# Self-Efficacy in Conservation: Relationships between Conservation Behavior And Beliefs in the Ability to Make a Difference<sup>1</sup>

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## ABSTRACT

The focus of education impacts is to modify behavior toward conservation. Several areas of the literature (the community-based social marketing literature and the literature on self-efficacy) imply that considerations beyond demographics are important in the adoption of new behaviors, and that non-traditional education methods may in fact be critical determinants the impacts of education and outreach efforts.

The community-based social marketing approach directs education at communities rather than individuals, and emphasizes factors beyond economic best interests. These factors include elements of culture, social interactions, and human feelings. Ignoring these factors diminishes the value of education programs. Self-efficacy theory argues that internal factors are strong components of behavior change – specifically, the perceived facility of an individual to produce desired results. Education programs that incorporate these factors may be more effective at inducing change. We briefly address these theories and present examples of these approaches on real-world programs from the literature – including experience in the western United States and elsewhere. These applications include residential utility and environmental programs.

The paper then presents the results of new research on self-efficacy conducted by the authors. One study provides information linking self-efficacy indicators with actual behavior and open-ness to new program options. The other study relates self-efficacy indicators with program participation decision-making. The presentation will summarize the results of the surveys, including significant links between efficacy indicators, demographics, program needs, and actual behaviors.

## Introduction

Interventions geared toward modifying behavior and investments in energy and resource conservation have shown considerable variation in effectiveness. Both the community-based social marketing literature and the literature on self-efficacy imply that more deeply held attitudes and considerations beyond demographics as well as non-traditional education approaches that leverage these factors may prove more effective than traditional outreach programs and interventions. Understanding which underlying attitudes are linked to acceptance of "green" programs may help target outreach dollars more effectively.

<sup>&</sup>lt;sup>1</sup>The views presented in this paper are those of the authors and do not represent the views of the project sponsors or the organizations discussed in this paper.

<sup>&</sup>lt;sup>2</sup>For the portion of this work related to NYSERDA programs, Jennifer Ellefsen was the project manager. The NYSERDA portion of this study was conducted under subcontract to Summit Blue Consulting. Carl Erickson was the project manager for the Utah Project.

There have been several strands of research that attempt to relate the receptiveness to and effectiveness of education to broader factors that influence viewers to process and consider education messages.

- One is the community-based social marketing approach, which directs education at communities beyond individuals, and emphasizes factors beyond economic best interests into elements of culture, social interactions, and human feelings. This literature argues that ignoring these factors diminishes the value of education programs.
- Another area of research, self-efficacy theory, argues that internal factors are strong components of behavior change specifically, the perceived facility of an individual to produce desired results. Education programs that incorporate these factors may be more effective at incenting behavioral change.

These bodies of research show particular application to Demand Side Management (DSM) programs, environmental, and other "green" behaviors.<sup>3</sup>

This study focused on testing the role of self-efficacy in modifying behavior – with resulting implications for marketing and outreach for programs. The study analyzes examples of these approaches in several conservation programs. This work links self-efficacy indicators with actual behavior and participation in energy conservation and green energy programs.

# Literature Review

As a first step, we reviewed and summarized more than 80 studies that analyzed education programs – especially as they related to impact measurement, education and marketing implications, and recommendations relative to marketing "green" programs, energy education, resource conservation, and advertising fields. Unfortunately, much of the research related attitudes, programs, and outreach to changes in attitudes, or intentions to purchase or intentions to modify behavior, rather than to measured changes in behavior or resource use.

## **Community-Based Social Marketing Programs**

Some educational programs have also incorporated self-efficacy components to promote behavioral change. These programs have tried to impart the idea to participants that they have the ability, skill, knowledge, and/or experience to contribute to effect change. Several studies (both in energy and, more generally, resource conservation) have analyzed social marketing campaigns and their effectiveness in community outreach. These community-based social marketing campaigns have attempted to incorporate culture, social interactions, and human feelings in an effort to encourage customers to change behavior. Many involved direct personto-person contact and had been tailored specifically to the locality in which they were conducted. This approach has especially started to gain a following in the recycling literature.

<sup>&</sup>lt;sup>3</sup>Research on non-energy benefits makes it clear that residents make the connection between DSM programs, energy efficiency measures, and "doing good" for the environment. Recent publications by the author (Skumatz, 2002) show that "doing good" for the environment was one of the most valuable NEBs associated with residential programs.

- Energy Partners Program. A study by Haeri, Jennings, and Quigley (Haeri, Jennings, and Quigley, 1989) of the Energy Partners program examined three pilot low-income demand side management programs consisting of 800 households each. They found that outreach should be tailored to the specific conditions of the community and that recommended that advertising and cold calls be used for more concentrated urban communities.
- **McKenzie-Mohr.** Work by McKenzie-Mohr (McKenzie-Mohr 1995) among others indicates that significant increases in preferred behaviors may be realized if the marketing campaigns address barriers to behavior changes (making programs convenient). Further, work has demonstrated significant impacts if "pledges" or other honor commitments are used. For example, the proper disposal of leftover paint is higher if, at the point of purchase, education is provided to explain proper disposal and if the customer is asked to sign a pledge that they will strive to dispose of leftover paint properly. Similarly, personal interventions at the entry into grocery stores provided in conjunction with broadbased "buy recycled" campaigns helped increase purchase of recycled products and products with less packaging.
- **Denver Block Leaders**. Burns (Burns 1991) looked at the block leader approach in recycling behavior. Residents in Denver were split into different groups, and one group was contacted by block leaders and another group received pamphlets. Recycling among the block leader group increased 33%, and recycling in the pamphlet group increased by 20%. Personal contact seems to make a difference.
- **Commitment.** Trained Boy Scouts went door-to-door to present recycling information and / or to ask residents to sign a pledge to recycle (Burns 1991). Over 40% of the residents that were contacted or asked to sign a pledge started recycling. Only 11% of the control group started recycling.
- **Door-to-door recycling campaign.** Mitchell and South (Mitchell and South 1997) detailed the efforts of one city providing door-to-door education about upcoming changes in the city's garbage and recycling collection procedures. In an effort to make the transition as smooth as possible, the program planners felt justified in undertaking a door-to door education campaign. They felt that this would be the most efficient way to not only notify customers about the change, but also provide them a forum for voicing their opinions and having their questions answered. To quantify the results of the education campaign, the study used a comparison of pre- and post- treatment tonnages. They found that recycling rate increased by 10% due to increased awareness and willingness to separate material.

## Self-Efficacy Study Summaries

Three examples of self-efficacy studies were reported by Peters (Peters 2001).

• Sacramento Municipal Utility District (SMUD). In 1998, SMUD conducted six focus group sessions to investigate customer reaction to the use of landfill gas as a green energy source and determine whether they would be willing to pay higher fees to purchase this energy. Focus group participants who stated they would purchase green energy were also much more likely to agree with the statements "If I don't do it (purchase green energy), who will?" and "It seems important to take the first step." On the other hand, focus

group participants taken as a whole agreed with the statements "Why should I do it if everyone else isn't?" and "I think it should be the same for everyone."

- **Tennessee Valley Authority.** When the Tennessee Valley Authority began a program in which customers of twelve distribution companies were given the option to purchase renewable energy, a short, two-question survey was administered to customers that signed up during the first three months. The results showed 90% of respondents either strongly agreed or agreed with a statement that their actions (i.e. purchasing renewable energy) can make a difference (Peters & Feldman, 2001). Further, 57% either strongly disagreed or disagreed that the individual's efforts only make a difference if others do it to.
- Wisconsin Focus on Energy. A pilot program for the Wisconsin Focus on Energy Program included an advertising campaign aimed at increasing awareness of a forthcoming renewable energy program. A pre-program survey of 300 customers and a post-program survey of 400 revealed that awareness of renewable energy increased from 46% to 55% (Peters & Feldman, 2001). This increase could not be fully attributed to the education campaign; however, self-efficacy outreach efforts motivated customers to seek out more information and become more knowledgeable about renewable energy.

# **Analyzing Self-Efficacy -- Approach and Results**

This paper summarizes the results of two studies that examined the impacts of self-efficacy:

- A study for a client in Utah, to assess whether efficacy attitudes translated into increased conservation above and beyond a variety of factors including household demographics; willingness to pay, and various program-related factors.
- A study for a client in New York, which focused on many other items, but allowed us to also examine the impact of self-efficacy attitudes on 1) the purchase of ENERGY STAR® appliances, and 2) participation in a program to install PV measures in the home.

# Analysis Approach and Results for the Utah Study

For this study, the authors included a battery of self-efficacy questions in surveys. The questions covered topics related to:<sup>4</sup>

- Whether individual behavior makes a difference, and whether it matters if others don't also participate;
- Whether individual behavior can decrease pollution or the use of resources;
- Whether conservation is an easy, common sense way to reduce use of resources at home,
- Whether any behaviors do much to reduce pollution, resource use, or utility cost control.

We used principal components analysis to test our efficacy / attitudinal questions and their independence. Then we followed up with multivariate regression to examine whether key

<sup>&</sup>lt;sup>4</sup>Thanks to Jane Peters, Research Into Action, for assisting in developing the questions for this study.

efficacy attitudes translated into increased conservation – above and beyond a variety of factors including household demographics; willingness to pay, and various program-related factors.

We were able to compare attitudes and beliefs for both participants and non-participants in the Utah study. We found:

- Fifty percent of participants agreed that what they do only makes a difference if others do it too; 45% of non-participants agreed with this;
- Eighty-six percent of participants feel that each of us has to be responsible and what we do can make a difference; 90% of non-participants feel the same;
- Ninety-one percent of participants agreed that conservation is an easy, common sense way to reduce the use of resources at home; only 76% of non-participants agreed with this;
- Seventy-eight percent of participants felt that conservation behavior is an easy way for the government or utility to control cost; 74% of non-participants agreed with this statement.

The statistical results showed that the only efficacy attitude with a significant impact on actual conservation behavior was "conservation is an easy, common sense way to reduce resource use in my home." This factor had a positive effect, showing 11% greater conservation in homes that agreed with this statement than homes that did not. None of the other efficacy attitude questions proved significant in explaining differences in behavior; our research found little variation in some indicators, and in others, the variation did not affect outcomes.

The results showed that households that agreed with the statement "conservation is an easy, common sense way to reduce resource use in my home" conserved more – specifically, 11% more than other households. Interestingly, however, this was one of the most self-interested of the self-efficacy attitudes we analyzed, as it relates directly to the impacts on household bills, rather than larger issues like pollution and environmental factors.

## Analysis Approach for the New York Study

In a program evaluation conducted for the New York State Energy Research and Development Authority (NYSERDA), we had the opportunity to survey households about their attitudes and beliefs toward energy conservation and efficiency. This research was part of a much larger study of the market characterization, assessment, and attribution of NYSERDA programs. Surveys regarding attitudes and beliefs were administered to:

- Participants that bought ENERGY STAR® appliances, and
- Participants in the end-use renewables program that used NYSERDA incentives to install photovoltaic systems in their homes, and
- Program non-participants that did not buy ENERGY STAR® appliances or lighting equipment and did not participate in the photovoltaic program.

It should be noted that participants that bought energy star appliances did not self-select into the program. Rather, the participants in this case, are people who purchased ENERGY STAR® appliances and indicated that NYSERDA had a positive influence in their decision to purchase the appliance.

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. We asked household participants whether they agreed with the following statements:

SE1. What I do only makes a difference if others do it too.

SE2. Each of us has to be responsible; what I do can make a difference.

SE3. There is not much I can do to save energy in my home.

SE4. Using energy efficient appliances is an easy, common sense way to reduce the amount of energy used in my home.

SE5. Comfort is more important to me than saving energy in my home

SE6. The amount of energy I use now has little impact on future generations or on the environment.

SE7. Promoting energy efficiency is an easy way for my utility and the State to control energy costs.

SE8. We are using up our energy supplies too fast.

SE9. There are no new energy efficient products on the market.

Their responses could vary from 1 to 4, where 1 indicates strongly disagree, 2 disagree, 3 agree, 4 strongly agree.

We then examined the role of self-efficacy in determining behavior. In this case we looked at how the responses to these self-efficacy questions were related to the decision to participate at some level of energy conservation. We identified participants and non-participants in the installation of photovoltaic systems and individuals who purchased ENERGY STAR® appliances and lighting products. Using regression techniques, we estimated the effect of attitudes and beliefs on energy efficient behavior.

**Detailed responses on self efficacy attitudes**. We examined the responses of self-efficacy attitudes for the three groups, and the results are presented in the Tables below.

	Strongly Disagree	Disagree	Agree	Strongly Agree
PV Participants	25%	47%	16%	12%
<b>Appliance Participants</b>	9%	42%	41%	8%
Non-participants	10%	46%	27%	17%

Table SE1. What I Do Only Makes a Difference If Others Do It Too

The responses to this question indicate that most people disagree with this statement, although the percent of PV participants who disagree is much higher than the other groups.

Tuble SL2. Luch of 05 Hus To be Responsible, What T bo Can Make a biller thee				
	Strongly Disagree	Disagree	Agree	Strongly Agree
PV Participants	3%	0%	28%	69%
Appliance Participants	2%	1%	71%	26%
Non-participants	1%	4%	58%	37%

Table SE2. Each	of Us Has	To Be Res	ponsible: What	t I Do Can	Make a L	Difference
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Most respondents either agree or strongly agree with the statement. However the PV participants had a much higher percent that agreed strongly with the statement. The non-participants had a greater percentage strongly agreeing with the statement than did the appliance

participants. This seemed surprising initially; however, considering that the appliance participants did not self-select into the program, the findings are not necessarily counterintuitive.

	Strongly Disagree	Disagree	Agree	Strongly Agree	
PV Participants	78%	16%	6%	0%	
Appliance Participants	22%	66%	11%	1%	
Non-participants	35%	57%	8%	0%	

Table SE3. There Is Not Much I Can Do To Save Energy in My Home

Most disagreed or strongly disagreed with the statement. Again the PV participants seemed to have stronger beliefs although similar to the appliance participants and non-participants; and non-participants seemed to have stronger views than the appliance participants.

 Table SE4. Using Energy-Efficient Appliances Is an Easy, Common Sense Way To

 Reduce the Amount of Energy Used In My Home

	Strongly Disagree	Disagree	Agree	Strongly Agree
PV Participants	0%	3%	28%	69%
Appliance Participants	0%	1%	67%	32%
Non-participants	0%	5%	61%	34%

More than two-thirds (69%) of PV participants strongly agreed with this statement. The overall pattern is similar for all groups, but the PV participants were more likely to strongly agree than just agree.

Table SE5. Comfort Is More Imp	portant To Me than	1 Saving Energy in My Home

	Strongly Disagree	Disagree	Agree	Strongly Agree
PV Participants	19%	50%	31%	0%
Appliance Participants	8%	48%	41%	3%
Non-participants	4%	50%	42%	4%

Although responses were not evenly split, a significant amount of people indicated that comfort is more important than saving energy in their homes; 42% of non-participants, 41% of appliance participants, and 31% of PV participants agreed with the statement.

Table SE6. The Amount of Energy I Use Now Has Little Impact on FutureGenerations or on the Environment

	Strongly Disagree	Disagree	Agree	Strongly Agree
PV Participants	69%	25%	3%	3%
Appliance Participants	27%	50%	20%	3%
Non-participants	31%	43%	22%	5%

Appliance participants and non-participants had similar responses; most disagreed although 23% to 27% agreed. PV participants were much more likely to disagree or strongly disagree that the amount of energy one uses has little impact on future generation or the environment.

State to Control Energy Costs					
	Strongly Disagree	Disagree	Agree	Strongly Agree	
PV Participants	3%	3%	29%	65%	
Appliance Participants	3%	13%	74%	11%	
Non-participants	4%	15%	69%	12%	

# Table SE7. Promoting Energy Efficiency Is an Easy Way for My Utility and TheState to Control Energy Costs

There were similar responses across participants groups to this question; most agreed or strongly agreed with the statement. The PV participants were again more intense in their agreement.

Table Sho, we fire Using Up Our Energy Supplies 100 Past					
	Strongly Disagree	Disagree	Agree	Strongly Agree	
PV Participants	3%	3%	25%	69%	
Appliance Participants	2%	14%	60%	24%	
Non-participants	1%	15%	49%	34%	

#### Table SE8. We Are Using Up Our Energy Supplies Too Fast

The responses for appliance participants and non-participants were somewhat similar, about 84% agreed or strongly agreed with the statement. 69% of PV participants strongly agreed that we are using up our energy supplies too fast.

Table SE7. There Are no new Energy Efficient Frouders on The Market					
	Strongly Disagree	Disagree	Agree	Strongly Agree	
PV Participants	65%	35%	0%	0%	
<b>Appliance Participants</b>	28%	67%	4%	1%	
Non-participants	32%	65%	2%	1%	

#### Table SE9. There Are No New Energy Efficient Products on The Market

#### **Analytical Results for Participants and Non-Participants**

Using logistic regression, we evaluated the effect of attitudes and beliefs on participation at some level, whether it is participating in using alternative sources of energy (solar) or purchasing ENERGY STAR® appliance and lighting products. The model we estimated was:

 $P = Probability (Participant = yes/X) = F(X\beta)$ 

Where: X describes the explanatory variables that affect the participation decision. In this case the explanatory variables are the attitudes and beliefs that are represented by the self-efficacy questions. The self-efficacy questions are reconstructed into indicators as to whether one agrees with the statement or not. These indicators are used in the analysis to predict the likelihood of participation.<sup>5</sup>

**Results for PV (Photovoltaic) Participation Decision**: In the first analysis, we compared those who installed photovoltaic systems to those who did not. Those who did not include both those respondents that purchased ENERGY STAR® appliances and those who

<sup>&</sup>lt;sup>5</sup>An attempt was made to control for demographic characteristics. There were too few non-participant responses and the convergence criterion for the estimation was not satisfied.

purchased appliances that were not ENERGY STAR®. The results showed that most of the indicators were not significant. However, the following results were found.

- Those who feel what they do makes a difference regardless of whether others do it as well, were more likely to install PV systems. The SE1 variable, "What I do only makes a difference if others do it too" appears to influence the decision to participate negatively. People who disagree with this statement were more likely to participate in installing a photovoltaic system. Thus, those who felt their behaviors could not help much unless others did it too, did not tend to be PV participants / system purchasers.
- Those who believed the amount of energy they used has an impact on future generations or the environment installed PV systems. The SE6 variable, "The amount of energy I use now has little impact on future generations or the environment", influenced the decision to participate negatively. People who disagreed with this statement were more likely to install a photovoltaic system.
- **Those who feel we are using our energy supplies too fast, installed PV systems**. The SE8 indicator, "We are using up our energy supplies too fast", influences the decision to participate positively. People who agreed with the statement were more likely to participate in this renewable energy program.

**Results for the Decision to Purchase ENERGY STAR® Products.** In this analysis, we compared those who purchased ENERGY STAR® appliances or lighting equipment with those who purchased appliances that were not ENERGY STAR®.

- Those who believed energy efficiency could help control energy costs were more likely to purchase ENERGY STAR® appliances. Again the SE7 variable, "Promoting energy efficiency is an easy way for my utility and the State to control energy costs", influenced purchases positively. People who agreed with this statement were more likely to purchase ENERGY STAR® appliances.
- Those who believed energy efficiency could help reduce the energy used in their home, were more likely to purchase ENERGY STAR® appliances. The SE4 variable, "Using energy efficient appliances is an easy, common sense way to reduce the amount of energy used in my home", influenced the decision to participate positively. People who agreed with the statement were more likely to purchase ENERGY STAR® appliances and lighting.
- However, those who didn't think they could do much, tended to buy ENERGY STAR®. The SE3 variable, "There is not much I can do to save energy in my home", influenced the decision to participate positively. People who agreed with this statement (believed they could not do much) were more likely to purchase ENERGY STAR® appliances and lighting. This result may be reflecting an already high level of energy conserving behavior. Participants may have already purchased and installed all the major energy efficient appliances they feel they can at this time.

**Conclusions for the New York Study.** Self-efficacy effects appear to be strongest for PV participation. The means, frequency analysis, and regression analysis all indicate that self-efficacy influences participation. This result isn't surprising given the demographics of PV purchasers. Although we did not collect demographic information from these survey

respondents, the interviews made it clear that these people tend to better educated, wealthier, more committed to the environment, and more likely to believe that what they do matters and that they can affect change. In addition, this program took considerably more commitment on the part of participants – while incentives covered a significant share of the cost of the PV system, the participant responsibility was still thousands of dollars, and many times as large a financial commitment as purchasing ENERGY STAR® appliances or lighting equipment.

We did not find much difference between participants and non-participants for purchasers of ENERGY STAR® appliances and lighting. The non-participants in some cases tended to agree with the self-efficacy indicators as much or more than did the participants.

There were however some self-efficacy indicators that do appear to influence participation at both levels (PV participation and ENERGY STAR®). Generally, people who agreed with the idea that promoting energy efficiency is an easy way for my utility and the State to control energy costs, were more likely to participate in some type of program. Self efficacy attitudes with a nod toward financial benefits appear to make a difference in conservation decision-making.

## **Summary and Implications**

The paper summarized the results of an analysis of self-efficacy attitudes on behaviors related to several programs in Utah and in New York. The theory and results indicate that influences beyond demographics and other traditional factors affect the decision to adopt conservation behaviors. Deeply held attitudes about an individual's ability play an important role, and outreach that helps illustrate the broader impact of individual behaviors may be effective in helping modify behaviors and choices.

The results of the Utah study indicate that self-interest (reducing their own resource use) remains a powerful motivator in achieving conservation results. Outreach and education that emphasizes this link will likely prove effective in increasing conservation. This concern was reflected (indirectly) in the New York study as well – those who believed energy efficiency could control overall energy costs were more likely to adopt conservation-related measures. However, the New York results also showed a relationship between concerns about the future and energy conservation behavior, and that those who felt they could have no impact did not adopt conservation behaviors. From an educational and marketing standpoint, educating the general public on the ease and tangible benefits of participation could prove successful. Demonstrating that the individual can make a difference – perhaps by linking local or small household behavior changes to environmental impacts – may also prove successful.<sup>6</sup>

Moreover, these results provide a link between self-efficacy indicators and actual behavior rather than self-efficacy and recall or the belief that one can affect change. Unfortunately, the research also indicates that expanding education to increase agreement with broader / greener self-efficacy attitudes may not be effective in increasing conservation behavior.

The self-efficacy indicators which did not prove to be significant in participation may indeed play a role although, not a direct one. It may be the combination of self-efficacy and planned behavior (Ajzen 1988) that are important in determining participation. One may agree with the statements and "like" the idea of participation, but may not have non-motivational factors necessary to actually participate. In other words, one could consider self-efficacy a

<sup>&</sup>lt;sup>6</sup>This also links back to the high value associated with the non-energy benefit related to "doing good for the environment" (Skumatz 2002)

necessary but not sufficient condition for participation. Identifying these other factors could prove useful in the success of future efforts at education and outreach efforts.

Since behavioral beliefs and attitudes toward the behavior influence intention and ultimately behavior, itself, educational efforts toward energy conservation would be well served to consider these beliefs and attitudes and their effects on consumer behavior.

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