A Comparison of Punishment and Positive Reinforcement Group Contingencies in the Modification of Inappropriate Classroom Behaviors

Jack Schonewille, Jack Martin, and Philip H. Winne
simon fraser university

On a utilisé un modèle inversé ABCDCB pour tester les effets différentiels d'une méthode de punition légère de type I et d'une méthode de renforcement positif sur les comportements requis de 22 élèves provenant de deux classes de 6ème et de 7ème année (on demande à l'élève d'avoir, dans une circonstance donnée, telle ou telle attitude, qu'il a *on-task behavior* ou qu'il n'a pas *off-task behavior*).

Tandis que l'efficacité relative des deux procédures différait numériquement, on n'a trouvé de différences notoires et significatives que dans la réduction des fréquences de réponses verbales lorsque l'attitude de l'élève ne correspond pas à celle requise – ces fréquences favorisant la méthode de renforcement positif. En dépit de l'absence relative de différences entre les méthodes, toutes deux ont occasionné des changements souhaitables dans les comportements-cibles des élèves. On a considéré ces changements pour généraliser aux classes de comportement d'où on a tiré les réponses-cibles. On a aussi montré la conscience que les élèves ont de leur propre comportement pour produire un changement de comportement désirable, mais non dans la mesure de celui produit par les différentes méthodes. On en dégage des questions de méthodologie et d'implications en classe.

Two primary objectives of school are that students learn and that they gain intrinsic motivation to continue learning. However, prior learning and the intrinsic reinforcement it may produce don't always ensure that young children will engage in learning tasks. Traditionally, teachers have used verbal and physical discipline to counter students' disengagement from learning. Recently, research has substantiated that contingency systems based on principles of operant learning can significantly reduce and modify students' academically nonproductive actions and concurrently increase productive classroom behavior (Barrish, Saunders, & Wolf, 1969; Schmidt & Ulrich, 1969; Medland & Stachnik, 1972). In other words, by making certain events such as time off from homework contingent on paying attention during class, teachers can significantly increase the degree to which students attend to instruction. The application of contingency systems to classroom groups, rather than to individual class members, has had an especially noteworthy success owing to its efficiency and positive use of peer pressures

(Hall, Lund, & Jackson, 1968; Wolf & Risley, 1969; Herman & Tramontana, 1971; Litow & Pumroy, 1975).

Systems of contingencies between students' classroom behavior and either punishing or positive reinforcing consequences have been applied to classroom groups. Although both strategies have been successful (Barrish, Saunders, & Wolf, 1969; Hall, Fox, Willard, Goldsmith, Emerson, Owen, Davis, & Porcia, 1971), few studies have examined their comparative effects on the same student group. Hundert (1976) compared the effects of a positive token reinforcement contingency with those of a response cost (mild punishment) contingency in which an inappropriate response "cost" the student some otherwise available tokens. Over six replications of a single-subject design, he found no differential effects on student behavior or preference as a function of the type of contingency system. He concluded that subjects were not able to discriminate the key features of the respective contingencies to which they were exposed, thus making both systems equally effective.

The main purpose of this study was to measure the relative effectiveness of a short-term punishment versus a short-term positive reinforcement contingency system for reducing the frequency of specific inappropriate behaviors of a group of senior elementary students. Both short-term contingency systems were embedded within a long-term reinforcement/punishment contingency system.

To ensure that students in the class understood the specific features of the contingencies which were operative, they were directly involved in identifying the contingencies which were used. This involvement constituted a unique phase in the research design, and its effects formed a second focus of the experiment which examined Bandura's (1969) claims about the utility of involving students in determining the nature of their environment.

METHOD

Subjects and Setting

The teaching environment of the study was one area in a multi-area teaching space involving 95 students in the sixth and seventh grades. The children had attended this school for all their elementary schooling and were accustomed to open area teaching styles. During the study, five teachers shared instruction by individually teaching each of several distinct but more or less homogeneous groups of students. The groups had been formed earlier in the year on the basis of the students' performance on a teacher-made test on the basic arithmetic operations using whole, fractional, and decimal numerals, and ratio and percent.

The subset of students participating in the study were 6 seventh-grade students (3 boys and 3 girls) and 16 sixth-grade students (8 boys and 8 girls)

judged to be of average ability. They had shown mastery of the basic operations involving whole numbers, but had some difficulties in performing the arithmetic operations involving common and decimal fractions, and difficulties with ratio and per cent. Informal observations over the fall term revealed that the students were talkative and easily distracted from their tasks. The teacher usually spent considerable time urging students to attend to the lessons. Unfortunately, this strategy seemed to produce the antithesis of the desired results. Specifically, the frequency of inappropriate behaviors attended to by the teacher seemed to increase.

Defining Target Behaviors and Contingencies

The classroom teacher had previously selected a set of general off-task behaviors, i.e. behaviors signalling inattention or disruption of learning, based on those used by previous experimenters (Barrish, Saunders, & Wolf, 1969), which fitted the present class setting. These behaviors were grouped into three classes: verbal, out-of-seat, and disruptive. The rationale for creating the three classes was that specific off-task behaviors within each class were thought to be related to one another and seemed to function as a class in decreasing student learning efficiency.

Specific behaviors targetted for change by the contingency systems were specified in co-operation with the students through a teacher-led discussion. By means of leading questions from the teacher, the students identified specific behaviors which they considered to be inappropriate and to interfere with their learning. The students then ranked the behaviors they judged most disturbing, the top five of which became target behaviors. A sixth behavior, being out-of-seat without permission while in the area, was suggested by the teacher and included in the set of target behaviors with the students' approval. All six behaviors were equivalent to a subset of those identified earlier by the teacher, the major difference being a greater specificity of definition in the teachers' list of off-task behaviors. Since each target behavior was representative of the class to which it belonged, reducing the frequency of its occurrence might generalize to the class of general off-task behaviors as a whole. Both general off-task and target off-task behaviors are identified in table 1.

Students also were involved in selecting a reinforcing event which became the consequence in the experimental contingencies. Events suggested by the students included: (*a*) intervals of free time, (*b*) participation in math games once a week for a whole session, (*c*) an unstructured period once a week to catch up on assignments, (*d*) elimination of homework on a regular basis, and (*e*) a spelling bee once a week. The teacher, with the agreement of the students, operationalized one of the suggestions: namely, the elimination of homework every second class session for which the conditions established for the attainment of this reinforcer had been met. The discussion

Table 1/Off-Task Behaviors

Classes	General Off-Task Behaviors
Verbal	Talking or whispering to other students*
	Talking or reading audibly to oneself
	Calling out answers
	Calling out for the teacher
	Calling out to other students
	Making verbal noises such as exclamations
Out-of-seat (without permission)	Out-of-seat within the area; getting a drink of water, sharpening a pencil, etc.*
	Leaning over another's desk while in the seat*
	Leaving the area to go to the library, washroom, etc.
	Tipping the chair and/or desk
Disruptive	Kicking or tripping another student, a desk, or a chair*
	Hitting another student*
	Taking things from others*
	Making noises such as tapping, drumming, or whistling
	Turning around in the desk

Note: An asterisk indicates a target off-task behavior to be modified during the study.

in which students specified the behaviors targetted for change and the events which would serve as reinforcers constituted one of the interventions of the study, as described in the following section.

Experimental Design

The experimental design consisted of six phases: baseline I (5 sessions); intervention I (class discussion — 9 sessions); intervention II (punishment contingency — 8 sessions); intervention III (positive reinforcement contingency — 8 sessions); reversal to intervention II (8 sessions); and baseline II (8 sessions). A session was a standard 35-minute mathematics period. Since baseline II was, as will be seen, equivalent to intervention I, the design employed was an ABCDCB reversal.

Baseline I. For this phase an independent observer merely recorded the frequency of the general off-task behaviors (table 1). No imposed contingencies were in force during the phase.

Intervention I. This intervention consisted of the previously described discussion between the teacher and students about disruptive behaviors and their interference with the learning process. The discussion was held between the fifth and sixth sessions of the study. No changes were made in the recording of the general off-task behaviors as observed in baseline I and no prescribed contingencies were in force for any of the nine sessions of this phase.

Intervention II. For this phase the students were informed that a short-

term punishment contingency and a long-term reinforcement/punishment contingency would be in effect. The short-term punisher consisted of a demerit point (punishment type I, i.e. the application of an unpleasant stimulus following a target behavioral response) assessed to the group for each target off-task behavior emitted by any individual student in the group. The long-term reinforcer was the contingent event selected by the students, namely, the elimination of homework every second session. This reinforcer would be withdrawn if criterion levels previously established had not been met. Thus, the long-term contingency event could be either positive reinforcement or punishment type II (i.e. the withdrawal of a reinforcing stimulus following a target behavioral response).

The criterion level was determined with reference to the baseline I data. Since the average frequency of the target off-task behaviors during baseline I was approximately 60 behaviors per session, the teacher and the students agreed upon the criterion level of 30 points (i.e. 30 behaviors). The teacher recorded the number of demerit points on the blackboard so that the students would be continuously aware of their performance. This phase lasted for eight sessions.

Intervention III. For this phase the students were told that a short-term positive reinforcement contingency and a long-term reinforcement/punishment contingency procedure would be used. The short-term reinforcer consisted of merit points awarded to the group for successful time intervals during which none of the target off-task behaviors were emitted by anyone in the group. An interval of two minutes was suggested by the teacher on the basis of some spot-checking while intervention II was in progress. A criterion level of 10 two-minute intervals was agreed to by the students and the teacher. This constituted roughly 57% of class time. The long-term reinforcement/punishment contingency was the same as for intervention II. This phase lasted for eight sessions.

Reversal. At the beginning of the thirty-first session the teacher explained that the conditions for intervention II would again be in effect. This phase lasted for eight sessions.

Baseline II. This phase was a return to the conditions of intervention I, namely, the condition of students being aware of the off-task behaviors but with no contingencies in force for these behaviors. It was introduced by simply telling the students that the interventions and contingent events would no longer be in effect. A 14-day Christmas vacation intervened between this phase and the reversal phase. The phase lasted for eight sessions.

Observation and Recording Procedures

Observations were made between 1:05 P.M. and 1:40 P.M. each day for the entire study. There were two separate observation schedules kept by two different observers.

Schedule I: Off-Task Behaviors. An independent observer recorded each occurrence of all off-task behaviors (table 1) for the entire study. Since the target off-task behaviors were a subset of the general off-task behaviors, a continuous observation record of the target behaviors also was obtained. A subscript code recorded the distinction between off-task responses which were self-initiated and those which were initiated by others.

Schedule II: On- and Off-Task Behaviors. A second independent observer recorded the students' on- and off-task behaviors throughout the study in order to identify any unintended effects resulting from either contingency system. On-task behaviors were separated into two categories. "Hard" on-task behaviors were tightly operationalized, e.g. when students were using their pencils to work problems, orally responding to the teacher appropriately, and so on. "Soft" on-task behaviors were those which required the observer to exercise some discretion in judging task involvement, as when the students appeared to be listening to the lesson, or reading the assignments, or were finished with the task assigned but were not engaged in off-task behavior.

Schedule II employed a time-sampling procedure in which each student was observed in a predetermined random order for a 10-second interval. The recording was done in behaviors (rows) by time (columns) matrix with each column representing a 10-second interval. The observer used an earphone to monitor a tape recording which bleeped the passage of each 10-second time interval. In this manner, the observer could continuously observe individual students without having to watch a timing device.

For on-task behavior to be recorded the student was required to exhibit on-task behavior for the total interval. If at any time during the 10-second interval the student exhibited off-task behavior, the entire interval was recorded as off-task. The rationale for this was that if a student engaged in off-task behavior during such a short time interval, it was reasonable to assume that on-task concentration was seriously disrupted.

This time-sampling procedure was used by Bushell, Wrobel, and Michaelis (1968) to validate the assumption that, in a given situation, behavior observed at fixed intervals adequately represented behaviors occurring during the total interval. If a child's behaviors are observed seven times during a daily observation period and the on-task behaviors are observed four times, then the rate of on-task behavior for that child is .57 for the entire period. The percentage of on- and off-task behaviors for the group as a whole was calculated as the number of on- or off-task individual response intervals, divided by the total number of response intervals and multiplied by 100.

Teacher observations. The teacher observed and recorded the frequency of the target off-task behaviors as defined in intervention I (see table 1). Each time target behaviors occurred during interventions I, II, and reversal, the teacher recorded it on a hand-held manual counter. This count made

by the teacher was used to determine whether the students achieved the contingent event.

During intervention III, the teacher, by means of a stopwatch, recorded the number of completed two-minute intervals during which no student exhibited any of the target off-task behaviors.

Training of Observers. Prior to the study, there was a one-week training period for the teacher and the two independent observers. The two independent observers initially used both observation schedules and acted as interobserver reliability checks for each other during the training period. When Schedule I recording sheets were used, the teacher also recorded the frequency of several arbitrarily selected target behaviors. In this way, training was continued until a high degree of interobserver reliability was established. In addition, several reliability checks were made at various points throughout the study with both independent observers using the time-sampling observation schedule or the off-task observation schedule at a time of day different from that during which the experiment was conducted.

Throughout the study, except for intervention III, the teacher's recordings of the frequency of target behaviors were used as rough interobserver reliability checks between the teacher and the independent observer who used Schedule I. Since the target behaviors were a subset of the general off-task behaviors, it was thought that a high degree of interobserver agreement for the target behaviors would be a strong indication of the reliability of the frequency of all the general off-task behaviors.

RESULTS

Reliability of Observations

The reliability of the on-task observations obtained using Schedule II was analyzed three times during the training sessions and once during the fifth phase. Interobserver agreement between the primary observer and the reliability observer was calculated by dividing the number of intervals for which there was a perfect agreement by the total number of intervals, multiplied by 100. These proportions ranged from 69% to 100%, with an average of 89%.

The reliability of off-task behavior observations from Schedule I was analyzed twice during the training sessions and twice during the study. Agreement was analyzed separately for each class of responses (verbal, out-of-seat, and disruptive) and calculated by dividing the smaller number of responses observed by the larger number of responses observed, multiplied by 100. The ranges and means of the interobserver agreements for each class of responses were: verbal responses (93%–98%; $M = 96\%$), out-of-seat responses (71%–98%; $M = 82\%$), and disruptive responses (84%–91%; $M = 87\%$).

In addition, the reliability of the group of target off-task responses was

analyzed for each session of the study except baseline I and intervention III. Interobserver agreement between the teacher and the independent observers using Schedule I was calculated in the same way as for the general off-task behavior observations. The percentage of agreement ranged from 30% to 100%, with an average of 81% and a standard deviation of 15.9. This standard deviation indicated large discrepancies between the observations by the teacher and the independent observer. In comparison, the percentage of agreement in observations for the target off-task behaviors recorded by the primary and reliability observers during the training and analysis sessions ranged from 87% to 97%, with an average of 91% and a standard deviation of 2.

Achievement of the Long-Term Reinforcer

The long-term reinforcer, the elimination of homework for every second session when the predetermined conditions of the contingency system were met, was given as a function of the teacher's observations of the frequencies of the target behaviors. The students as a group were successful in meeting the predetermined conditions in every instance. The range and mean of the target responses for intervention II were (11–26; $M = 18.4$) and for reversal (3–11; $M = 7.6$). The range and mean of the completed time intervals for intervention III were (11–17; $M = 13.6$). If the reinforcer had been made available on the basis of the frequencies recorded by the independent observer, the group would have obtained the reinforcer in every instance. Thus, the aforementioned discrepancies between the teacher's observations and those of the independent observer were not relevant to the practical effects of the contingency systems.

General and Target Off-Task Behaviors

Figures 1 through 4 and tables 2 and 3 indicate the extent of the effect which the contingency procedures had on all the general and target off-task behaviors and the classes of off-task behaviors. Generally, the frequencies of all verbal responses were significantly reduced, in practical terms, from their levels in baseline I compared with their levels for interventions I, II, and III. A reversing trend was recorded for reversal and baseline II. The same pattern was noted for the general out-of-seat behavior frequencies, while for the target response category a decrease for this class was noted only for interventions I and II. The mean response frequencies of the target out-of-seat behaviors remained almost stable for intervention III and reversal, while a slight increase was recorded for baseline II.

The pattern of results for the general disruptive behavior was similar to that of the verbal response class with one exception. There was a decrease in the mean response frequencies of general disruptive behaviors from reversal to baseline II (table 2). The pattern of results for the target disruptive behaviors was quite varied. The mean response frequency

Table 2/Comparison of Frequencies of Off-Task Behaviors for Each Phase

	Phase					
		Interventions				
Behaviors	Baseline I	I (Discuss)	II (Punish)	III (Reward)	Reversal	Baseline II
General Off-Task						
Grouped						
Range	92–137	33–124	22–51	11–26	17–29	18–41
Mean	110	80	34	18	21	30
S.D.	16.7	26.4	9.8	6.0	6.6	9.2
Class A						
Range	52–87	16–92	7–27	1–15	7–18	13–33
Mean	70.3	56.8	19.1	6.9	9.6	21.6
S.D.	16.3	24.3	7.5	2.8	3.4	6.2
Class B						
Range	11–31	7–26	1–10	2–8	1–7	2–12
Mean	20.8	13.4	6.5	4.6	3.9	5.5
S.D.	6.8	5.8	2.8	2.7	1.7	3.0
Class C						
Range	11–29	4–18	3–14	3–12	5–10	2–6
Mean	18.8	9.8	7.8	6.6	7.6	3.3
S.D.	6.5	4.3	4.4	2.5	2.2	1.3
Target Off-Task						
Grouped						
Range	66–98	22–100	11–30	1–17	8–16	13–33
Mean	79.0	59.9	21.5	8.5	10.6	24.3
S.D.	11.9	24.3	5.6	5.0	3.0	6.8
Class A						
Range	45–75	16–83	6–27	0–13	5–13	12–28
Mean	62.0	50.0	18.0	5.5	7.5	20.0
S.D.	14.3	21.6	6.6	4.1	3.0	5.4
Class B						
Range	4–21	4–19	0–4	0–7	0–3	1–7
Mean	15.0	8.0	2.3	2.7	2.1	3.5
S.D.	6.5	6.2	1.5	2.0	1.1	2.1
Class C						
Range	0–4	0–5	0–5	0–1	0–3	0–2
Mean	2.3	1.7	1.9	.3	1.1	.5
S.D.	1.5	2.2	1.8	.4	1.2	.7

Note: Class A = Verbal Off-Task; Class B = Out-of-Seat Off-Task; Class C = Disruptive-Off-Task.

Table 3/Comparison of Mean Responses as Percentages of the Total Number of Responses for Each Phase.

Phases	Classes of Behavioral Responses					
	General Responses			Target Responses		
	A	B	C	A	B	C
Baseline I	64	19	17	78	19	3
Intervention I	71	17	12	83	13	3
Intervention II	56	19	23	82	10	9
Intervention III	38	26	37	65	32	3
Reversal	46	18	36	68	19	10
Baseline II	72	18	10	83	15	2

Note: A = verbal off-task responses; B = out-of-seat off-task responses; C = disruptive off-task responses.

decreased from baseline I to intervention I, remained stable for intervention II, and dropped to almost insignificant levels for intervention III, reversal, and baseline II. The fluctuations of slight increases and decreases were probably floor effects since the frequencies were already at low levels and could not be reduced significantly further.

The proportionate levels of the classes of behaviors in terms of a percentage of the total responses were roughly maintained throughout the study (table 3). The verbal response class consistently had the highest percentage of mean frequencies of all phases. The relative frequency levels for each class of general off-task responses were similar only for intervention III. An unusually large proportionate frequency level was observed for the target out-of-seat behaviors for intervention III. Other fluctuations were observed but were not so significant.

On- and Off-Task Recordings

Figure 5 shows that the contingency procedures positively affected the general percentage of on- and off-task behavior of the students. There was an increase of about 5 percentage points in on-task behavior for intervention I, with a further increase of 2 percentage points for each of interventions II and III. This high level was maintained for reversal. A decrease of about 2 percentage points was recorded for baseline II.

Data for the different on- and off-task categories are summarized in figure 6. These data indicate that, with the exception of reversal, the percentage of "hard" on-task behaviors had an increasing trend, while the "soft" on-task behaviors had a decreasing trend. The percentage of off-task behaviors consistently decreased from the baseline I frequencies through the interventions and reversal phases. A slight increase in percentage frequency was observed for baseline II. The increases were relatively

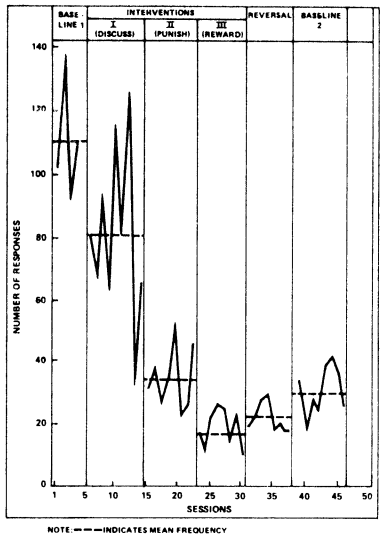

Figure 1. General off-task behaviors

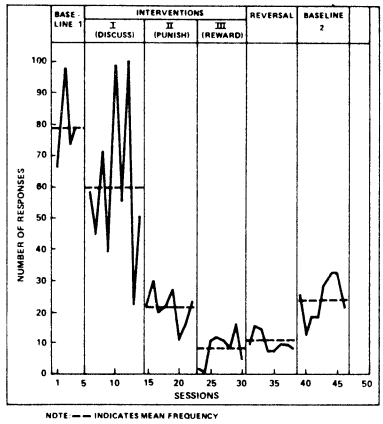

Figure 2. Target off-task behaviors

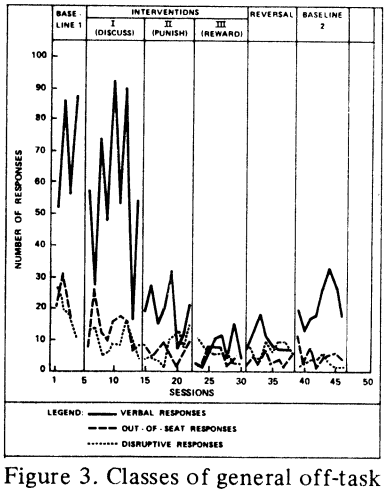

Figure 3. Classes of general off-task behaviors

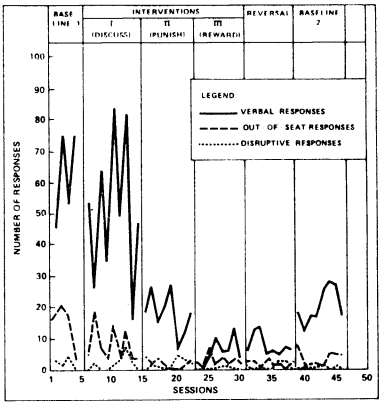

Figure 4. Classes of target off-task behaviors

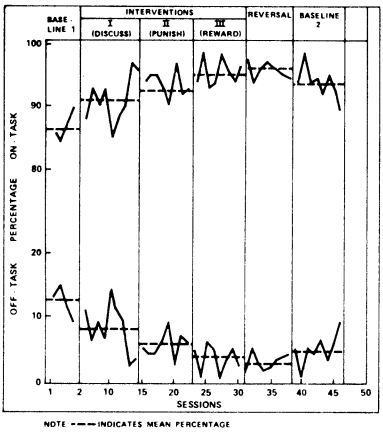

Figure 5. Percentage of on-task and off-task behaviors

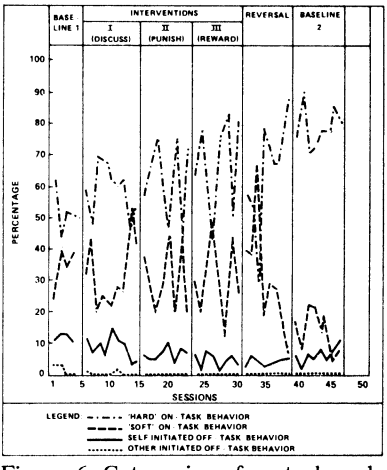

Figure 6. Categories of on-task and off-task behaviors

small, but still significant in view of the relatively high standard of on-task behaviors recorded for baseline I.

DISCUSSION

General Observations

The contingency procedures defined and used in this study significantly and reliably modified most target behaviors in a normal classroom situation. These findings support previous research (Barrish, Saunders, & Wolf, 1969; Medland & Stachnik, 1972; Schmidt & Ulrich, 1969) indicating that off-task behaviors can be effectively modified by contingency procedures. Not only were the target response frequencies reduced, but the frequencies of the classes of responses to which the target responses belonged were similarly reduced. These results are similar to those of O'Leary and Drabman (1971) who found that contingencies tended to increase the frequency of emission of similar appropriate behaviors through response generalization, even though application of the procedures was made only upon the occurrence of specific appropriate behaviors. The present study found that such response generalization also held, in terms of decreased frequency of similar inappropriate behaviors, even though the application of the procedures was made only upon the occurrence of the target response classes.

The relative effectiveness of the two short-term contingency procedures was found to be numerically different. However, in terms of practical classroom application, the short-term reinforcement procedures were found to be substantially and significantly more effective only in reducing the verbal response frequencies. Short-term reinforcement and short-term punishment procedures were found to be similarly effective in modifying and reducing out-of-seat and disruptive behaviors. (It must be noted that both the latter behaviors were at relatively low levels of emission throughout the study and that differential treatment effects might well have been reduced by this "floor effect.")

Despite the fact that both short-term contingencies were effective in reducing the frequencies of the inappropriate behaviors, informal observations and discussions with the students indicated that the students preferred the short-term reinforcement contingency. As well, the general classroom atmosphere seemed to be more positive, although there is no objective data to substantiate this claim.

For the group as a whole, the criterion level for the short-term reinforcement contingency meant that they could not engage in any target off-task behaviors for at least twenty of the session's thirty-five minutes. Results showed that the group usually achieved more than the required twenty minutes and, compared to the baseline I data, this was very satisfactory for the teacher.

The percentage of on-task behavior increased relative to the baseline for

each of the intervention phases. (No relative differences in effectiveness were determined between the short-term contingency systems. This may have been due to the fact that the same long-term reinforcement procedure was in effect during both short-term contingency procedures.) Although the increase in terms of percentage points (about 8) appears to be low, it can be considered important in view of the relatively high level of on-task behavior exhibited by the students during baseline I (86.7%).

The frequency of the off-task responses varied from one session to another within each phase. This seemed to be an indication that usual classroom conditions were present, reflecting the mood of the class and the relative difficulty and interest of the topic dealt with during any specific session. This fluctuation in response frequencies increased significantly for the general and target off-task behaviors during intervention I as was reflected by an increase in the standard deviations of emission frequencies for these behavioral categories. However, for most other phases and behavioral categories, the standard deviations decreased as the frequencies decreased, and vice versa.

The discussion between the students and the teacher regarding the need for more acceptable classroom behaviors had a significant effect on modifying the frequencies of all behaviors. These results support Bandura's (1969) claim that it is useful to involve students in specifying the behaviors to be modified. Allowing the students to select the reinforcing event seemed to have ensured that it would be of sufficient strength to significantly and consistently modify the behavior frequencies. However, as indicated by the overall trends in student behaviors over the entire experimental period, students' awareness of their own behavior must be coupled with a well-defined contingency system if desirable behavioral change is to be maximized.

The response frequencies for the reversal phase did not return to the levels previously recorded during baseline I and intervention I. This result was presumably due to the appropriate behaviors being sufficiently established to become somewhat "internalized" by the students. This result is supported by the frequencies of responses recorded during baseline II. The relatively significant decrease in the frequency of the target disruptive response class is explainable in that these responses were at an insignificant level, even during baseline I. However, the maintenance of these low frequencies even after a two-week Christmas holiday is noteworthy.

Research Concerns

Observer discrepancies. The independent observer usually recorded a greater frequency of target off-task behaviors than did the teacher. One reason for this was that the teacher could not observe the behaviors while writing on the blackboard or helping individual students. Despite these discrepancies, the results of the study indicate that it is possible for class-

room teachers to act as observers and to substantially modify the behaviors of students.

Time sampling procedure. The time sampling procedure used to determine the percentage of on-task behavior of the students as a group did not accurately reflect the general behavior of the group. Baseline I data indicated a relatively high percentage of on-task behaviors (figure 5), but at the same time a relatively high frequency of off-task behaviors (figure 1). One reason for this discrepancy is that a few students were responsible for a great number of off-task behaviors while each accounted for less than 5% of the time sampling observations. A better method for recording on-task behaviors may be to record the occurrence or nonoccurrence of any off-task behavior by any member of the group over smaller time intervals. On-task behaviors, calculated as a percentage of on-task behavior intervals relative to the total number of intervals, would be a more accurate indication of the on-task behavior of the group as a whole.

Use of stimuli. The same stimulus was used for both short-term contingency procedures. First, a "point" was used as a punisher, then as a reinforcer, and lastly again as a punisher. This required the students to perceive the different intent of the "point" as applied in the different contingency procedures and may partially account for the relatively minor differences between contingency systems, particularly between intervention III and the reversal. Perhaps the use of two different stimuli would have resulted in more distinct differences for the two short-term contingencies.

Floor and ceiling effects. There was a lack of significant differences in modifying the frequency of some of the specified off-task behaviors. This was especially so for out-of-seat and disruptive behaviors as a result of intervention III and reversal. One reason may be a floor effect on these behaviors, which already were at a relatively insignificant level. Further decreases in frequency levels may not have been possible (or even desirable) for a group of active students, without adverse side-effects emerging.

A similar but opposite effect was noted for the percentage of on-task behaviors which exhibited ceiling effects. The percentage of on-task behavior was at such a high level for baseline I that further increases, beyond those observed, may not have been possible. Such floor and ceiling effects together with the repetitive topographical characteristics of key stimuli across interventions prevent this study from offering definitive information vis-à-vis the differential effects of positive reinforcement and punishment contingency systems when applied to classroom groups. Nonetheless, differential effects on verbal off-task behaviors are well-documented.

Classroom Implications

The results of this study show that a classroom teacher can effectively and consistently reduce the frequency of off-task responses by applying a short-term punishment and/or a short-term positive reinforcement

contingency procedure to particular target responses which are a subset of general classes of behavior inappropriate for learning. Teaching time, i.e. time devoted to academic concerns, was increased because the teacher did not have to call the students to their tasks during the period of use of these contingency procedures. The general atmosphere of the classroom remained positive and seemingly more productive. Although no measurements were obtained, the students seemed to have less homework on days when homework was not eliminated than they had before the study was initiated. Yet as much, and perhaps more, material was covered by the teacher. Thus, the special event, i.e. elimination of homework on a regular basis, had no observed detrimental effect. On the other hand, the students were always eager to know whether the criterion levels, which entitled them to the contingent event, had been met.

This study provides teachers with practical knowledge about the effectiveness of contingency procedures in modifying and reducing the frequency of students' off-task behaviors. It demonstrates that a teacher does not need equipment or devices other than those already present in most classrooms to effectively manage the classroom behaviors of students. Through the use of similar contingency procedures, teachers can help students to acquire patterns of appropriate behavior which may continue to benefit the students long after the external contingency conditions have been removed. Most important, such procedures provide teachers with practical and effective techniques so that their technical skills of teaching can be used most productively in assisting students to learn.

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Jack Schonewille is a teacher at MacCorkindale School, Vancouver, B.C. V5S 3M8.
Jack Martin and Philip H. Winne are assistant professors of education, Simon Fraser University, Burnaby, B.C. V5A 1S6.