

Are Education and Training Programs Producing Knowledge and Behavioral Effects in Wisconsin?

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ABSTRACT

The Wisconsin Department of Administration's (DOA) Public Benefits program, Focus on Energy (Focus), provides a variety of education and training (E&T) programs to the business and residential sectors as part of its overall efforts to achieve long-term market transformation. The primary research question being asked by program sponsors, implementers, policy makers, and evaluators is whether or not the Focus E&T programs are affecting the knowledge and behavior of attendees such that they are more likely to implement energy efficiency practices. As a result of analysis of an extensive base of evaluation findings from research of a range of business and residential E&T events over four years (1999 – 2002), the answer to this question is “yes.” The objective of this paper is to discuss the application of an evaluation approach in which knowledge and behavioral effects among attendees are measured as leading indicators of market effects. This paper discusses the challenges and limitations to the research approach, presents a sample of the findings that support the conclusion above, and asserts that this research approach, despite its challenges and limitations, provides value to the evaluation of E&T program performance.

Introduction

The Wisconsin Department of Administration's (DOA) Public Benefits program, Focus on Energy (Focus), provides education and training (E&T) programs as part of its overall efforts to achieve long-term market transformation. Focus offers a wide range of energy efficiency programs, most of which have an E&T component. The primary objective of Focus' E&T efforts is to support the delivery of Focus' energy efficiency programs. For example, Focus' energy efficiency program for the residential new construction market, Wisconsin Energy Star Homes (WESH), relies on E&T efforts to provide training to participating home performance contractors, builders, and contractors. To support the 20 programs offered through Focus, Focus implemented about 80 E&T events during the year in which the programs were evaluated. About 2,500 people attended these events. Prior to the commencement of the statewide Focus program in 2001, DOA had been offering a pilot Focus program in a 23-county area in Northeast Wisconsin since 1999.

The primary research question being asked by program sponsors, implementers, policy makers, and evaluators is whether or not the Focus E&T programs are affecting the knowledge and behavior of attendees such that they are more likely to implement energy efficiency practices. As a result of analysis of an extensive base of evaluation findings from research of a range of business and residential E&T events over four years (1999 – 2002), the answer to this question is “yes.” The objective of this paper is to discuss the application of an evaluation approach in which knowledge and behavioral effects among

¹ The paper's findings are based on a report co-written when Mr. Talerico was with TecMRKT Works. This paper was written subsequent to Mr. Talerico's departure from TecMRKT Works.

attendees are measured as leading indicators of market effects. This paper discusses the challenges and limitations to the research approach, presents the findings that support the conclusion above, and asserts that this research approach, despite its challenges and limitations, provides value to the evaluation of E&T program performance.

The organization of the paper is as follows. First, the paper discusses the evaluation approach. This discussion includes the rationale for the approach and its associated challenges and limitations. Next, the paper presents the evaluation findings that indicate knowledge and behavioral effects are resulting from Focus E&T efforts. This presentation focuses on the most recent evaluation findings from the statewide program (2001-2002). Findings from earlier evaluations of the pilot programs (1999-2001) are also briefly summarized to demonstrate the consistency of the evaluation findings over time and to provide a solid foundation of research that supports the conclusion that E&T efforts are resulting in knowledge and behavioral effects. Finally, the paper considers merits of the evaluation approach and asserts that this type of research, despite its challenges and limitations, provides value to the evaluation of E&T program performance

Evaluation Approach

E&T implementation, while coordinated with the individual programs, was performed outside of the individual programs by one contractor. Because a single entity was overseeing several E&T activities across programs and sectors, the E&T evaluation was conducted at a cross-cutting level to provide a consistent evaluation approach to E&T activities. This ensured that the E&T implementation contractor was not held to different evaluation criteria for the same activity performed under different contractual arrangements.

The adoption of this strategy posed a challenge regarding the delineation of impact evaluation responsibilities between the cross-cutting and program-specific evaluations. The challenge arose from the fact that the E&T efforts played a supporting role to the individual energy efficiency programs. Consider, for example, the case where Focus E&T efforts affected knowledge and behavioral such that an attendee implemented a project through one of Focus' programs and that this project resulted in savings of 1 MWh. If the cross-cutting and program-specific evaluations independently measured the impacts, the energy savings estimate would be overstated at 2 MWh and evaluation resources would be wasted. On the other hand, even if the cross-cutting and program-specific evaluations could effectively coordinate estimation, the attribution of the 1 MWh to the E&T and program-specific efforts that influenced the project was not a high priority in the overall evaluation scheme given that evaluation needed to address process, market effects, and impact issues across a multitude of programs. Given available resources, we decided that the cross-cutting evaluation would concentrate its efforts solely on process and market effects issues related to E&T efforts and that the program-specific evaluations would track impacts related to the individual program efforts, regardless of whether or not the resulting impacts were precipitated by involvement with Focus E&T efforts. The two major ramifications of this decision were: (1) impacts would not be directly attributed to E&T efforts and (2) impacts of E&T influenced projects conducted outside of Focus' individual energy efficiency programs would not be documented.

In addition to the high importance of assessing market effects, a process evaluation was also considered to be integral to the E&T evaluation. The logic for this decision was that continual improvement must be made in course development and design to better meet participants' training and education needs. This decision, however, necessitated that the cross-cutting evaluation team make trade-offs because available evaluation resources could not support both full-scale market effects and process evaluations. Although the end result was that a higher level of attention was given to the market effects evaluation, the activities for the market effects evaluation were limited to facilitate a medium level of effort for the process evaluation. First, the evaluation team decided to collect information on project

implementation that was more qualitative in nature rather than collecting very detailed project information. This enabled exposure to a greater number of attendees. We did, however, ask for permission to conduct follow-up interviews to collect more detailed information on the projects implemented and, if necessary, collected contact information of the person who would be able to provide these details. This was done in case the program-specific evaluation team had remaining resources to investigate non-Focus projects. The second limitation was that in-depth interviews with a nonparticipant control group could not be funded. Therefore, the evaluation needed to rely solely on self-reported data from attendees in order to gauge effects of the training.

Because of the wide-range of E&T activities being implemented and the limited evaluation resources available to support the E&T evaluation efforts, the cross-cutting E&T evaluation team worked closely with the E&T program implementation manager and the program-specific evaluation team to prioritize events for evaluation. Higher priority was given to:

- New initiatives rather than activities that had already been implemented.
- Activities that had not been evaluated as part of the previous evaluations of the pilot programs.
- Activities that program managers expected to have high potential for impacts compared to activities where low potential for impacts were expected.
- Activities that provide skills-based education and training as opposed to those activities that provide primarily general information or marketing/networking opportunities.

A total of four business events and four residential events were evaluated.² These events are described in Table 1 below.

Data for determining the knowledge and behavioral effects of E&T events were gathered through post-training interviews administered to attendees of selected E&T events. Business findings are based on in-depth interviews with 80 attendees. These interviews were conducted during June–August 2002. The time lag between event attendance and the in-depth interviews for the business E&T events varied depending upon the event and session date, ranging from six months to two years. Residential findings are based on 85 in-depth interviews conducted approximately four to five months after the training event. The session dates, the number of attendees, and the number of in-depth interviews for each of the evaluated E&T events are presented in Table 1 below.

The questions asked to address knowledge and behavioral effects are discussed in the next section. Because the questions asked to address these effects were designed somewhat differently for the business and residential E&T events, they are discussed separately in their respective sub-sections.

² Business E&T events are designed for businesses serving commercial end-users, while residential E&T events are focused toward businesses serving residential end-users.

Table 1. E&T Events Evaluated

E&T Event	Event Summary	Session Date(s)	# of Attendees	# of In-Depth Interviews
<i>Business E&T Events Evaluated</i>				
Building Expectations 2001: High Performance Buildings, High Quality Indoor Spaces	Presented ways to achieve high performance in commercial buildings. The conference offered sessions in indoor air quality, lighting retrofits, airflow improvements, and green buildings.	Apr 2001	213	26
Energy Rx: Measurement and Diagnostic Tools	Provided guidance in using specific energy measurement and diagnostic tools properly. Instructors demonstrated how these tools could assist in quantifying energy use and calculating energy savings potential.	Dec 2000; Jun 2001; Nov 2001	108	20
Geothermal Showcase	Provided an opportunity to learn about GeoExchange systems and their implementation.	Jan 2002	31	19
Advanced Management for Compressed Air Systems	Focused on how to achieve energy savings and improve system performance.	May, 2000; Dec 2001; Jan 2002	62	15
<i>Residential E&T Events Evaluated</i>				
Cure for the Common Callback	Provided residential building professionals with an overview of: fundamental building science; the Wisconsin Energy Star Homes (WESH) Program; and techniques designed to avoid common Wisconsin callback issues.	Dec 2001	225	28
How the Heck Do I Sell This Thing?	Demonstrated to participating builders how to effectively communicate features and benefits of the WESH Program to consumers.	Feb 2002	30	15
Indoor Air Quality in Existing Homes	Provided building professionals with a basic understanding of indoor air quality issues, including identifying, diagnosing, and remediating indoor air quality problems in existing homes.	Apr 2002	51	17
Licking Your Building Envelope and Breaking the Mold	Addressed building envelope best practices that help prevent moisture damage and maximize building envelope performance, durability and efficiency.	May 2002	25	25

Knowledge and Behavioral Effects

One of the most important indicators of training’s contribution to transforming the market of an energy efficient practice is if attendees are actually taking the skills and knowledge gained in training and applying them. In other words, is the training affecting behavior? Past and recent evaluation findings indicate that attendees have learned information and skills from the training and have applied this knowledge to energy-related projects.

Before presenting the most recent statewide findings, we present a brief summary of the pilot evaluation findings from 1999-2001 (Lee and Koenig, 2002) to demonstrate the consistency of the

evaluation findings over time and to provide a solid foundation of research that supports the conclusion that E&T efforts are resulting in knowledge and behavioral effects. A total of twelve individual training workshops were evaluated throughout the Focus pilot evaluation. For each evaluated event, the pilot evaluation administered pre-training surveys at the event and sent post-training mail surveys four to five months after the event. The pilot evaluation research findings represent a wide range of events and encompass four residential workshops, one multi-family workshop, five commercial and industrial workshops, two renewable energy workshops, and library-supported energy tools. The evaluation found that E&T efforts were a successful component of the Focus pilot and concluded that the E&T events were resulting in sustainable market effects by positively impacting energy efficiency knowledge and to a lesser extent behavior. Based on the success of Focus pilot E&T events, the evaluation strongly recommended that E&T efforts be a significant component of the statewide Focus programs and a required part of program plans that could benefit from an E&T component.

The remainder of this section presents recent statewide evaluation findings that indicate knowledge and behavioral effects resulting from Focus business and residential E&T efforts.

Business E&T Findings

Attendees of business E&T events were asked what they learned from the training that had the greatest impact on their day-to-day work or on how they make energy-related plans or decisions. This question was designed for an open-ended response. In other words, attendees had to provide specific information on what they learned rather than simply responding “yes” to a question such as “Did you learn anything from the training that had an impact on your day-to-day work or on how you make energy-related plans or decisions?”

Table 2. Learned Information or Skills from the Training

Event	Learned Information or Skills
Building Expectations Conference	81%
Energy Rx Workshop	70%
Geothermal Showcase	84%
Compressed Air Workshop	93%

The percent of interviewees who reported at least one area in which they learned information or skills as a result of the training is presented in Table 2 above. The majority of attendees reported that they have learned information or skills from the training. Examples of areas of knowledge that were cited by attendees in each of the four events are presented below.

- *Building Expectations Conference*. Examples include: daylighting; glass and glazing; LEED program certification; lighting technology; air distribution and quality; building commissioning; motor efficiency and metering; how to be cost-effective with preventative maintenance; the need for retrofitting T12s; and sustainable building information.
- *Energy Rx Workshop*. Examples include: awareness of equipment available for monitoring usage devices; the availability of a tool library; how to measure air leaks; learning how to use amperage data loggers; and the types of adjustments for AC systems.
- *Geothermal Showcase*. Examples include: how geothermal systems work; aspects of applying loop systems; pond applications; site selection; and examples of successful projects.
- *Compressed Air Workshop*. Examples include: awareness of air leaks; basic principles of compressed air; controls and sizing; and leak maintenance.

Attendees of business E&T events were also asked if they had discussed what they had learned at the E&T event with anyone in their company and the titles of the people with who they shared information. Because the process for making energy-related decisions can involve a number of individuals across multiple departments/levels within a firm, sharing of information is an important component to enhancing the effects of E&T efforts. Further, the skills and knowledge gained at the E&T event may not only affect that attendee's knowledge and business practices, but might also affect the knowledge and business practices of others within the company. As illustrated in Table 3 below, the majority (79%–93%) have discussed what they learned, expanding the influence of the training throughout their company.

Table 3. Discussed What Learned with Colleagues

Event	Discussed What Learned with Colleagues
Building Expectations Conference	85%
Energy Rx Workshop	80%
Geothermal Showcase	79%
Compressed Air Workshop	93%

Attendees of business E&T events were asked if they had started or completed any projects or procedures in which the skills or information presented at the E&T event were used. For each project, attendees asked to provide a brief description, to describe the types of technologies installed and replaced, and to report the skills or information from the E&T event that were used on the project.

Table 4. Use of Training Skills on Projects Started or Completed

Event	Started or Completed Projects that Have Used Training Skills
Building Expectations Conference	69%
Energy Rx Workshop	20%
Geothermal Showcase	16%
Compressed Air Workshop	73%

The percent of interviewees who reported starting or completing at least one project that was influenced by the training is presented in Table 4 above. Attendees in *Building Expectations Conference* and *Compressed Air Workshop* were more likely to have started or completed projects or procedures in which the skills or information presented at the training were used. Attendees in *Energy Rx Workshop* and *Geothermal Showcase* were less likely to have started or completed projects. This does not mean, however, that these events were not successful.

- *Energy Rx Workshop*. The primary objectives were to provide guidance in using specific energy measurement and diagnostic tools properly and to demonstrate how these tools could assist in quantifying energy use and calculating energy savings potential. Forty percent of attendees reported having used the tools since attending the training. These tools include amp probes, data loggers, infrared cameras, and meters. Half of these attendees have completed projects (resulting in 20 percent of attendees overall completing projects).
- *Geothermal Showcase*. The types of projects covered by the *Geothermal Showcase* are typically more capital intensive and larger in scale compared to the projects covered by the

other three training events. In addition, the other training events presented information that could be applied on a wider variety of projects compared to the information presented at *Geothermal Showcase*.

Examples of projects that have been started or completed by attendees in each of the four events are presented below.

- *Building Expectations Conference*. Examples include: performing air flow verification using a flow meter; assessing indoor air quality and getting estimates for installing energy efficient chillers; using cool daylighting at an elementary school; having an energy audit that resulted in the installation of energy efficient lighting; hiring an environmentalist to do indoor air quality testing; incorporating high efficiency glass, lighting, and HVAC on a new office building; installing lighting and tinted glass on an office space addition; installing 90% efficient HVAC system, sensors, and controls; installing motion detectors; and using sustainable building practices on construction of a new chapel.
- *Energy Rx Workshop*. Examples include: performing an energy audit that resulted in conversion of exit lights and installation of T8s, LED lights, window film, and water saving toilets; using an infrared camera during an energy audit to help identify energy improvements; monitoring a compressor using a data logger resulting in the replacement of one 125 HP compressor with two 75 HP compressors; and using HOBO data loggers to check compressors for expansion needs and to detect leaks, resulting in replacement of 20 HP and 10 HP compressors.
- *Geothermal Showcase*. Examples include: installing a geothermal HVAC system at Waterloo Water and Lighting; installing a ground source heat pump with wells at a public library; and starting a three-day University of Wisconsin course on geothermal practices that covers calculation procedures and controls knowledge.
- *Compressed Air Workshop*. Examples include: adding a reservoir tank; auditing compressed air system and fixing leaks; replacing two 75 HP and one 40 HP compressors with a single 200 HP compressor; doing preventative maintenance and leak detection; updating a system with a new 4" air loop and replacing 75 HP compressor with two 50 HP compressors; and replacing air lines and dropping one 75 HP compressor.

To gauge the extent of Focus E&T efforts on these projects, attendees who had started or completed projects were asked to first rate the level of influence that the skills or information presented at the training had on the project and then to rate the influence of six other sources on these projects. We used the ratings for these six other sources to benchmark the level of Focus E&T influence.³

Table 5. Influence of Training Skills on Projects Started or Completed*

Event	Mean Rating	Percent Rating 8–10	Percent Rating 10	Rank Compared to Other Six Sources (and Range of Means for Other Six Sources)
Building Expectations Conference	7.0	55%	9%	3 rd (5.2-7.2)
Energy Rx Workshop	7.0	50%	25%	2 nd (1.0-7.7)
Geothermal Showcase	8.3	67%	33%	1 st (4.0-6.5)
Compressed Air Workshop	8.5	85%	23%	1 st (5.0-7.0)

* Ratings were on a 1 to 10 scale, where 1 is “not at all influential” and 10 is “extremely influential”

³ These six sources included Focus advertising or brochures, Focus representatives, discussions with others, utility advertising or brochures, utility representatives, and information or skills used from energy efficiency actions in their homes.

As illustrated by the findings in Table 5 above, the skills and information from the training have influenced projects that have been started or completed. For all training events, at least half of the projects that have been started or completed by attendees were strongly influenced by the training, receiving a rating of 8 or higher. In addition, the mean rating given to Focus E&T events ranked highly compared to the other six sources of influence addressed in the interviews.

Finally, attendees of business E&T events were asked a similar set of project-related questions to address future plans for any projects in which the skills or information presented at the E&T event would be used.

Table 6. Use of Training Skills on Future Projects

Event	Planning or Considering Projects that Will Use Training Skills
Building Expectations Conference	39%
Energy Rx Workshop	15%
Geothermal Showcase	26%
Compressed Air Workshop	27%

The percent of interviewees who reported future plans to complete at least one project in which the skills or information presented at the E&T event would be used is presented in Table 4 above. These findings indicate the potential for future E&T effects. Examples of projects that are being planned or considered by attendees in each of the four events are presented below.

- *Building Expectations Conference*. Examples include: using daylighting and obtaining LEED certification on a new state building; using daylighting, lighting controls, geothermal heating, and green building practices on a new office; installing energy efficient building envelope measures and lighting on a new church; installing energy efficient glass on a new office building; improving a ventilation system; using pulse start lighting, exit lights, and motion sensors on a new county airport terminal; and installing new ducts on a remodel of an HVAC system at a high school.
- *Energy Rx Workshop*. Examples include: using CO₂ metering to adjust the amount of outside air in building; using a data logger to verify savings on a project; using HOBO and EEMC to verify a new lighting system; and using online data logging and monitoring.
- *Geothermal Showcase*. Examples include: looking at a ground source heat pump with ducts to move air at an environmental education center; planning a geothermal system at a new office complex that will incorporate a pond design; developing a framework for renewable energy education; using a geothermal system at a new school that utilizes ponds for heating; and using more geothermal systems with clients that incorporate ponds for heating, in-floor tubing, and Techmar controls.
- *Compressed Air Workshop*. Examples include: using a two-inch air loop, 20 HP air compressor, and dryer on a new building; planning a central air compressor project; planning a new compressed air dryer; planning an air quality and production project that includes piping distribution and filtration systems; and revamping compressed air piping and filtration.

Similarly, participants who are planning or considering projects were asked to rate the influence of training and other sources on the project (see Table 7 below). Again, results indicate that the skills or information from the training is influencing projects that are being planned or considered. For all

training events, at least 40% of the projects that are being planned or considered by attendees received a rating of 8 or higher. In addition, the mean rating given to Focus E&T events ranked highly compared to the other six sources of influence addressed in the interviews

Table 7. Influence of Training Skills on Projects Planned or Considered *

Event	Mean Rating	Percent Rating 8–10	Percent Rating 10	Rank Compared to Other Six Sources (and Range of Means)
Building Expectations Conference	6.2	54%	15%	1 st (2.3-6.2)
Energy Rx Workshop	7.3	50%	25%	2 nd (1.0-8.0)
Geothermal Showcase	6.2	40%	0%	2 nd (4.0-6.3)
Compressed Air Workshop	8.6	80%	20%	2 nd (4.0-9.5)

* Ratings were on a 1 to 10 scale, where 1 is “not at all influential” and 10 is “extremely influential”

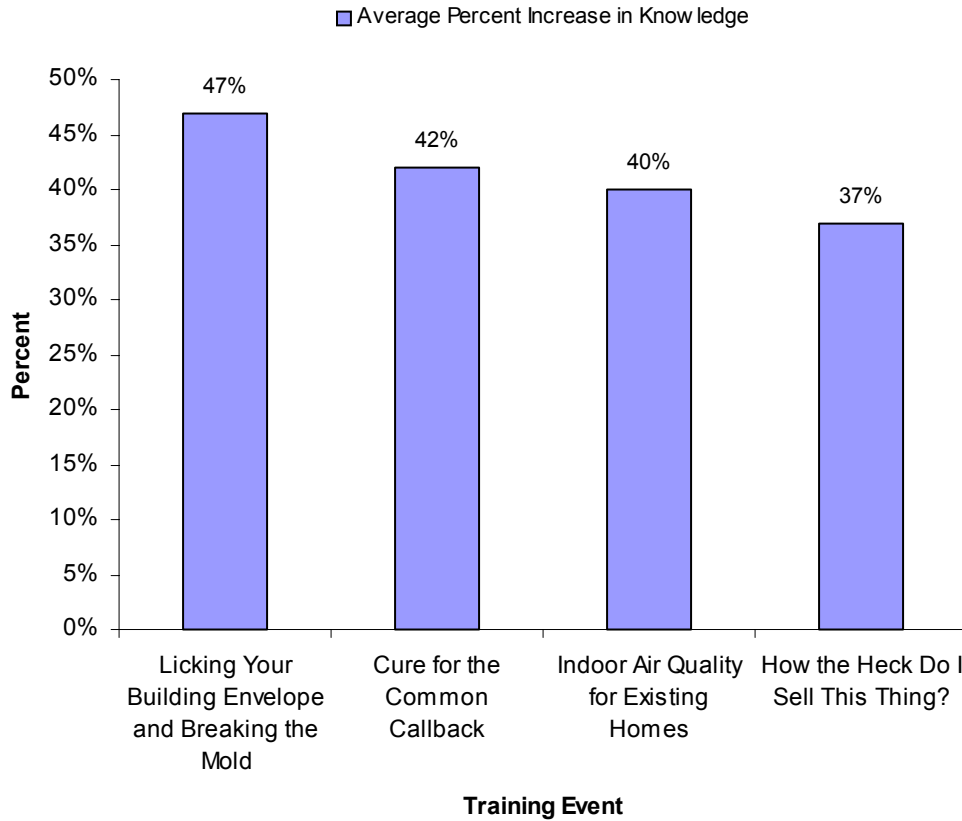
Residential E&T Findings

Residential E&T evaluators worked closely with the E&T implementer and residential program staff to determine which sessions to evaluate. Once sessions were identified, evaluators attended the training session to provide process observations. Feedback forms from the sessions were reviewed and evaluators collaborated with program and training staff to develop in-depth interview protocols that would address the areas of knowledge and behavior targeted by each session. For example, during the in-depth interviews for *Cure for the Common Callback*, interviewers asked attendees to rate their pre-training and post-training knowledge and identify who they shared knowledge with on 14 topics, including: the types of problems to be watchful of in older homes; sources of moisture; how to control condensation; air pressure in buildings; and combustion safety in mechanical systems.. Attendees were also asked to indicate whether they had made changes to their business practices in each of the topic areas.

The interviews indicate that the trainings successfully increased participants’ knowledge on main topics covered in the training. The knowledge increase was assessed by asking respondents to rate their knowledge level before the training, then after the training, on a 5-point scale (where 1=not knowledgeable and 5=very knowledgeable) for each of the topic areas addressed. The percentage increase in knowledge ratings was calculated by taking the difference between the post-training and pre-training reported knowledge ratings and dividing it by the pre-training knowledge rating for each topic area. Figure 1 below shows the average increase in knowledge ratings across all topics for each of the four sessions.⁴

⁴ Due to page limitations of this paper, we could not present all of the comparisons of pre- and post-training ratings for each of the topic areas. Instead, the paper presents a comparison of the mean of means across the topic areas covered for each of the four evaluated residential events.

Figure 1. Average Percent Increase in Knowledge Ratings across Topics from Pre-training to Post-training

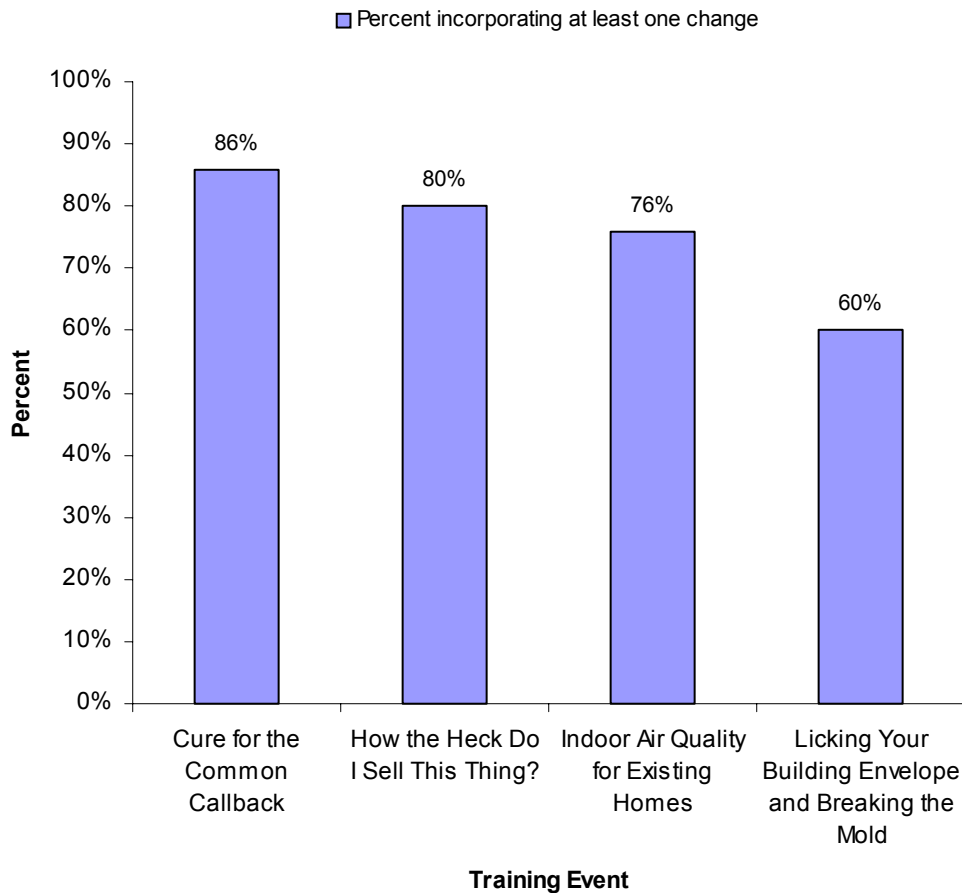


The average increase in knowledge ratings across topics for each session ranged from a minimum of 37% for attendees at *How the Heck Do I Sell This Thing?* to a maximum of 47% for those that attended *Licking Your Building Envelope and Breaking the Mold*. The increase in knowledge ratings was much more consistent (between 37% and 47%) in Year 1 than in the pilot (between 14% and 118%). If the pilot event showing an 118% increase is removed as an outlier, the range for the pilot was only between 14% and 31% increase.

Respondents were asked if they shared any of the information they learned throughout the training with anyone. More than half of respondents said that they shared training information with other individuals, such as clients, subcontractors, employees, and managers. The fact that more than half of respondents shared training information is positive, since respondents sharing information with other individuals is an important component to enhancing the training's impact. The skills and knowledge gained at training may not only affect that respondent's knowledge and business practices, but can also affect the knowledge and business practices of that other individual.

Survey results continue to indicate that knowledge changes lead to behavioral changes, just as in the pilot (please see Figure 2 below). For all evaluated events, changes in business practice had a positive correlation with the increase in knowledge level on the topic. For example, the three topics from *How the Heck Do I Sell This Thing?* for which respondents reported the largest increases in knowledge were: selling benefits instead of features (58% increase), preparing for the call (44% increase), and overall ability to sell Wisconsin Energy Star Homes (WESH) (44% increase). These are the same topics that respondents identified as areas where they have made the most changes in business practices since the training. The correlation is even higher in other sessions described in this paper.

Figure 2. Percent Incorporating One or More Changes Into Business Practices



The most common changes in business practices reported from the *Cure for the Common Callback* were in the areas of identifying and solving common problems in newer homes, preventing and correcting indoor air quality problems, and providing mechanical ventilation. Overall, respondents are more aware, concerned and thorough than before *Cure for the Common Callback*.

The most common changes in business practices reported from *Indoor Air Quality for Existing Homes* were identifying and fixing biological problems, impacts on indoor air quality of heating and combustion, and strategies for improving indoor air quality. Overall, respondents are more aware and now feel more qualified to identify and fix problems.

Selling benefits instead of features, preparing for the call, and the overall ability to sell WESH were the business practices with the most reported change after *How the Heck Do I Sell This Thing?*. Fifty percent of respondents talk about the program more to customers now than before the training. Respondents from *How the Heck Do I Sell This Thing?* were also asked specific questions about changes in how they sell WESH. Eighty percent reported that the training made it easier for them to sell WESH. Respondents reported that attending the training made them feel more knowledgeable, more confident, more enthused about the program and more likely to ‘push’ WESH with customers.

While there was a large increase in knowledge reported after *Licking Your Building Envelope and Breaking the Mold*, not many of the respondents have implemented any changes. Many of them said that it was already ‘standard practice’ for them or that it was not their responsibility on a project.

Conclusions

The evaluation of the statewide business and residential training sessions support the pilot evaluation finding that education and training is a successful component of the Focus program and should continue to be offered based on its demonstrated potential to meet policy objectives. The primary limitations to the application of the research presented in this paper were the lack of a nonparticipant control group and the lack of pre-attendance data on business attendees. This data would have enabled the evaluation team to address issues regarding self-selection and to provide additional insights into the extent of the training's effects on attendees. We strongly recommend that future applications of this type of research include these components if the evaluation budget is available.

Assessing knowledge and behavioral effects among attendees as a leading indicator of market effects is a research approach that provides value to the evaluation of E&T program performance. Three benefits include: (1) implementation of this approach is considerably less expensive than estimating impacts, which facilitates evaluation of a broader range of E&T efforts, if necessary; (2) program managers can use the findings to assess program effectiveness and identify areas for redesign; and (3) program administrators can use the findings to determine whether or not the programs are effective and worth continued funding. Accomplishment of (2) and (3), however, requires that the evaluation team work closely with the E&T program managers and administrators to identify the desired outcomes from the E&T efforts (through review of program theory and logic model) and design the research accordingly to measure the progress in achieving these outcomes.

Finally, the ultimate goal of energy efficiency market transformation programs is the self-sustaining adoption of energy-efficiency practices and measures in the market. The measurement of progress towards this goal, however, can occur at various levels. We assert that assessing knowledge and behavioral effects among attendees as a leading indicator of market effects is a sufficient measurement level for the Focus E&T programs, and other E&T programs with similar goals. This is because these programs are designed to either (1) achieve market preparation (which is preliminary to market transformation) through increases in knowledge and awareness or (2) culminate in the use of energy efficiency practices. Both of these outcomes are usually intangible, and thus difficult to track. Further, these E&T programs are typically delivered to support and complement other market transformation programs that are designed to culminate in the installation of measures (which are usually tangible, and thus more easily tracked). Given these objectives, it is not necessary to measure energy savings in order to assess the performance of these types of E&T programs. Further, the achievement of goals at higher levels (such as energy savings) requires achievement at lower levels (such as knowledge and behavioral effects). For example, energy savings will not occur as a result of training efforts unless attendees first apply the knowledge and modify behavior. Therefore, assessing goals at lower levels (such as knowledge and behavioral effects) not only provides feedback on performance to that goal itself, but also provides evidence that effects at the next higher levels (such as energy savings) can be attributed to the program.

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