

LOW-INCOME ENERGY EDUCATION: IS IT AN EFFECTIVE ADJUNCT
TO TRADITIONAL ECIP AND WEATHERIZATION SERVICES

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ABSTRACT

Low-income energy programs have not traditionally acknowledged the importance of the human dimension of energy use, but have focused instead on installing conservation hardware, paying clients' fuel bills, and providing financial incentives to promote conservation. The limitations of these traditional approaches have led local agencies to explore other strategies to maximize energy efficiency for low-income clients. Through public education, information sharing, interagency referral of clients, and staff training, some local agencies have designed more effective low-income programs.

This paper will review public education programs conducted from 1983-85 by six different community-based organizations as demonstrations for the California Energy Extension Service (CEES) and the Department of Economic Opportunity (DEO). Energy consumption data and changes in knowledge, attitudes, and behavior for Target and Comparison groups will be reviewed to determine which education strategies led to reduced energy consumption. It is not the intent of these authors to suggest that energy education can replace weatherization and other direct assistance programs, but rather that it can increase the effectiveness of those programs. However, in some instances, lower cost services such as education may provide a cost-effective first step in reducing the energy consumption of low-income clients.

INTRODUCTION

Low-income energy programs have not traditionally acknowledged the importance of the human dimension of energy use, but have focused instead on installing conservation hardware, paying clients' fuel bills, and providing financial incentives to promote conservation. In their October 1985 report, Low-Income Weatherization—A Better Way of Meeting Needs In View Of Limited Funds, the General Accounting Office (GAO) estimates that if current policies, procedures, and funding are continued, twelve of seventeen states examined would not complete the weatherization of all currently eligible dwellings until the end of the 21st century. In response to their charge from Congress to determine whether the limited resources for low-income programs could be more effectively utilized, GAO concluded that "the program's cost-effectiveness and ability to weatherize more low-income dwellings could be improved if spending per unit was limited to those measures most cost-effective in terms of energy savings per dollar cost of weatherization." Another review of low-income program data (Ferrey, 1984) suggests that there is great variation in actual savings achieved by low-income weatherization programs. It goes on to postulate that this variation is not inherent in the low-income housing units per se, but program design, quality control, and education as well as the specific measures that are installed.

Common sense suggests that education which reinforces energy efficient practices and proper utilization of energy measures is an effective adjunct to direct assistance programs. Program operators can provide such services at a relatively low cost compared to the purchase of energy measures. Unfortunately, discussions with state and local staff and a review of the literature (Leonard, 1986; Lonergan, 1985; Oklahoma, 1984), reveal that few deliberate efforts have been made to document the effect of education on the energy consumption of low-income clients, although many are convinced of its effectiveness. As a result, the potential impact of energy education is either discounted or ignored. In the GAO report, they note, "The studies we analyzed did not evaluate how people were behaving before and after weatherization and the effect of these behavior patterns on energy use," without explaining whether or not such analyses were sought. This is unfortunate since in the often quoted Twin Rivers Study, Socolow (1978) noted a two-to-one difference in energy consumption in identical townhouses. He also noted that "unpredictable behavior patterns of the occupants introduce a large source of uncertainty." As noted in Energy Use: The Human Dimension (Stern & Aronson, 1984), analysts are frequently surprised when well engineered energy technologies fail to work as expected. "Often the surprise is traceable to the fact that the analysts have not paid enough attention to crucial processes in individual organizations or social institutions. Others have reached similar conclusions (Morrison, 1984).

This paper will present information on energy education programs conducted in conjunction with traditional Department of Energy (DOE) Weatherization and Health and Human Services (HHS) Low-income Energy Assistance Programs (LIHEAP), including Energy Crisis Intervention (ECIP).

The conditions of EES programs are more flexible and allow more creativity in delivering energy services than WAP. Although states are able to use their 15% set-aside options under LIHEAP for innovative programs, the majority do not (GAO, 1985). As a result, some of the most innovative strategies for achieving low-income energy efficiency have been piloted through EES programs. The authors hope that a review of local projects conducted by different community-based organizations will encourage policy makers to consider energy education as a viable option for increasing the effectiveness of energy services for low-income clients. We feel this is particularly important in light of the limited resources available for these services and the impact of high energy costs on those persons least able to afford them.

REVIEW OF FOUR PROGRAMS

Just as most business innovation takes place in small firms, most innovations to improve the cost-effectiveness of energy programs are being generated in small entities, not within large bureaucracies. Such is the case with low-income energy education programs. Unfortunately, those innovations are not likely to be adopted on a broad scale because many of the programs lack any kind of evaluation, particularly hard data on energy savings directly attributable to energy education. According to local agencies, this lack of follow-up was due to limited funding and staff resources for evaluation. The validity of the findings of education programs that have been evaluated is questionable due to evaluation designs which often rely on self-reporting or small sample sizes from which statistically valid conclusions could not be drawn (Leonard, 1986).

Since its inception in fiscal year 1980, over half of the CEES-funded, residential programs have served low-income clients, particularly the elderly and Indians. The programs are administered on a decentralized basis through CEES headquarters in Sacramento. To ensure that quality evaluations are conducted, CEES assumes responsibility for the evaluation designs and monitors the evaluation effort. In the evaluations that follow, every attempt has been made by CEES staff to develop the strongest evaluation methodology possible for each program given the limitations of local program operators' expertise, budget and time. Programs operated by J.O.V.E., Inc. (1983-84), Redwood Community Action Agency (1983-84; 1985-86) and Cal-Neva (1986) are presented below.

J.O.V.E., Inc.

Low-income participants received energy education as a component of ECIP and weatherization services. For ECIP clients, workshops were scheduled 1/2-hour prior to the time families received assistance so they wouldn't have to make two trips. For weatherization clients, staff visited their homes to conduct a home energy survey and provide personalized energy management instruction.

Participants received information on major appliances such as the refrigerator, freezer, water heater, space heater, and air conditioner. The discussion then focused on practical low cost/no cost techniques that the 1,726 ECIP clients could adopt to lower their energy costs. The focus varied with changes in seasons. For the 278 families in the home visit group, virtually the same curriculum was provided.

The overall goal of the evaluation was to determine whether any difference existed between the conservation behavior of the workshop and home visit groups. Clients were broken down into two groups accordingly, each comprised of 100 clients. In addition, two Comparison groups of 100 each were chosen from clients who did not receive services. Each Target group was surveyed on their conservation behaviors on a pre- and post-basis. The instrument listed conservation practices which the clients reply they do "regularly," "occasionally," or "rarely." The Comparison groups were not pre-tested. Post-surveys were mailed to all four groups, with telephone follow-up used to achieve a 75% response rate.

Households in the "home visit" group took 21% more energy conservation actions than households receiving weatherization only. The "workshop" group took 9% more actions than those who received ECIP assistance only. A similar improvement on knowledge questions in the post-tests indicate that information given in the home, on a one-to-one basis, may be most effective.

For the energy study, the same four groups of clients were used as identified above. Data was collected for the period January — June in both 1984 and 1985. (Clients were served from July 1984 — December 1984.)

The results of the program are encouraging. A fairly rigorous quasi-experimental design demonstrated that workshop attendees had a net 8% reduction in electricity usage and a 5% reduction in gas usage compared to households receiving ECIP only. The "home visit" families reduced electrical usage by 5% and gas usage by 11%. The 6% higher savings in gas consumption for the home visit participants compared to the workshop households is probably due to savings from weatherization measures being installed. The average savings per workshop client of \$56 and for home visit clients of \$61. (These figures exclude the additional savings from weatherization.)

REDWOOD COMMUNITY ACTION AGENCY (RCAA): PHASE I

Clients in the Rural Energy Management (REM) Program received one of three services, depending on their individual needs: 1) major conservation "hardware" consisting of basic weatherization services; 2) minor conservation hardware such as low-flow showerheads and water heater jackets; and 3) instruction in home energy management through brochures, workshops, and other personalized educational services. Each component of service focused on a limited number of high priority actions which were most widely applicable to that particular group.

A pre/post survey of client attitudes, knowledge and conservation behavior was distributed to 145 clients. The pre-survey of ten questions was completed during an intake process, and the post-surveys were administered by mail with telephone follow-up. The attitude survey showed that members of all three client groups (American Indians, seniors and low-income) improved their attitudes concerning their ability to affect energy savings and felt they had greater control over home energy use than before the workshops. The knowledge portion of the survey yielded similar, positive results. In both cases, the gains of the American Indians and low-income groups were higher than those of seniors.

The survey also listed sixteen common energy conservation behaviors such as replacing filters, using "warm rooms," turning down thermostats, installing fluorescents, washing and drying full loads, etc. On the post-survey, the average respondent reported nearly two more activities than on the pre-survey. The American Indians reported an additional 2.9 activities on the post-test, nearly twice as high as the number of activities reported by low-income (1.2) and senior (1.4) groups.

A Comparison group of 145 households (approximately ten percent of the original target population) was also selected which matched the Target clients in relevant characteristics. Energy use data was collected for three months following program services and for the same three months in the previous (base) year. The base year data was subtracted from the current year data, and any savings in the Comparison group were subtracted from the three Target groups' savings. Results from the energy use study indicate strong program performance.

The Comparison group showed a decrease of 1.4% in electricity and 2.5% in natural gas. About 49% increased energy use, while 51% decreased use. In contrast, the Target group had a 2.4% reduction in electrical use and an 11% reduction in gas use. Expressed in another way, 76% of the members of the Target group decreased energy use, while only 24% increased use.

The "information only" group (N = 8) saved 6.1% in electrical use and 2.2% in gas. This is consistent with the activities addressed in the information campaign, which focused on electricity-using appliances and lights. The minor conservation hardware group (N = 20) had negligible savings in electricity, but a 10.4% savings in gas, which should be expected since the measures focus on hot water and space heating. The "major hardware" group (N = 108) also had little change in electrical use, but demonstrated a 9.2% drop in gas use. (These figures were calculated after subtracting the Comparison group savings.) Project personnel were unable to explain why the minor hardware changes resulted in nearly the same savings as the major installations, but it certainly suggests that further research should be done since the minor changes are much less costly.

CAL-NEVA, 1986

Late in 1985, CAL-NEVA proposed a program based on the J.O.V.E., Inc. and RCAA successes that would be replicated at four sites in California. This program was funded by the Department of Economic Opportunity (DEO) with the evaluation conducted by CEES. Staff were trained to provide an hour workshop in conjunction with ECIP services at agencies in Orange County, Fresno, San Jose, and Solano. The curriculum was a game format with each client assessing their energy habits and choices. Clients were given \$100 in play money with which to pay utility bills. For positive behaviors, clients got to "pocket" money. If they did not practice energy conservation they quickly used up their \$100. At the close of the workshop, clients pledged in writing to take three no cost/low cost actions. Follow-up telephone calls assessed changes as a result of the workshop.

The evaluation examined self-reported energy attitudes and behaviors, in a Pre-Post Test Design. Three questions, "Do you believe you have any control over your utility bill?" "Do you believe you can reduce the amount of your bills and still live comfortably?" and "Can you name three things you are doing to reduce your bill?" were asked during the client intake.

Only clients who completed both pre- and post-surveys, between 412 and 494 of 700 depending on the question, are included. In summary, about 37% of the clients had a positive attitude change in their ability to control their utility bills. After the workshop, 44% of clients surveyed said they could reduce the amount of energy used and over half could name three things they were doing to reduce utility bills. Although this is not a large battery of questions, the consistent, between-question results strongly suggest that between one-third and one-half of the respondents had more positive attitudes and behaviors after the workshop.

Energy consumption was measured using a true experimental design (pre- and post-treatment with repeated measures and an equivalent Control group). Utility bills were tracked for at least three months following the workshops and compared to the same months in 1984-85. Clients were randomly assigned by local staff to the Target and Control groups. Post-consumption was subtracted from pre-consumption data for a resulting gain score. The Control group savings were subtracted from the Target group with the resulting change attributed to program intervention.

Complete energy data was collected for a sample (105 Target; 82 Control) of 774 Target clients, well under half of the original sample of 140 combined clients for each agency. Unfortunately, an analysis of pre-project data revealed that the groups were not equivalent as the Control group bills are consistently higher. In addition, the number of bedrooms and percentage of renters was significantly different. This does not invalidate the study, but suggests more care in the interpretation of results. The results of the study for three agencies are noted below.

Table I. Percent change in energy consumption for CAL-NEVA agencies.

AGENCY	SAMPLE SIZE		PERCENT CHANGE IN KWH		PERCENT CHANGE IN THERMS	
	TARGET	CONTROL	TARGET	CONTROL	TARGET	CONTROL
ORANGE	50	41	+3%	-1%	-15%	-22%
SOLANO	28	41	-1%	+5%	-4%	-18%
SAN JOSE	27	*	-2%	+3%	-24	-20%

*Energy use for the San Jose group uses the combined control groups from Orange and Solano as a comparison because San Jose did not select the control correctly. Fresno data was "lost" by local staff.

The results for the three agencies are quite similar. There was little change in electricity use, either from year-to-year, or between Target and Control. Natural gas use was more difficult to interpret, particularly given the non-equivalent groups. Statistically significant differences were only found in Solano for gas use without any clear explanation. In fact, the colder weather in the project year suggests Control usage should have increased. Perhaps weatherization occurred after the last month of pre-project data collection. We do not have data to examine this hypothesis.

The overall results are mixed. Clearly, attitudes and behaviors changed, but the workshops were not effective in reducing energy use. Perhaps the sample was too small to indicate any change, though such a change itself would have been only on the order of 1%-4%. We were not able to correlate the affective questions with energy consumption as nearly half are incomplete for the energy study clients, leaving too small a sample. Finally, although the project appeared well designed, there may have been some implementation problems which we were not aware of.

REDWOOD COMMUNITY ACTION AGENCY (RCAA): PHASE II

The REM program was continued in 1985-86 because of its success in 1984. In addition to serving 1,682 previously unserved low-income clients directly, services were expanded in two major ways. First, the project developed a referral system with social service agencies to reach the truly needy who may not have been aware of free energy services. Social service agencies were trained to provide "Energy Counseling" and referral of their clients to RCAA. The second innovation was to transfer the lessons that had been learned to other energy agencies.

Clients generally fell into two categories, ECIP and weatherization. No group received minor hardware even though it was effective in the previous year. All received a brief, five-minute "rap" on simple energy behavior modifications along with an energy conservation newsletter and handouts. In addition, a sample of each group attended an "energy doctor" workshop which introduced clients to how energy was used in their homes,

particularly the impact of appliances and lifestyle. As an exercise, clients learned how to read their meter and "translate" their bills to assess personal areas of excess, which staff felt was more effective than an impersonal summary of kilowatts or therms saved. Low cost/no cost practices and measures, particularly focusing on natural gas use, were presented, along with information on weatherization measures and other free energy programs. A portion of the one-and-one-half-hour workshop was spent in group discussion, sharing ideas and problem-solving. Twenty-nine of these workshops were attended by 238 clients.

Both studies, the attitude/action study and the energy usage study were conducted in a similar manner as the year before, including a Comparison group. Unfortunately, data for weatherization clients as distinct from ECIP clients who attended workshop was not available because RCAA staff did not disaggregate the data properly. Although the sample size for the Target group (N = 155) was approximately ten percent of the clients served, only half (N = 79) of the sample was usable in this study, all of whom were ECIP clients. Further, the sub-sample for the "energy doctor" workshop was only 12; a group too small to provide very reliable data.

Table II below notes the changes in attitudes and actions for ECIP clients after participating in the project. As the data indicates, there was not a significant change (decrease of 1%) in attitude between the two groups in contrast to the previous year. Of greater importance are the changes in actions the clients reported taking. Although there was little change in attitude, clients were willing to take actions to control their energy usage after attending the workshop.

Table II. Percentage change in attitudes, actions, and energy use for REM.

GROUP	SAMPLE SIZE (N)	PERCENTAGE CHANGE			
		ATTITUDE	ACTIONS TAKEN	THERMS	KWH
Energy Doctor Workshop	12	-1%	+10%	-29%	+7.0%
Short Energy "Rap"	67	+1%	- 3%	- 7%	+6.5%

For the energy study, a Comparison group (N = 125) was selected by identifying the major geographic areas where most RCAA ECIP and weatherization clients lived. The utility, PG&E, then randomly selected the sample from these areas. Since RCAA provides all local ECIP and weatherization services, anyone from these areas who received those services were Target clients. Therefore, the Comparison group, while largely low-income, did not match the Target group for ECIP or weatherization services. Data from the Comparison group is relatively valid to adjust Target scores for the effects of weather, energy pricing, and any other items which may have affected energy use between the pre- and post-project periods.

The Comparison group (N = 125) had a 5% increase in gas use and a 2% increase in electrical use from the pre-program to post-program periods. The moderate gas use increase may have resulted from colder weather in the post-program period.

The Target group of clients who attended "energy doctor" workshops reduced gas use by 24%, but increased electrical use slightly, by 9%. Subtracting the Comparison group changes from the Target group, the program was responsible for a net decrease in gas use of 29%, while electrical consumption increased by 7%. The data indicates that even though most clients reported taking action to control energy consumption, most savings occurred in gas consumption, rather than electricity. The short energy "rap" resulted in a 7% net gas savings, but electricity usage increased by 6.5%.

We can conclude that education seems successful in saving clients natural gas; and that the longer, formal workshop is apparently more effective than the short energy "rap". It is difficult to determine the degree of difference between the two strategies, since the small sample size for one group makes for a weak estimate of the whole Target group's results.

Clients from the first year program who participated in the energy study were selected for a follow-up of energy consumption. Although there were 145 clients in the first year study, many had moved during the second year, leaving a sample of only 17 for the two-year energy study. Electrical consumption for this group decreased 3.5% after the first year (1984), but returned to pre-program levels in 1985. However, clients experienced a 5.7% drop in gas use after the first year, and continued these savings another 7.9% in 1985. Comparison group data from the 1985 study shows an expectation for increased gas use, so the data from this small sample indicates that first year clients continued to save natural gas, but not electricity.

DELIVERY SYSTEMS: THEIR STRENGTHS AND WEAKNESSES

Although descriptions for each program reviewed include a description of program elements, five strategies can be generalized with varying costs and levels of effectiveness.

1. DIRECT INSTALLATION. As has been shown repeatedly in evaluation studies, audits and workshops alone don't necessarily lead to concrete energy savings. The direct installation of devices, however, usually will result in savings. While LIHEAP guidelines allow programs to provide low-cost devices, some programs such as RCAA have utilized this as a "carrot" to establish good will and encourage rural seniors to take advantage of other services. RCAA provided water heater blankets and low-flow showerheads, and clients realized a 10.4% savings in gas usage. Coincidentally, 10.4% is the average annual savings for weatherization (GAO, pg. 35, 1985).

2. HOME VISITS. This personalized service tailored to an individual client is a hallmark of EES services. The cost-effectiveness of this approach is dependent upon the skill of the staff person providing the information, the applicability of the information to the client's home, and the time spent in each home. In the programs reviewed, home visits already scheduled for the installation of low-cost devices or complete weatherization were seen as an opportunity to provide energy education. Cost-effectiveness is improved in part because additional time is not spent on program promotion or scheduling. In the J.O.V.E. program, the information imparted was the same as that provided in workshops. Clients took 21% more actions, an additional savings of \$61, as a result of the home visit than their counterparts who received basic weatherization. Training weatherization personnel to provide education would be an effective way to keep program costs down.
3. WORKSHOPS. The success of workshops is determined largely by actions taken afterward by the clients. The key, however, is getting the clients to attend in the first place. RCAA initially had attendance problems, but overcame them by changing workshop times from morning to afternoon, and contacting clients the night before with a reminder call. J.O.V.E. overcame the perceived barrier in the initial design of their program by arranging workshops for a 1/2-hour before scheduled ECIP appointments. Making ECIP payments dependent upon workshop participation gave J.O.V.E. a captive audience and no need for outreach or additional program promotion. Clients also had a monetary incentive to attend—receipt of ECIP payment. Cal-Neva adopted this piggybacking approach and called clients the night before to remind them of their appointment.

Making the information available is not enough. Staff must motivate clients to take action. Suggestions for effective workshop leaders include good communication skills, use "props" that clients can handle or pass around, establishing rapport with the audience, personalizing and tailoring information by using individual utility bills and encouraging active audience participation with games such as energy bingo or group discussions. Group discussions also serve to establish norms and provide case studies which increase the vividness and personal relevance of information as well as provide a standard of comparison (Coltrane, 1986). All programs felt that workshops alone were not effective, but that they were an important component of a comprehensive program because it takes more than one training session to institutionalize a new set of behaviors.

4. REFERRAL. Recognizing that low-income clients are not taking advantage of all the services offered by both the federal government and utilities, all programs included a referral element. Although this type of "education" does not affect energy efficient behavior directly, it does increase awareness of services and decreases outreach costs for agencies providing weatherization. Referrals from social service agency staff who were trusted by the clients was the primary program strategy of the second year program of RCAA. In the others, the information was

imparted directly to clients through written materials, workshops or home visit presentations.

5. **WRITTEN MATERIALS.** Written information is usually the least expensive educational strategy, and hence, a favorite approach though its effectiveness is questionable. There is no guarantee that information will ever be read or acted upon without some other reinforcement. Written materials were utilized as supplements in workshops and home visits to provide a summary of information presented. In the J.O.V.E. programs, written materials were translated into non-English languages including Spanish and Vietnamese to reach special clients. Program evaluations were not able to separate out the effect of these materials alone.

Although it is not the purpose of this paper to explore the social and psychological theories that contributed to the success of any individual strategy, these programs were grounded in lessons learned by previous CEES programs (CEES 1981; CEES 1982; CEES 1984) which have since been explained by social psychologists (Collins, 1985; Coltrane, 1986; Stern, 1984). Of particular importance are the agencies who were delivering the services, as we have found that marketing programs through local community organizations is particularly effective in reaching minority groups and the elderly (CEES, 1981; CEES, 1982; CEES, 1984). As these organizations have already established a track record with low-income clients and gained their trust, they add credibility to the education effort. The presence of these organizations in the community also facilitates a long term commitment to energy conservation by providing a range of services so that clients may return when they are ready or as new services become available.

This issue of quality control cannot be ignored. As noted earlier, it is a critical variable in determining the magnitude of weatherization savings. We believe that it is an even more critical element in the success of these education programs and probably accounts for the difficulty in replicating the programs. CEES is committed to exploring the transferability of these strategies to shed some light on this last point.

CONCLUSIONS AND RECOMMENDATIONS

It is not our intent to suggest that energy education can replace weatherization and other direct assistance programs, but rather that it can increase the effectiveness of those programs. Recent surveys conducted by these programs suggest that most low-income households have a very poor understanding of the factors that affect their energy consumption and thermal comfort. The initial response of most residents was that they did not practice home energy management and felt that there was little, if anything, they could do beyond the weatherization measures that were installed. Unfortunately, many of these inactions may negate the benefits of weatherization.

Not only can behaviorally-oriented education ensure that installed hardware is used effectively, first year savings documented in California

programs, particularly J.O.V.E. and RCAA, and others around the country are very competitive with, and even surpass, the 10.4% estimated annual savings for weatherization (GAO, pg. 35, 1985), suggesting that in some cases education may be a more cost-effective first step for reducing low-income energy consumption. Additionally, the weatherization programs focus on heating fuels, usually natural gas, while educational strategies can target electricity usage which may be significant in some types of households. It is our hope that those states now piloting low-income energy education programs will take the time to conduct solid evaluations of energy savings that result from these programs. We would also like to see some long term projects conducted to follow-up with clients served and an emphasis placed on process evaluation to determine which educational techniques prove most persuasive. Indeed, with expenditures per dwelling in ten of seventeen states for 1983 averaging between \$1,000 and \$1,500 (GAO, pg. 16) as compared with figures under \$100 for energy education programs, not only do these programs appear to be an effective adjunct, but energy education may reach more households with strategies that will enable them to reduce their energy costs until hardware can be installed in their homes.

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