JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1980, **13**, 611-617 NUMBER 4 (WINTER 1980)

EFFECTS OF INFORMATIONAL PROMPTS ON ENERGY CONSERVATION IN COLLEGE CLASSROOMS

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A multiple-baseline design was used with two target classroom groups (n = 28 and 27) in a study to reduce electrical energy waste in college classrooms. A dittoed letter, signed by a faculty member, was sent to each professor in the prompt condition. In the letter the professor was informed that he or she taught prior to an unscheduled period and was asked to turn off lights following the class. The results showed that after the prompt, the percentage of rooms with lights turned off increased by 13% and 6% in each target group. A further analysis of the 10 classrooms that had the lowest baseline rates of turning lights off indicated a 30% increase after the prompt. This study indicates that a minimum prompt procedure was effective in reducing electrical energy waste. The further significance of these results are also discussed.

DESCRIPTORS: energy conservation, prompting, electricity conservation, ecology

Escalating costs and diminishing supplies of energy have had a significant impact on colleges and universities in recent years (Atelsek & Gomberg, 1977). Although electricity accounted for only 20% of the total energy used by colleges during this period, it costs fully 55% of the total energy bill, and costs are continuing to rise. Technological changes have been made to reduce energy use, but little or no progress has been made in changing behavior patterns that consume energy. One behavior problem is leaving lights burning after scheduled classes. A recent survey of unscheduled and unoccupied college classrooms found that lights were left burning in 24% of such classrooms, at a waste of over 9 million watt-hours of electrical energy per year in a small college (Luyben & Luyben, Note 1).

The failure to turn off lights may reflect users' indifference to energy shortages and needs. However, an alternative analysis suggested that the problem of energy waste in classrooms is a problem in discriminating when to leave lights on or turn them off. It is important to recognize that leaving lights on after a class is an appropriate response in most instances because many class periods are followed by subsequently scheduled classes. In such cases, turning the lights *off* after a class, and then *on* again for a subsequent class would use more energy than leaving the lights on for the 10- to 15-min period between classes (*Energy Facts,* Note 2). However, in cases where a scheduled class precedes an unscheduled period, leaving lights on wastes energy. The failure to turn lights off at such times may be attributed to the absence of a cue or prompt indicating that the lights should be switched off at that particular time. If this analysis is correct, then providing such a prompt should enable classroom users to respond discriminately.

The author expresses appreciation to the following persons for their assistance in this research: Richard Jones, President of the College; Richard Margison, Vice-President for Business and Finance; James Updyke, Plant Superintendent; Art Robinson, Maintenance and Supervisor; Gordon Manings, for his help with data analysis; and Lois Arnone, Jenifer Boise, Linda Caine, Jody Clarke, Heather Daims, Ann Marie Di Blasi, Lorraine Johnson, Thomas Lambert, Joan Luyben, Thomas O'Rourke, Roseann Parotta, Susan Rice and Rebecca Salas, the observers. Without their help this project could not have been completed. I also thank Robert Lehr and Craig Barclay for their assistance with the design as well as manuscript preparation. Reprints may be obtained from Paul D. Luyben, Psychology Department, State University College at Cortland, Cortland, New York 13045.

A number of previous studies have examined the effects of prompts, e.g., verbal reminders, notices, and flyers (Hayes & Cone, 1977; Kohlenberg, Phillips, & Proctor, 1976; Palmer, Lloyd, & Lloyd, 1978) and information brochures (Winett & Nietzel, 1975) on electrical energy consumption. Recently, it was found that prompts displayed on large posters were quite effective in reducing the percentage of days in which lights were left on after 5:00 p.m. in a college classroom (Winett, 1977). Unfortunately, the use of only one classroom where data were collected late in the day limits the generalizability of the findings. Also, posters are relatively expensive to use on a large scale. An equally effective, less expensive approach is needed.

In the experiment reported here, the effects of an information prompt on the frequency of lights left on in unscheduled college classrooms were examined.

METHOD

Setting and Observational Procedure

Classroom observations were conducted in five academic buildings between 10:00 a.m. and 5:00 p.m. on weekdays. Starting 5 min after each class hour began, observers circulated through each building on a 15-min cycle, recording whether lights were left on or turned off in unscheduled classrooms, and whether the room was occupied (e.g., by students studying). Observation times were determined by the schedules of participating observers.

A total of 162 "observation periods" were identified. An observation period was defined as any unscheduled class period in which an observer could record whether lights were left on or turned off in a classroom, regardless of whether observations were made in that classroom at other times or on other days. However, a room that was observed several days a week at the same time (e.g., Mondays, Wednesdays, and Fridays at 2:00 p.m.) was counted as a single observation period.

From the 162 observation periods identified, 55 were classified as target observation periods. These were defined as observation periods that immediately followed a *scheduled* class. Observations from these periods provided the primary data of the study. (A complete report, including data from nontargeted classrooms, is available from the author.)

One additional note is that approximately 11% of observed classrooms were found to be occupied with the lights left on. Because such use of lighting was considered to be appropriate, these data are not included in the figures presented below.

Reliability

Twenty-four reliability checks were conducted in which a second observer circulated independently through each building. Percent reliability was computed using the formula, agreements/agreements + disagreements, × 100. Perfect agreement was obtained on 23 of the checks, with 94% agreement on the remaining check.

Experimental Procedure

A letter prompt phase was used in which a dittoed letter was sent to each target professor, in which he or she was: (a) reminded of the need to conserve energy; (b) informed that lights were frequently left on in unscheduled classrooms and that his or her classroom preceded an unscheduled period; and (c) asked for assistance in turning off the lights. The classroom was specifically identified by location and time.

This condition was designed to simulate a procedure that could be routinely used by the registrar's office. Consequently, although it was known that errors in selecting faculty would occur (because, for example, faculty occasionally change rooms or schedules without notifying the registrar's office), no attempt was made to correct for these errors. The data should therefore underestimate the actual experimental effects of the prompt (but not the programmatic implications), because prompting a professor who did not teach in a target room at the time scheduled would not produce a reduction in unnecessary lighting. In addition, to minimize the costs of the procedure, only one prompt was used.

When it became apparent during the course of the study that many lights were still left on in the letter phase, the decision was made to use an intensive prompt procedure following the letter phase in Target Group A. This procedure, called the letter and poster condition, was similar to that used by Winett (1977). A bright yellow poster (approximately 11 cm × 14 cm) with red and green lettering was placed next to each light switch and/or exit door in the classroom associated with each target observation period. The poster urged classroom users to turn out lights after *specified* class periods. A letter was also sent to the faculty member, advising that the poster was being placed in the classroom and again requesting cooperation in turning off lights.

This procedure differed from the letter condition in that, although the professor who taught the class was contacted in each case, the poster prompt was available to all persons using the room. The purpose of using this procedure was to determine the maximum percentage of lights that would be turned off under the most intensive prompt procedure judged likely to be cost effective.

Experimental Design

A multiple-baseline design was used. The 55 target observation periods were assigned randomly to one of two groups, with the restriction that no classrooms or professor could be represented in both groups. The groups were labeled Target Groups A and B ($n = 28$ and 27, respectively). Baseline data were collected for 5 and 8 wk in each of these two groups, respectively. The letter prompt procedure followed baseline for 6 wk in each group.

The letter and poster procedure was instituted for 3 wk following the letter phase in Target Group A.

RESULTS

The data of primary interest are presented in Figure 1. These data represent the percentage of observations in which lights were turned off in target classrooms over successive weeks.

After receiving the letter prompt, the percentage of observation periods with lights turned off increased from 67% during baseline to 80% in Target Group A, a mean increase of 13%. The difference between conditions was statistically significant using the Wilcoxen matched-pairs signed-ranks test $T(24) = 46.5, p < .005$ (Siegel, 1956).

The mean percentage of observation periods with lights turned off increased from 70% during baseline to 76% after institution of the prompt in Target Group B. This difference just failed to reach statistical significance at the .05 level. (It should be noted that the baseline rate for this group was quite high, thus leaving little room for improvement.) In addition, the difference between Target Groups A and B during baseline and prompt phases were not statistically significant.

The downward trend apparent in the data from Target Group A during the last 3 wk of the letter phase was reversed by introducing the letter and poster condition. In this condition, the percentage of observation periods with lights turned off increased to 84%.

In order to evaluate the effects of the prompts on "worst cases," the 10 classrooms in Target Group A that had the lowest rates of extinguished lights were selected. These data are presented in Figure 2.

The percentage of observation periods with lights turned off increased from 32% during baseline to 62% during the prompt phase, a 30% increase $T(10) = 3.0, p < .01$.

Individual data are presented in Table 1, where it is seen that the percentage of occasions when lights were turned off increased in all but one classroom and that positive changes were distributed across nearly all members of the group.

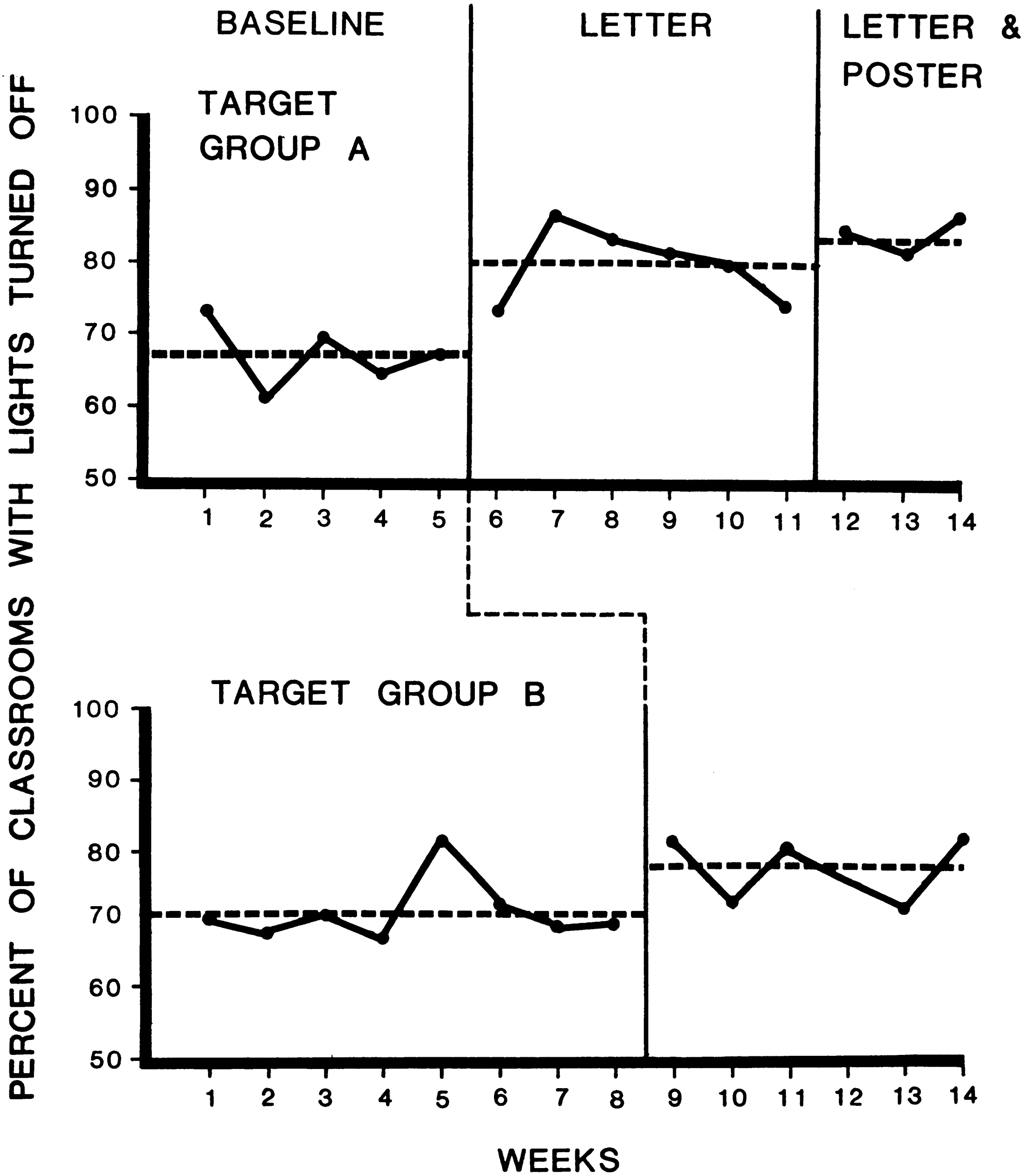

Fig. 1. Percentage of target observations in which lights were turned off after the letter prompt for both Target Groups A and B.

A postexperimental consumer survey was also conducted. The survey consisted of eight questions using a Likert-type response scale (Likert, 1932), with a range from 1 to 5, plus a free response, "Remarks" section. The survey included questions such as "I am (not at all/very much) concerned about energy waste and energy conservation," and "In particular, I (strongly disapprove/strongly approve) of the use of letters to encourage conservation." Arrangements were made to ensure that all responses would be anonymous and confidential.

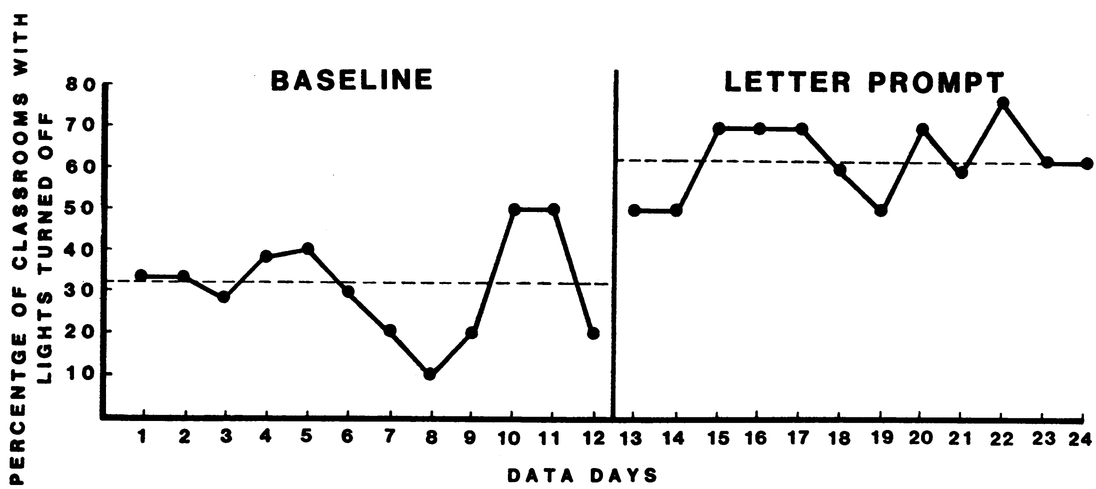

Fig. 2. Percentage of 10 target observation periods with lights turned off before and after the letter prompt. The classrooms were those that had the lowest baseline rates for turning lights off.

Table 1

Percentage of observation periods in which lights were turned off during baseline and prompt conditions in 10 selected classrooms, and the difference between conditions.

Rooms	*Baseline* (%)	*Prompt* (%)	*Change* (%)
1	25	92	+67
2	8	66	+58
3	25	80	+55
4	10	58	+48
5	50	83	+33
6	0	33	+33
7	58	75	+17
8	50	58	+ 8
9	38	44	+ 6
10	55	33	−22

Of the 55 surveys distributed, 24 were returned. Expressed attitudes toward energy conservation and this project were generally positive, with a mean rating of 4.0 out of 5 on all but one question. On that question, which received a mean rating of 2.5, the major reservation expressed was that professors tended to feel that they had been targeted because they had been found to have left lights on, rather than simply because they taught prior to an unscheduled class period. Several expressed disapproval of the use of letters and/or posters and one person returned the survey unanswered, with the comment that the survey and project were "insulting."

DISCUSSION

The results show clearly that a single prompt was effective in producing increases in the percentage of observation periods with lights turned off. Although statistically significant increases were demonstrated only in Target Group A, similar effects were obtained in Target Group B as well. The fact that the effect in the latter group was not as large as that obtained in Target Group A may be due to the fact that the prompt was delivered over halfway into the semester and lacked "face validity" at that point. Alternatively, it is possible that the professors in Target Group B were under more powerful stimulus control *not* to turn off lights, compared to Target Group A, because they had performed the "incorrect" response many more times by the time they received the letter. A letter delivered at the beginning of the semester would probably produce larger gains for both groups than those found here. The large increases in the 10 "worst cases" following implementation of the letter phase provide further evidence of the effectiveness of the prompt.

The significance of the present research lies in two areas. First, although electrical energy waste in college classrooms accounts for a very small proportion of our total energy problem, even small sources of waste, if widespread and systematic, can result in significant energy losses (Atelsek & Gomberg, 1977; *Environmental Design Human Factors Society,* 1977). Even if procedures such as those used here reduced classroom electrical energy waste only by one third, as was obtained in Target Group A, substantial energy savings could accrue if the procedures were implemented across the hundreds of colleges and universities in this country. Further, it is anticipated that refinements of this procedure will produce even great savings.

The second point is somewhat speculative. It is suggested that the present research is significant as a component of a much larger strategy for confronting our energy problems. It seems clear that Americans face serious shortages of energy in the near future unless significant changes in our life style are achieved (Carter, 1977); that is, changes toward developing a pro-ecological, energy-conserving culture. Unfortunately, it seems equally clear that attempts to change established behavior patterns will encounter considerable institutional and individual resistance.

One way to reduce such resistance to efforts to change established high-energy behavior patterns may be to encourage changes in low-energy behavior patterns. High-energy behavior patterns are herein defined as established behavior patterns that are supported by substantial social and/or economic contingencies, consume relatively large proportions of energy, and are integral to the American life style (e.g., large private automobiles, individual family housing and central heating with high thermostat settings). Low-energy behaviors consume relatively small proportions of energy and could be changed without major threats to the prevailing standard of living (e.g., leaving unused lights burning, and discarding paper, glass, and aluminum as trash). It is hypothesized that some of the conditions that support high-energy behaviors may also support low-energy behaviors (e.g., absence of prompts for energy conservation and reduced response cost associated with the energy wasteful response). Therefore changing the contingencies that maintain low-energy behaviors may increase the probability that high-energy behaviors will be susceptible to behavior change programs, because of the shared elements of their respective supporting contingencies. If this analysis is correct, then changing low-energy behaviors may facilitate behavior change in high-energy patterns, and thus assist in shaping the development of an energy-conserving culture. Programs to alter low-energy behaviors should therefore be encouraged if they are cost effective and have the potential for widespread application. If adopted, they would not only save energy, but may contribute to solving other problems as well.

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Received March 3, 1978
Final acceptance March 17, 1980