

*INCREASING RECYCLING IN OFFICE ENVIRONMENTS:
THE EFFECTS OF SPECIFIC, INFORMATIVE CUES*

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We investigated the effects of prompts on the recycling behavior of approximately 217 faculty, staff, and graduate students in two academic departments of a large university. During the intervention, two signs were posted in each department. One sign prompted recycling (posted above the recycling receptacle), and the other sign prompted proper disposal of trash (posted above the trash receptacle). Results of a multiple baseline design across the two departments indicated that the sign prompt increased recycling behavior. Installation of the sign prompts in close proximity to receptacles in Department A resulted in a 54% improvement over baseline. Posting of sign prompts over containers 4 m apart in Department B resulted in a 17% improvement, whereas positioning the signs and receptacles in close proximity resulted in a 29% improvement over baseline.

DESCRIPTORS: recycling, paper recycling, prompts

On the average, each American produces one ton of waste per year, and the amount of waste generated is growing at a drastic rate (U.S. House of Representatives, 1989). In 1960 the United States produced 7 million tons of solid waste. This figure increased to 160 million tons per year in 1989, and the EPA projects our total solid waste to reach 190 million tons per year by 2000 (U.S. House of Representatives, 1989).

Eighty percent of our solid waste is deposited in landfills. However, in 1989, 40% of existing landfills were targeted for closure, and new sites are both time consuming and costly to develop (U.S. House of Representatives, 1989). Of the total amount of municipal solid waste produced each year, recyclable paper and paperboard constitute approximately 41% (U.S. House of Representatives, 1989). Businesses are one of the greatest contributors to this mass of recyclable paper and paperboard waste. Therefore, greater emphasis must be placed on increasing the rate of recycling of paper and paperboard products in the workplace.

Numerous studies have been completed con-

cerning attitudes and beliefs about recycling (De Young, 1986; Kallgren & Wood, 1986; Kok & Siero, 1985; Oskamp et al., 1991; Williams, 1991), demographics and other possible predictors of recycling behavior (Oskamp et al., 1991), and the inconsistencies between recycling beliefs and recycling behavior (Kallgren & Wood, 1986). Attitudinal surveys have demonstrated that people who recycle (a) are better informed about which materials are recyclable, (b) know where these materials can be recycled, and (c) are better informed about the benefits of recycling on the environment than are their nonrecycling counterparts (Vining & Ebreo, 1990). All three of these aspects must be combined for a recycling program to be effective (Oskamp, 1983). Simply knowing where a recycling container is located is insufficient as a prompt to produce high levels of recycling. Likewise, information about recyclable materials becomes meaningless without knowledge of easily accessible recycling locations, and inconvenient recycling locations increase the response cost of recycling behavior. Finally, knowledge of the benefits of recycling is also insufficient by itself to increase the behaviors involved in recycling.

The majority of the recycling literature, however, has focused on behavioral rather than attitudinal measures (Vining & Ebreo, 1990). Jacobs and Bailey (1982) demonstrated that multiple prompts

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given prior to recycling opportunities increased rates of recycling in an apartment community. In conjunction with single or multiple prompting conditions, proximity and accessibility of recycling receptacles have been shown to increase the rate of participation in a recycling program (Reid, Luyben, Rawers, & Bailey, 1976).

Efforts to promote environmentally conscious behavior have included television and radio commercials, statements from teachers and public officials, beautified waste receptacles, and clearly marked containers for appropriate disposal of waste (Geller, Winett, & Everett, 1982). Information and prompts have proven to be effective means for increasing recycling behavior in public communities and apartment complexes (Jacobs & Bailey, 1982; Jacobs, Bailey, & Crews, 1984; Reid *et al.*, 1976), but few studies have evaluated the effectiveness of these procedures in the workplace. This is unfortunate, because offices generate substantial amounts of recyclable paper and paperboard products each year. We sought to supplement and extend the recycling literature by examining the effects of specific and informative response-approach (Geller, Koltuniak, & Schilling, 1983) prompts on recycling behavior in an office environment.

METHOD

Participants and Setting

Participants were members of two academic departments at a large southeastern university. In Department A (social sciences), the setting was an enclosed mailroom housing two copy machines and one mailbox for each faculty, staff, and graduate student in that department (approximately 170 people). In Department B (physical sciences), the setting was a small area just inside the entrance to the general office. This area contained the mailboxes of all faculty and some staff members of that department ($n = 47$). The study was conducted during the spring semester of the academic calendar.

In Department A, there were two trash cans (one was 90.17 cm tall, with a diameter of 35.56 cm, and one was 74.93 cm tall, with a diameter 39.37 cm) and one recycling box (39.37 cm by 26.67

cm by 31.12 cm). The area of interest in Department B contained one trash can (36.83 cm tall, with a diameter of 35.56 cm) and one recycling box (39.37 cm by 26.67 cm by 31.12 cm).

Data Collection

Data were collected daily (Monday through Friday) by the first, second, and third authors and one undergraduate psychology major. Data collection consisted of counting the number of recyclable materials that were in the trash cans and recycling boxes on any given day. On each day after the data were collected, all materials (trash and recyclables) were placed in appropriate containers in a separate area. Each data collection session required 10 to 30 min. Data were collected just before the experimental areas closed for the day in order to minimize interaction between the participants and the data collectors.

The number of recyclable materials found in the trash cans and the number of recyclable materials found in the recycling boxes constituted the primary dependent variables. Recyclable materials were defined as any wood pulp-type paper (5.08 cm by 12.7 cm sheets or larger) not having a glossy-ink or plastic finish. Recyclable materials encountered included business envelopes (without plastic windows), manila envelopes and folders, newspaper, copy and bond paper, memo paper, and magazines without glossy pages or glossy covers. All materials considered recyclable in the present study were also accepted as such by the University recycling service (Florida State University Recycling Program, 1991). All other materials, such as plastic, styrofoam, aluminum, facial tissue, and paper towels, were considered trash (*i.e.*, nonrecyclable). Newspapers, magazines, or bound manuscripts were counted as one item each, because number (rather than volume) of items placed in the containers was the measure of interest.

Independent Variable

The intervention involved posting two signs (approximately 48.26 cm by 71.12 cm each) in each department. A red sign labeled "TRASH" was posted above the trash can and denoted those items

most appropriately disposed in the trash receptacle. This sign displayed a sample of each of the following categories: plastic, glossy-ink paper, glossy-ink magazines, and other nonrecyclable items. A green sign labeled "RECYCLABLE MATERIALS" was posted above the recycling box. This sign displayed samples of each of the following categories: newsprint, memos, envelopes without a plastic window, and multiple pages with staples. A sign (21.59 cm by 27.94 cm) that read "NO PAPER PRODUCTS" was placed on the remaining trash receptacle in Department A.

Interobserver Agreement

Interobserver reliability checks were conducted during 14 of 51 sessions (27.5%) at Department A and 12 of 49 sessions (24.5%) at Department B. Interobserver agreement was computed by dividing agreements by agreements plus disagreements and multiplying by 100%. Percentages were calculated for both trash and recycling receptacles. In Department A, mean interobserver agreement for scoring recyclable materials in trash cans as recyclable was 94.7% (range, 84% to 100%) and was 96.7% (range, 91% to 100%) for materials in the recycling box. In Department B, mean agreement on scoring recyclable materials in the trash can was 94.2% (range, 79.6% to 100%) and was 96.3% (range, 88.9% to 100%) on materials in the recycling box. There was no systematic variation of reliability observed during the study.

Research Design

A multiple baseline design across the two academic departments was implemented to investigate the effects of prompts on recycling behavior.

Baseline. In Department A, one trash can was located immediately beside the recycling box. The remaining trash can was located approximately 3.5 m away, in the corner of the room. Department B contained one trash can, located immediately beside the entrance/exit to the area, and one recycling box, approximately 4 m from the trash receptacle. The recycling box in each department had a small (2.54 cm by 5.08 cm) sticker affixed to it as part of a previous university-based program. The sticker

read, "Recyclable Materials Only—Deposit these items: computer printout paper, white and color bond, letterhead stationery, noncarbon forms, and Xerox copies."

Proximal prompt in Department A. The red and green signs were placed above the receptacles in Department A. Receptacles (trash can and recycling box) remained beside each other.

Prompt in Department B. Signs were placed above the receptacles, which remained approximately 4 m apart.

Proximal prompt in Department B. After seven sessions in the prompt condition, we relocated the recycling receptacle and sign prompt to a position immediately beside the trash receptacle, in order to replicate more closely the proximal prompt condition in Department A.

Manipulation Check

Data collectors conducted a visual inspection of the posted signs in each department each day during data collection to check for the presence of the signs in proper locations. If signs were misplaced, data collectors were instructed to replace them in the correct locations. Manipulation checks revealed no instances of misplaced or missing signs throughout the intervention.

RESULTS

Figure 1 shows the daily percentage of discarded items recycled in each department during each experimental condition. Department A showed an increase in recycling from 51% (range, 8% to 81%) during baseline to 84% (range, 67% to 98%) during the proximal prompt condition. Department B showed a mean of 51% (range, 19% to 96%) of materials recycled during baseline. This increased to 60% (range, 25% to 85%) during the initial prompt condition and to 66% (range, 51% to 92%) during the proximal prompt condition.

Figure 2 shows the median number of recyclable items found per day in the trash and recycling receptacles in both departments during each experimental condition. During baseline in Department A, a median of 84 (range, 31 to 258) re-

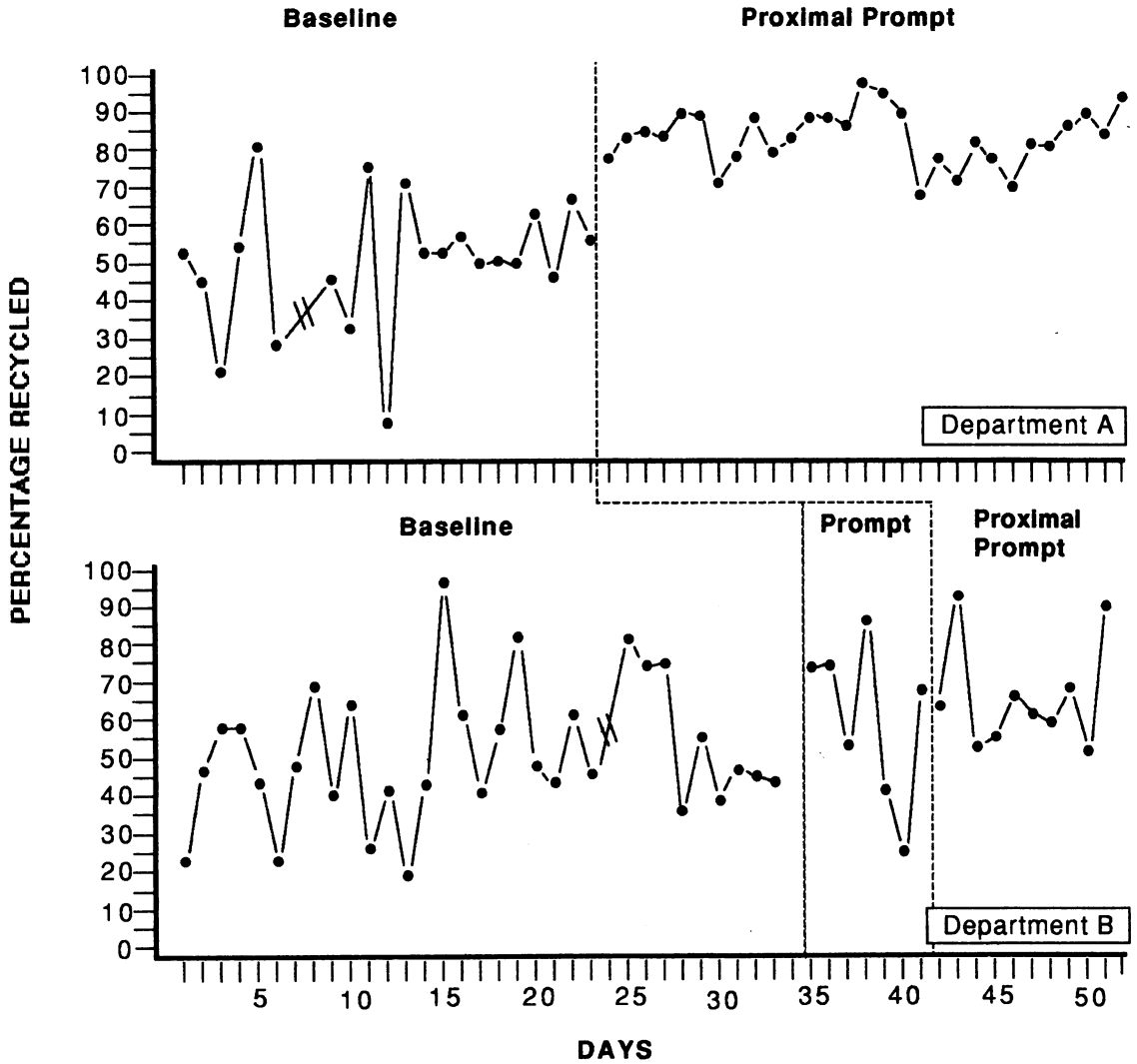


Figure 1. Mean percentage of items recycled per day in each department across conditions. Hatchmarks denote days on which data were not available.

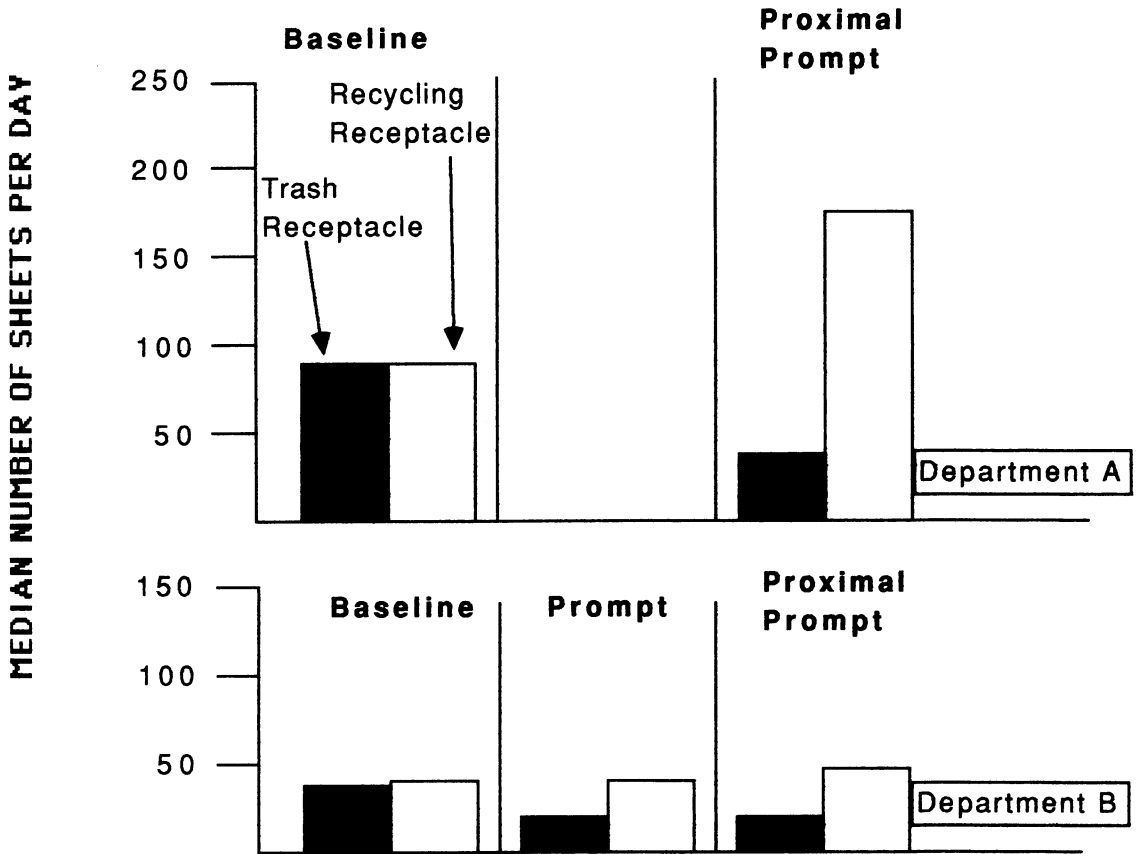
cyclable items was found each day in the trash receptacle and a median of 84 (range, 31 to 551) items was found in the recycling receptacle. Recyclable items in the trash were reduced to a median of 34 per day (range, 16 to 147) during the proximal prompt condition, whereas recyclable items in the recycling receptacle increased to a median of 170 per day (range, 64 to 3,790).

During baseline in Department B, a median of 39 (range, 14 to 99) recyclable items was found in the trash receptacle and a median of 40 (range, 9 to 367) recyclable items was found in the recycling receptacle. During the prompt condition, re-

cyclable items in the trash were reduced to a median of 24 per day (range, 16 to 57) and a median of 42 per day (range, 16 to 146) was found in the recycling receptacle. Recyclable items in the trash were reduced to a median of 23 per day (range, 16 to 43) during the proximal prompt condition, whereas recyclable items in the recycling receptacle increased to a median of 49 (range, 20 to 217).

DISCUSSION

The present study demonstrated the effects of informational prompts on recycling in an office en-



EXPERIMENTAL CONDITIONS

Figure 2. Median number of recyclable materials placed in receptacles per experimental condition, for each department. Shaded bars represent median number of recyclable materials placed in trash cans. Open bars represent median number of recyclable materials placed in the recycling boxes.

vironment. Both departments achieved substantial increases in recycling. These results support the assertion by Geller et al. (1982) that prompts that are not accompanied by some consequence are effective only if they (a) make a specific request or appeal, (b) are in close proximity to the area in which the individuals are expected to respond, and (c) request responses that are convenient to those who must respond. The sign prompts used in the present study met all of the above criteria, and there were corresponding increases in recycling behavior. The sign prompts also provided clear information regarding which materials were recyclable and which were trash.

Perhaps these sign prompts were effective antecedents to recycling behavior because the signs

served as a reminder at precisely the time when one was most needed. Locating the signs directly above each receptacle provided appropriate stimuli at the most critical moment: just as the materials were being deposited in the receptacle.

These stimuli produced obvious changes from baseline conditions, and therefore perhaps increased the level of stimulus control associated with each receptacle. Before and during the study, the university had a recycling program that consisted primarily of small (approximately 2.54 cm by 5.08 cm) sticker prompts on recycling receptacles. Judging from baseline measures, however, the stickers were minimally effective.

The effects of this intervention varied across the two settings. This may have been due to a com-

bination of factors. First, Department A housed two copy machines and mailboxes, whereas Department B had no photocopy machine. The sign prompts may have increased the recycling of photocopies in Department A, while having an effect on mail recycling similar to that achieved in Department B. The dependent measures were not sensitive to this possible difference.

Second, a different social milieu may exist in the two departments. Each department may have different levels of faculty interaction. The more frequently the participants interact, the more likely that prompting and social contingencies can occur. Thus, the larger effect in Department A might be attributable to some social element unique to that department.

Third, it is difficult to assess the similarity of the two populations. Although both groups consisted primarily of academics, one department was devoted primarily to the study of social science, whereas the other was primarily devoted to the study of physical science. It could be argued that these two groups have fundamentally different reinforcement histories regarding prompts, information, and recycling, and therefore responded differently.

Although the first, second, and fourth authors work in Department A and the head of the department was informed of the study, none of the authors used the receptacles in question at any time during baseline or intervention. In addition, data were collected unobtrusively, and the experimenters were careful not to allow subjects to know who had begun the program. Hence, there is little reason to believe that the intervention's effect in Department A was a reaction to the authors' academic affiliation.

A limitation of the study was the inability to partition the relative effects of prompting versus information. The sign prompt may have served as a "recycling directory," in that participants were clearly directed to the appropriate receptacles by several types of posted recyclable and nonrecyclable materials commonly encountered in each experimental area. Alternatively, the sign prompt may have served merely as a reminder to recycle. The results do not allow conclusions to be drawn about

the exact reason for the effectiveness of the interventions.

Implications of the present study are far-reaching. If employees become accustomed to recycling at the workplace, perhaps this behavior will generalize to other environments. Moreover, if employees can be encouraged to recycle at a reasonable rate without the use of expensive consequences, such as money or other incentives, programs can be implemented and maintained on a large scale at an extremely low cost (if not a profit) to the employer. Future research should focus on recycling in office environments and other environments in which large quantities of paper are generated. This focus should include behavioral analyses of prompting and informational components, addition of consequences to the posting of prompts, and long-term maintenance of programs such as that described in the present study.

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