were collected by the teacher and redistributed among the students for the purposes of scoring. (This method of exchanging papers was designed to inhibit the temptation to cheat by scoring one's own paper or bargaining with a friend). The teacher then orally dictated the correct answers and discussed areas of the test where students encountered difficulties. Students gave one point for each correct answer on the tests and totalled the points on the top of the paper. The teacher collected all test papers and immediately read all scores to the class. Before recording the test marks, the teacher checked the tests for errors in scoring. Tests were returned to students during the next social studies class.

The Bonus Point System

The bonus point procedure was introduced to give students an opportunity to raise their grades. Students were informed of the bonus point procedure

and informed that bonus points would be awarded to them as outlined in table 1 if their test scores totalled 70 points over any five consecutive days. The rules outlined in table 2 were explained to the students. Tables 1 and 2 were posted in a prominent place in the classroom.

Bonus points were verified at the end of the term to ensure that students had selected their highest scores in the calculation of bonus points. If the test scores of a particular student totalled 100 points over any five days (five perfect tests) then the student could be excused from writing his final homework essay of the term. This essay consisted of 500 words.

Any absence from class would result in breaking a five day sequence for that particular student. The first test after any absence could only be used to begin a series of five tests. Likewise the last test before an absence could only be used to end a series of five tests. Students were not penalized for teacher absences. All students caught cheating

by any method were awarded a score of zero for the test in question.

Experimental Design

A reversal design was employed in order to assess the effects of bonus points on academic performance. After establishing baseline rates of performance, bonus points were introduced, removed and reintroduced.

Baseline 1

This condition was measured over five history periods. The general procedure was followed but no bonus points were awarded.

Bonus Points 1

This condition was measured over the ten history periods directly following baseline 1. The bonus point system was introduced and used during bonus points 1.

Baseline 1

This condition was measured over the five history periods immediately following bonus points 1. Bonus points were not awarded for tests written during this time.

Bonus Points 2

Bonus points were again awarded using the same criteria as in bonus points 1. In class I this condition was measured over fifteen history sessions. In class II bonus points 2 was ended after five sessions due to the fact that the absentee rate was so high. The end of the year was approaching and many students in this class had arranged to work for the last few weeks of schools and to return in order to write the final examination.

t was calculated for all conditions in both classes. F was calculated for both classes.¹

¹The use of this statistical procedure for reversal design experiments has been challenged by Glass, Willson and Gottman (1975, p. 72). The procedure is however outlined and justified by Kelly, McNeil and Newman (1973, p. 59-62).

Table 1

Information sheet for bonus points criteria
and number of bonus points awarded

Mean test mark	Points Awarded
100	10 and no final essay
99-95	5
94-90	4
89-85	3
84-80	2
79-75	1
74-70	1/2

Table 2

Rules for awarding bonus points

1. Any five consecutive test marks may be used in the calculation of bonus points.
2. Any absence (excused or otherwise) on the part of the student will "break" the five consecutive days.
3. If the teacher is absent the five days will not be broken, the lesson and test as prepared by the regular teacher will be given by a substitute teacher.
4. If an unforeseen problem should arise, the teacher's decision is final.

Chapter V

Results, Discussion
And Recommendations

Results

Changes in the daily test scores of all students under all conditions are presented in table 3,4,5,6, 7,8,9, and 10. The daily mean scores are graphed in tables i and ii.

Class enrollment underwent no changes in class 1. In class 2, four students left during the course of the study. One of these students joined the army and the others left to work or to seek employment. One student who was successful in finding a job returned to the class after two weeks of working. The data of all four students was incomplete and therefore discarded. All calculations for class 2 are based on 19 students.

During the study no student achieved five consecutive perfect papers; therefore all students were required to write the final term assignment (see table 2).

Class 1

Baseline I

The mean score during baseline I was 11.9 (56%). The standard deviation of the scores during baseline I was 3.6.

Bonus Points I

The mean score of the bonus points I condition was 13.7 (68.5%). The standard deviation of the scores during bonus points I was 1.2. During bonus points I, the mean class score increased by 1.8 points (9.5%) over the mean score of baseline I. This increase is not significant $t(12) = 2.0$ ($p > .05$).¹

Baseline II

The mean class score during baseline II was 9.8 (48%). The standard deviation of the scores during baseline II was 2.9. The mean score during baseline II decreased by 3.9 points (20.5%) from the mean score of bonus points I. This decrease is significant $t(12) = 5.57$ ($p < .001$)

Bonus Points II

The mean score of the bonus points II condition was 15.0 (75%). The standard deviation of the scores during bonus points II was 1.9. The mean score during bonus points II increased by 5.2 points (27%) over the mean score in baseline II. The increase shows significance $t(12) = 8.97$ ($p < .001$).

¹ t was calculated by using the formula for correlated data.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S\bar{x}_1^2 + S\bar{x}_2^2 - 2r S\bar{x}_1 S\bar{x}_2}}$$

Class 2Baseline I

The mean score during baseline I was 11.2 (56%). The standard-deviation of the scores during baseline I was 3.0.

Bonus Points I

The mean score of the bonus points I condition was 14.6 (73%). The standard deviation of the scores was 2.8. The increase in the mean scores in bonus points I over the mean scores in baseline I was 3.4 points (17%). This increase showed significance $t(18) = 3.6$ ($p < .01$).

Baseline II

The mean score during baseline II was 14.6. The decrease in the mean score during baseline II from that of bonus points I was ~~1.0~~ points (5%). This decrease is not statistically significant $t(18) = 1.57$ ($p > .05$).

Bonus Points II

The mean test score of the bonus points II condition was 15.4 (77%). The standard deviation of the scores during bonus points II was 2.5. The increase in the mean scores during bonus points II

over the mean scores of baseline II was 1.8 points (9%).

This increase is significant $t(12) = 3.51$ ($p < .01$).

Further Tests

To check the results a double classification analysis of variance was done for both classes.

F_A is the combined baseline conditions compared to the combined bonus points conditions. F_B is the combined I conditions compared to the combined II conditions. F_{AXB} is the interaction of the conditions.

The results were as follows.

Class 1

$F_A(48, 1) = 24.04$	$p < .01$
$F_B(48, 1) = .36$	$p > .05$
$F_{AXB}(48, 1) = 5.72$	$p < .05$

Class 2

$F_A(72, 1) = 17.87$	$p < .01$
$F_B(72, 1) = 6.61$	$p < .05$
$F_{AXB}(72, 1) = .44$	$p > .05$

Table 3
 Test Scores
 Class I
 Baseline 1

Subject	Sessions					
	1	2	3	4	5	
1	15	16	10	14	-	13.8
2	8	20	19	16	17	16.0
3	14	-	20	-	15	16.3
4	8	7	3	4	7	5.8
5	4	18	17	16	10	13.8
6	-	-	14	-	-	14.0
7	10	12	8	11	-	10.3
8	-	9	-	7	6	7.3
9	-	14	6	-	-	10.0
10	11	-	1	12	4	7.0
11	18	-	-	-	15	16.5
12	14	14	-	-	-	14.0
13	4	12	15	-	-	10.3
Total	110	122	113	80	74	
\bar{X}	11	13.6	11.3	11.4	10.5	
%	55	68	56.5	57	55	
	\bar{X}	11.9				
	S.D.	3.6				

Table 4

Test Scores

44

Class I

Bonus Points 1

Ss	Sessions										\bar{X}
	6	7	8	9	10	11	12	13	14	15	
1	12	18	10	8	16	14	16	14	16	20	14.4
2	-	13	17	15	14	16	19	14	16	18	15.7
3	-	10	12	13	-	14	13	-	16	18	13.7
4	9	13	16	9	11	11	11	10	16	20	12.6
5	-	14	12	6	15	11	11	16	14	18	13.0
6	8	-	16	15	9	18	-	-	18	20	14.9
7	11	17	17	-	15	-	8	-	-	16	14.0
8	-	18	15	10	-	8	11	-	-	20	13.7
9	10	11	11	12	8	-	-	-	10	16	11.1
10	11	12	12	14	17	-	9	8	14	20	13.0
11	9	-	15	15	19	13	13	-	13	18	14.4
12	15	13	16	12	15	12	-	-	14	-	13.9
13	12	13	16	11	19	14	-	-	14	-	14.1
Tot.	97	152	197	152	158	142	111	162	174	204	
\bar{X}	121	138	152	136	144	129	123	124	158	185	
%	60.6	69	76	63	72.5	64.5	61.5	62	79	92.5	

 \bar{X} 13.7

D.S. 1.2

Table 5

Test Scores

Class I

Baseline 2

Subject	Sessions					\bar{X}
	16	17	18	19	20	
1	8	16	10	7	11	10.4
2	8	14	17	16	13	13.6
3	8	10	18	-	9	11.2
4	5	8	14	16	3	9.2
5	10	12	10	7	15	10.8
6	16	-	13	12	-	13.7
7	4	5	7	-	6	5.5
8	2	10	2	2	10	5.2
9	-	14	-	4	2	6.7
10	8	6	8	8	3	6.6
11	10	16	4	14	10	10.8
12	6	-	16	11	17	12.5
13	6	-	12	-	15	11.0
Total	101	111	141	95	131	
\bar{X}	8.4	11.1	11.7	9.5	10.9	
%	42	55.5	58.5	47.5	54.5	

 \bar{X} 9.7

S.D. 2.9

Table 6
 Test Scores
 Class I
 Bonus Points 2

	Session																	X
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
1	14	14	11	16	16	15	13	14	17	18	15	10	12	18	20	16	16	13.1
2	-	18	18	19	12	19	20	20	16	18	19	20	16	20	-	16	18	17.9
3	17	-	17	19	-	14	-	10	-	18	17	16	18	17	12	20	17.7	
4	-	16	15	12	7	11	18	9	-	15	16	18	9	-	16	16	14.0	
5	14	18	-	-	11	-	-	15	17	18	20	13	16	14	17	15	15.2	
6	-	18	10	-	19	16	20	20	-	18	-	18	18	-	10	19	17.3	
7	-	-	6	16	-	18	-	-	13	8	15	14	8	15	7	10	12.0	
8	18	15	-	15	9	8	-	9	-	10	14	-	12	15	-	12	12.5	
9	12	16	12	17	16	13	-	-	-	13	-	-	14	-	16	13	14.5	
10	11	18	15	13	14	-	-	19	14	15	20	16	18	-	8	8	14.7	
11	-	-	-	18	-	18	18	15	13	20	18	13	15	-	20	-	16.9	
12	18	-	10	-	-	-	14	-	10	20	18	10	-	15	-	-	14.4	
13	14	14	14	15	14	-	15	17	14	13	18	14	13	-	19	18	15.1	
Total	118	163	139	150	118	134	118	148	114	186	191	163	167	115	150	155	169	
\bar{X}	148	183	139	150	131	148	168	148	143	155	174	148	139	164	150	141	169	
%	737	915	695	75	655	74	84	74	713	775	87	74	695	82	75	705	845	

\bar{X} 15.0
 S.D. 1.9

Table 7
 Test Scores
 Class II
 Baseline 1

47

Subject	Sessions					\bar{X}
	1	2	3	4	5	
1	15	13	18	18	-	16.0
2	16	10	10	9	10	11.0
3	11	-	-	-	12	11.5
4	-	-	-	11	12	11.5
5	4	0	-	-	10	4.7
6	10	11	11	8	-	10.0
7	-	9	15	-	-	12.0
8	16	-	16	-	17	16.3
9	13	14	12	9	15	12.6
10	18	11	12	9	14	12.8
11	joined the army					
12	4	8	9	4	-	6.5
13	-	-	15	3	5	7.7
14	-	13	8	7	-	9.3
15	-	13	-	14	-	13.5
16	quit					
17	11	9	8	6	-	8.5
18	quit					
19	10	10	15	10	17	12.4
20	18	12	16	8	19	12.6
21	quit					
22	14	9	15	-	12	12.0
23	-	15	9	8	16	12.0
Total	150	157	189	124	159	
\bar{X}	11.5	10.5	12.6	8.9	13.3	
%	57.5	52.5	63.0	44.5	66.5	

\bar{X} 11.2

S.D. 3

Table 8
 Test Scores
 Class II
 Bonus Points 1

48

Ss	Sessions										\bar{X}
	6	7	8	9	10	11	12	13	14	15	
1	19	19	19	19	18	20	18	15	20	-	18.7
2	-	-	17	-	11	15	15	12	17	20	15.3
3	-	12	10	12	9	-	-	-	9	10	10.3
4	16	17	19	20	-	-	15	14	18	14	16.6
5	12	-	-	10	-	15	-	-	5	0	8.4
6	8	16	16	18	11	-	17	-	-	18	14.9
7	19	18	-	-	-	18	-	-	17	17	17.8
8	19	19	20	20	-	-	15	-	20	17	18.6
9	12	17	18	15	11	17	15	-	17	-	15.3
10	14	16	17	15	13	15	17	11	17	17	15.2
11	joined the army										
12	13	5	14	14	10	17	14	11	-	-	12.3
13	9	11	-	10	11	12	12	-	10	14	11.1
14	13	14	13	15	8	-	-	11	20	-	13.4
15	-	15	20	15	15	16	18	16	19	20	17.1
16	quit										
17	10	13	17	15	10	16	14	10	-	-	13.1
18	quit										
19	10	10	16	16	12	13	13	14	-	-	13.0
20	12	-	16	17	10	14	20	12	17	-	14.8
21	quit										
22	16	19	13	-	17	15	18	-	-	14	16.0
23	12	17	-	18	14	16	18	-	-	17	16.0
Tot.	214	238	245	249	180	219	239	126	206	178	
\bar{X}	133	149	163	156	12	156	159	126	158	148	
%	765	745	815	78	60	78	795	63	79	74	
\bar{X}	14.6										
S.D.	2.8										

Table 9

Test Scores

49

Class II

Baseline 2

Subject	Session					\bar{X}
	16	17	18	19	20	
1	-	-	17	18	-	17.5
2	11	-	-	16	14	13.6
3	12	5	6	11	13	9.4
4	13	-	-	17	16	15.3
5	11	-	-	-	-	11.0
6	11	-	15	19	16	15.3
7	10	-	-	-	-	10.0
8	20	-	19	14	20	18.3
9	14	-	14	13	20	15.3
10	19	-	8	15	11	13.3
11						
12	-	-	10	14	14	12.6
13	14	-	8	10	14	11.5
14	16	-	14	18	16	16.0
15	18	8	14	10	14	12.8
16						
17	13	-	14	10	-	12.3
18						
19	-	-	19	16	16	17.0
20	-	-	14	-	12	13.0
21						
22	8	-	13	12	14	11.8
23	-	-	8	14	18	13.3
Total	190	13	193	227	228	
\bar{X}	13.6	16.5	12.9	14.2	15.2	
%	68.0	32.5	64.5	71.0	76.0	
\bar{X}	13.6					
S.D.	2.5					

Table 10

Test Scores

50

Class - II

Bonus Points 2

Subject	Session					\bar{X}
	21	22	23	24	25	
1	-	16	-	17	19	17.3
2	10	-	14	16	17	14.3
3	11	14	-	-	9	11.3
4	20	18	16	15	18	17.4
5	14	10	5	-	13	10.5
6	-	18	-	16	9	14.3
7	-	18	-	16	9	14.3
8	20	19	20	-	-	19.7
9	-	18	-	14	17	16.3
10	12	16	17	16	17	15.6
11	-	-	-	-	-	-
12	-	-	16	13	13	14.0
13	13	-	-	13	17	14.3
14	16	-	18	14	-	16.0
15	18	19	-	17	19	18.3
16	-	-	-	-	-	-
17	16	-	18	14	-	16.0
18	-	-	-	-	-	-
19	17	15	15	-	18	16.3
20	11	16	-	17	10	13.5
21	-	-	-	-	-	-
22	13	15	10	14	18	14.0
23	20	-	-	-	-	20.0
Total	211	212	149	212	223	
\bar{X}	15.1	16.3	14.9	15.1	14.9	
%	75.5	81.5	74.5	75.5	74.5	

 \bar{X} 15.4

S.D. 2.5

Figure 1
Graph of Mean Scores in
Class 1 in all Conditions

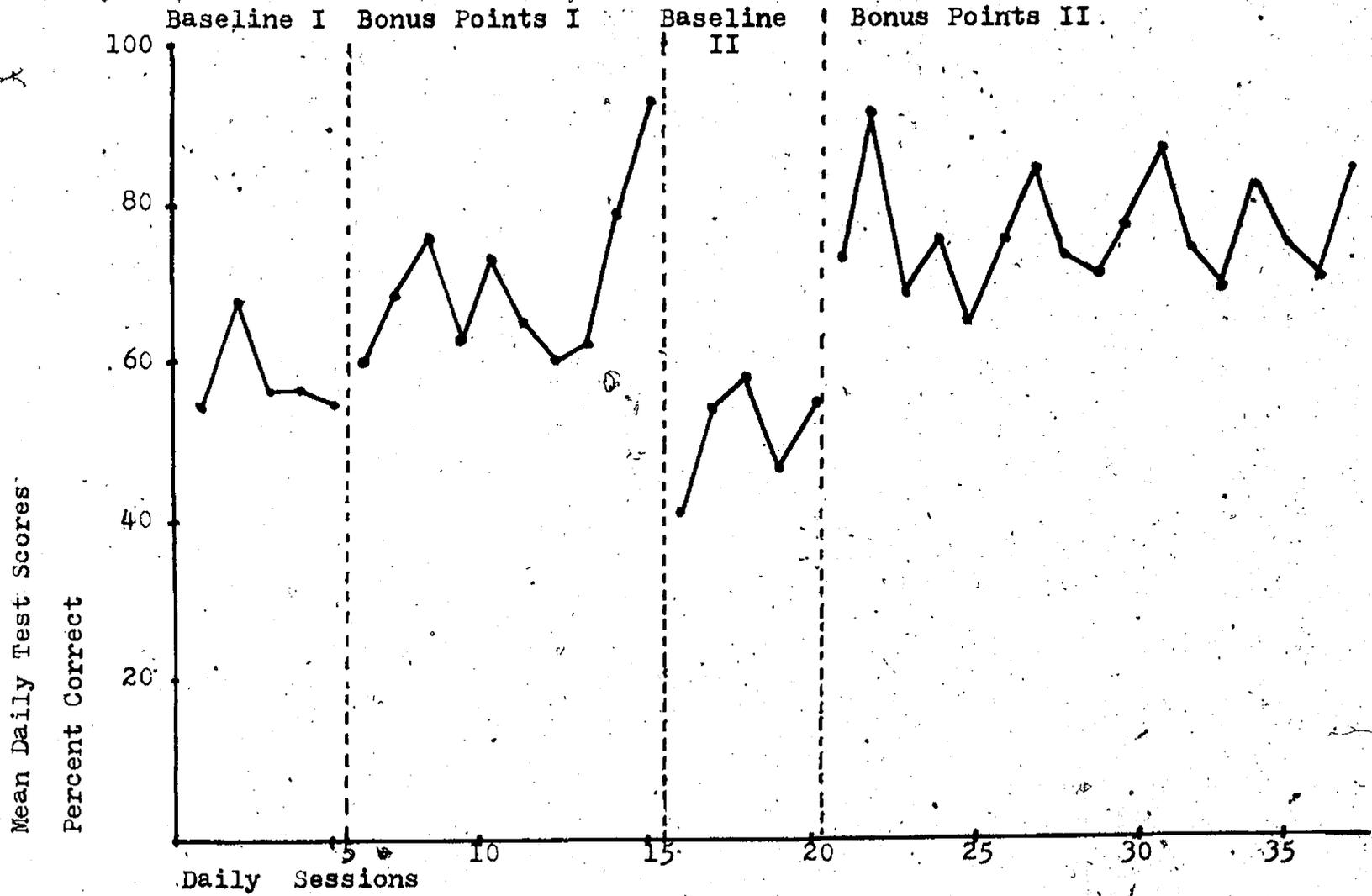
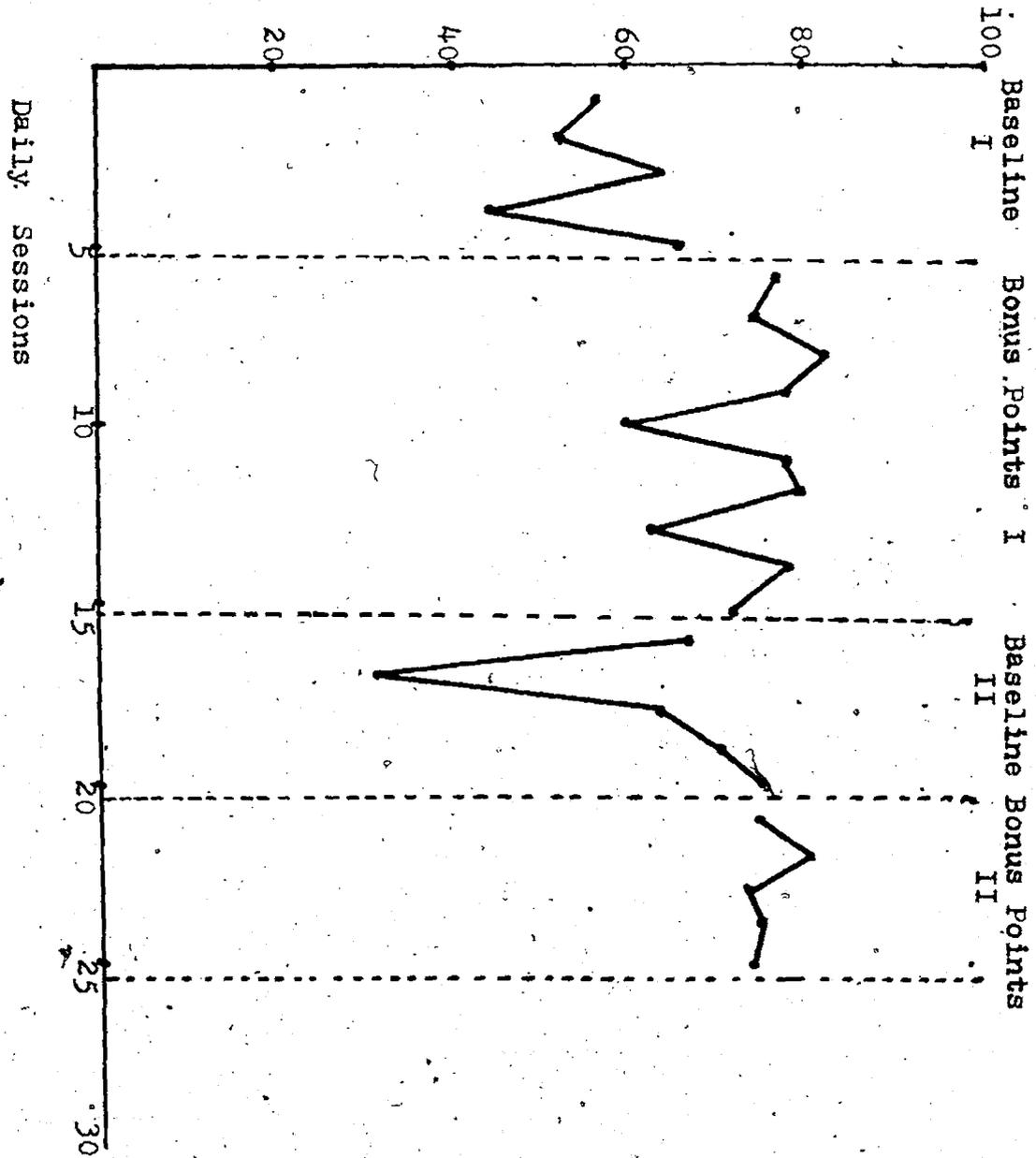


Figure ii
Graph of Mean Scores in
Class 2 in all Conditions

Mean Daily Test Scores

Percent Correct



Discussion

In both classes the introduction and removal of bonus points led to significant changes in mean class scores.

In class I the increase in mean class scores in bonus points I was not significant. Statistical significance was demonstrated in the changes in mean scores during Baseline II and Bonus Points II. The calculation of F also demonstrated a statistically significant differences between the baseline conditions and the bonus points conditions.

In class II statistical significance was shown in the increase in mean scores during bonus points I. The decrease in mean scores during baseline II was not statistically significant. The increase in scores during bonus points II was significant. The calculation of F demonstrated a statistically significant difference between the baseline conditions and the bonus points conditions.

Further experimentation is necessary to determine why the results of the two conditions were not statistically significant.

Students in both classes reported that they

were satisfied with their grades at the end of the study.

One serendipitous aspect of this study was the positive effect it had on the behavior of the students involved. The classroom teacher reported a noticeable decrease in disruptive behavior. The improved behavior of the students was also in evidence when the teacher was absent. One substitute teacher who was familiar with the classes wrote unsolicited remarks in praise of the behavior of the students. The improved behavior did not generalize to other subject areas.

It was not possible to compare the examination grades of the students before and after the study since only one set of examinations (the final) was written at that particular, high school.

In the experimental procedure used, bonus points were very difficult to calculate because the groups of five high scores could be regrouped to the best advantage of the students. It would have been easier to award bonus points per six

day cycle. It can be argued that penalizing students for being absent is unfair; especially during the winter months in an area where students are bussed considerable distances. The rate of absenteeism remained high throughout the study (see tables 3-10). Further experimentation is necessary to determine whether the rate of absenteeism is reduced in classes where bonus points are awarded.

The use of bonus points proved effective in increasing daily test scores.

Summary

Increasing academic performance is an area of concern for students and educators. Techniques of explicit timing and feedback have been successfully used to increase the rate of response and improve the quality of performance in elementary school students (Van Houten, Morrison, Jarvis and MacDonald 1974).

Engram (1976, unpublished) incorporated a design similar to that used by Van Houten et al. to show that low stream social studies students could achieve and maintain passing grades.

The classroom teacher involved in the study presented in this thesis used a timed mini lesson, daily tests and feedback as his regular method of teaching. He wished to find a suitable method of raising the low passing grades of his students.

Brigham, Graubard and Stans (1972), Maloney and Hopkins (1973) improved the academic performance of students by awarding points as tokens to the students. The tokens in these studies were exchanged for nonacademic rewards.

For the purposes of the study presented in this thesis, it was decided that academic rewards were most suitable. Bonus points awarded on the basis of daily test marks would serve as tokens and points added to the term examination would serve as back-up reinforcers. The rules and conditions for awarding bonus points are explained in table 1 and table 2.

After establishing a baseline of mean daily test results in both classes, the bonus point condition was methodically introduced, withdrawn and reintroduced in both classes.

Mean daily test scores improved significantly during the first bonus points condition, decreased during the second baseline condition, and increased when bonus points were reintroduced.

It was concluded that the significant increases in test scores resulted from the bonus points condition.

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