GOODMAN RESEARCH GROUP, INC.
*Program Evaluation • Consultation • Market Research*

# *eesmarts*
# Process Evaluation Follow-up


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**SUBMITTED TO**
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# EXECUTIVE SUMMARY

The eesmarts program is a joint energy education program that is funded by the Connecticut Energy Efficiency Fund and administered by The Connecticut Light and Power Company (CL&P) and The United Illuminating Company (UI). The purpose of the program is to develop an energy-efficient ethic among all school age students in Connecticut, encouraging them to incorporate energy-efficient practices and behaviors into their lives at home and at school.

In August 2008, the Energy Conservation Management Board contracted with Goodman Research Group, Inc. (GRG) to assess the effectiveness of implemented program changes that resulted from the 2005 eesmarts process evaluation, specifically from the 12 key recommendations of that evaluation (which are summarized in Table 1 of the report).

The following evaluation questions guided GRG's work:

- To what extent were the 12 key recommendations implemented (e.g., partially, fully)?
- How were decisions about program change implementation made?
- What were the barriers to and facilitators of program change implementation?
- How effective were implemented program changes?
- How well do the implemented program changes align with the three primary objectives of the 2008 program (teacher training, restricted program material distribution, alignment with Connecticut State Science Frameworks and inquiry-based methods)?
- Has the implementation of the key recommendations been effective in improving the program's ability to educate current and future users about the advantages of increased efficiency?
- Given the implementation of program changes, what are the implications for the future of the program?

## METHODS

To assess the effectiveness of the 12 key recommendations, GRG performed the following four evaluation activities:

- Activity #1: In-depth interviews with program decision-makers
- Activity #2: Interviews with Gatekeepers (science curriculum coordinators and other school administrators who make decisions about whether and how to adopt eesmarts for their school or school district)
- Activity #3: Web-based survey with teachers (both those who have received materials & trainings and those around the state who as yet have not)
- Activity #4: Review of existing program materials, including distribution materials, program/curriculum materials, case management database, evaluation forms, Connecticut State Science Frameworks

In addition to qualitative data analysis, GRG used SPSS Statistical Package 15.0[1] for descriptive analysis and ANOVA of quantitative data that informs this report.

## KEY FINDINGS

Based on the results and analysis of GRG's evaluation activities, GRG reports the following key findings:

- The eesmarts program's shift to professional development has successfully increased participating teacher's self-perception of competence in energy practices and ability to teach on energy practices. These successes can be more readily seen if the program is more strategic about which teacher outcomes are important to track.

- eesmarts teachers were significantly more likely to feel prepared to teach on science and energy. Teachers express enjoyment of and satisfaction with the program and believe that it does impact themselves and their students.

- The program has limited the distribution of materials to teachers who have attended workshops. Though program administrators and decision-makers feel that this change was efficient and effective, some science curriculum coordinators and other gatekeepers had mixed responses.

- Alignment with Connecticut's State Science Framework and Connecticut Mastery Tests has made the program more credible as a science-based curriculum and more attractive to curriculum leaders and teachers. This positive aspect of the program is underemphasized in program materials. Nevertheless, some weaknesses in the curriculum need attention.

- eesmarts program decision-makers have been very satisfied with their decision to hire PIMMS as the curriculum vendor and PIMMS' expertise on teaching science curriculum. Additionally, some of the teachers and gatekeepers reported that PIMMS was an important part of their decision to be involved with the eesmarts program.

- Program decision-makers have not set an end-date for the program, believing that the program needs to continue in order to see how effective changes to the program have been in educating Connecticut teachers about energy practices.

[1] SPSS Inc. (2006). SPSS Base 10.0 for Windows User's Guide. SPSS Inc., Chicago IL

## KEY RECOMMENDATIONS

GRG makes the following recommendations to the eesmarts program for continued program improvement in three major areas: program focus and infrastructure, professional development and curriculum materials.

### Program Focus and Infrastructure

- Continue with the program, reach out, and expand to other school districts throughout the state.

  The program has been a success in training educators and should continue to be available to Connecticut educators free of charge. Expansion of the program to new school districts can expand the program's influence and ability to carry out its mission to inspire our communities to adopt positive energy efficiency attitudes and behaviors in the use of all forms of energy.

- Continue to retain the services of PIMMS and further investigate other opportunities to partner with them. .

  eesmarts' hiring of PIMMS as the new implementation vendor has strengthened program credibility and helped the program gain exposure through PIMMS' existing networks within the Connecticut education system. PIMMS and SLC both offer eesmarts participants an added benefit and makes eesmarts more attractive as a multifaceted "package" that offers many educational opportunities for teachers to interface with learning energy practices.

- Make the program more attractive by advertising its alignment with state frameworks and standards.

  Curriculum leaders in Connecticut are especially concerned with meeting the recently instated state frameworks standards. As a beacon of this program, eesmarts should underscore how the program aligns with state standards to curriculum leaders and teachers in order to increase buy-in.

- Think strategically about which long-term outcomes are most important and begin to track those now as part of the developing 10-year plan, using a logic model.

  Now that the program's focus has turned to teacher training, eesmarts administrators should think critically about which measurable outcomes would be relevant for highlighting the program's success. Since the program plans to run indefinitely and there is a 10-year plan in development, program leaders should consider attempting to measure long-term outcomes that are in line with the mission of the program.

## Professional Development

- Make professional development workshops easier for all eligible teachers to attend.

  In line with offering "customized" workshops, eesmarts should strive to offer "customized" configurations using creative solutions to barriers to teacher attendance.

- Concentrate efforts on better recoding of the quality of teacher training and the impact of training on teacher classroom activity.

  Now that the eesmarts program's focus is on teacher training; tracking teachers and teacher outcomes is imperative to assessing the success of the program. Collecting data on students has been difficult and unsuccessful, and considering the program's new focus on teachers may be of less value to the program. Thus, the program's efforts should be put toward collecting information on teacher outcomes**.**

## Curriculum Materials

- Advertise and highlight the program curriculum materials' alignment with the State Science Framework in the teacher guides and curriculum materials.

  In accordance with emphasizing the program's alignment with state frameworks, the program should be even more explicit about how eesmarts lessons and *activities* within lessons reflect state standards and preparation for embedded tasks. Doing so can help increase teacher buy-in and the likelihood that teachers will incorporate the program into their curriculum.

- Continue to provide support for embedding the program materials in the State Frameworks curriculum and address curriculum weaknesses.

  Because of its uniqueness, this program has the opportunity to make itself an indispensable element to the school districts it serves. Adding lessons and curriculum materials that would allow the program to capitalize on these opportunities will require that the program receive increased funding. In order to do this, the program will need to address weaknesses in the curriculum materials by continuing to make revisions as needed to continue to align with state frameworks and any emergent revisions to the framework.

# PROGRAM OVERVIEW

## BACKGROUND & HISTORY

The ***eesmarts*** program began in 2001 as a joint energy efficiency learning program of CL&P and UI. The program's vision is to develop an energy-efficient ethic among school age students in Connecticut, and to encourage students to incorporate energy-efficient practices and behaviors into their lives at home and at school. It is electric ratepayer funded by the Connecticut Energy Efficiency Fund, which receives funds through a Public Benefits Charge on customer's electric bills.

When the eesmarts program was developed, the program was offered in all 17 towns in UI service territory and 6 towns in CL&P service territory. UI was financially responsible for developing the program, which originally offered a K-8 multidisciplinary curriculum. CRI had been the program's sales vendor from 2004 until August 1, 2006. The program's curriculum now has activities geared toward preparing students for the Connecticut Mastery Test in Grade 5 and 8 skills and the Connecticut Academic Performance Test in Grade 10.

During the course of the program's implementation, the Department of Education (DOE) in Connecticut made significant changes to the State Framework that would affect the program's focus. For Grades PreK-10, the DOE enacted the Connecticut State Science Frameworks and required that students complete "embedded tasks" of the Connecticut Mastery Test to demonstrate mastery of science topics.

Since its inception, eesmarts has supplied Connecticut schoolteachers with curriculum materials and resources that help teach students about Energy, Conservation and Energy Efficiency at no cost to teachers or schools. In recent years, it has expanded its program offerings beyond the curriculum unit distribution to include professional development through teacher training workshops for grades Pre-Kindergarten through 8$^{th}$ Grade.

Starting in August 2006, the Project to Increase Mastery of Mathematics and Science (PIMMS) of Wesleyan University took over the implementation of the program by providing "sales" and design, development and conducting of teacher training workshops. Additionally, eesmarts collaborates with the SmartLiving Center in Orange, CT, an independent project of the Connecticut Energy Efficiency Fund and UI that has a showplace for energy-saving ideas. eesmarts also collaborates with the future Connecticut Science Center in Hartford to offer educational tours designed to help provide educators with teaching resources and a Bus Reimbursement Program to help mitigate the costs of the tours to schools and teachers.

As of 2008, it is the only program of its kind in Connecticut and has sent over 5,000 curriculum units to teachers in the state. In helping teachers to integrate eesmarts into their curriculum plans, CL&P and UI have built a network of educators, community groups, curriculum leaders, school systems and government agencies.

## SERVICES & PROGRAMS

The capstone of the eesmarts program is the **Teacher Training via Continuing Education Units Workshops (CEU) and Professional Development (PD), which** trains teachers to teach energy practices and science topics, and how to coordinate eesmarts curriculum more effectively with their own science curriculums. A PIMMS staff member or hired industry professional or consultant initially leads the one- to two-day workshops.

The workshops include training on Inquiry Based Teaching and Learning, broad overviews of the program and demonstration of hands-on activities from the eesmarts curriculum. Custom workshops that are tailored to specific needs of teachers within a school district and general workshops are available. Workshops are held during the school year with longer workshops in the summer at the eesmarts Summer Institute.

As a complimentary offering to schools and teachers, eesmarts offers **Packaged Curriculum Units** that align with the Specific Connecticut Mastery Test, Connecticut State Framework, and National Science Standards skills. All grade levels tie in with existing units on energy, electricity, citizenship, consumerism, the environment, and use of the scientific method. Packaged Curriculum units are available to educators only after they participate in teacher education through the workshops, with some exceptions outside of that rule as a testament to the program's willingness to accommodate specific needs.

The program also offers a **Bus Reimbursement Program/Educational Tours of the SmartLiving™** Center in Orange that has interactive exhibits, educational games, displays of energy-efficient products and technologies.

The **On-site Program** is available for schools or school systems where the program has verified the use of numerous curriculum units. Each program can service 30 students over a 45-minute period. The on-site program activities can also be used when communities and schools request eesmarts participation.

## OVERVIEW OF CHANGES MADE TO THE PROGRAM

In 2004, Nexus Market Research (NMR), Inc teamed with Curriculum Research and Evaluation, Inc. (CRE) to conduct a process evaluation of the eesmarts program. In 2006, the evaluators produced a report outlining 12 major recommendations for the program's improvement and success.

Based on NMR's recommendations, the program made changes including: (1) focusing on the program as a teacher training initiative; (2) hiring a new vendor, PIMMS, to replace CRI; (3) limiting distribution of program materials to teachers who attend teacher training workshops and requiring that a Curriculum Request Agreement (CRA) be signed by a school or school district administrator to order lesson materials; (4) updating the formerly literature-based materials to meet the state science frameworks and standards; and (4) switching to a new shipping and warehouse vendor who used web-based inventory control.

## CURRENT EVALUATION

In August of 2008, The Energy Conservation Management Board contracted with Goodman Research Group, Inc. (GRG) to assess the effectiveness of implemented program changes that resulted from the 2005 eesmarts process evaluation, specifically from the 12 key NMR recommendations of that evaluation. GRG proposed using data collected through interviews, review of curriculum materials, and a web-based survey of teachers in Connecticut.

The following sections of this final report include the following:

- Evaluation methods employed in the analysis in both narrative and table/chart form;
- Detailed findings on the effectiveness of all key recommendations;
- An analysis of trends and typical findings;
- Appendix with copies of all supporting protocols, databases and spreadsheets used in the study.

# METHODS

Across evaluation activities, qualitative data from interviews, secondary data (document review), and data from open-ended survey questions were coded and themes clustered, and narrative accounts emphasizing commonalities are reported.

All data analysis was designed to yield findings on the effectiveness of the implementation resulting from the 12 key recommendations. For quantitative data, descriptive statistics were used to create a profile of teachers, their perceptions of the program, and their views on conservation and efficiency. Analysis of Variance (ANOVA) tests were conducted to identify differences in outcomes between groups (i.e. participant versus non-participant teachers).

## ACTIVITY # 1: In-Depth Interviews with Program Decision-makers

During August and September of 2008, GRG conducted in-depth semi-structured telephone interviews with five program staff that are decision-makers for the eesmarts program. Based on the client's recommendation, GRG coordinated informational interviews with program administrators representing CL&P (two), UI (two), and the ECMB.

Interviews lasted 30-45 minutes and focused on the perceived effects of changes that were implemented since the 2005 process evaluation. These interviews were essential to understanding the unfolding of the program in the time since the process evaluation was delivered in 2005.

## ACTIVITY #2: Interviews with Gatekeepers

GRG contacted 15 program "gatekeepers" for 15-minute semi-structured telephone interviews during September and October 2008. Gatekeepers were identified by eesmarts program administrators as teachers, principals, science curriculum coordinators, education consultants, and district-level administrators who make for their school or school district decisions about whether and how eesmarts curricula are adopted by teachers within their respective school districts.

After repeated e-mails, personal telephone calls and reminders, nine gatekeepers responded to GRG for an interview. Three interviewees did not follow through with their interview time and were unable to be reached for rescheduling. Some of the interviewees did not have updated contact information and could not be reached through contacting their former school district employer. In all, GRG was able to complete six interviews with gatekeepers.

## ACTIVITY #3: Web-based Survey with Teachers

To assess the implementation of key recommendations 3, 4, 8, and 9, GRG developed and launched a web-based survey to teachers across the state. Two groups of teachers were recruited for the web survey:

- eesmarts program recipients and former workshop attendees, based on contact information kept in the eesmarts case management database over the past two years of the program; and
- Non-recipient science teachers and elementary school educators for grades K-9, who might be potential future recipients of the eesmarts program.

GRG procured a list of all of the public elementary and middle schools in Connecticut from the Connecticut State Department of Education website. From this list, GRG identified all of the elementary and middle schools in school districts across Connecticut, excluding school districts that are not covered in the UI or CL&P service areas. GRG faxed a personalized flyer with the link to the web survey (www.grgsurveys.com/ENERGY) to the principals of each of 703 elementary and middle schools listed in the towns that CL&P and UI service with a follow-up phone call to a subset of schools to inform them a fax would be coming inviting their teachers to participate in a survey on science curriculum in Connecticut..

The web-based survey included an adaptive branching pattern, so participants were asked to respond only to questions relevant to their own experience. For example, teachers who received materials but did not attend trainings were not asked to provide feedback regarding the trainings. Non-participant teachers were included as a comparison group and to gauge potential needs for the program going forward. In addition, teachers were asked about their views as well as their students' perceptions of increased efficiency. The survey was primarily quantitative in nature but included some open-ended questions to allow teachers to elaborate on their experiences and opinions.

The web-survey was available beginning September 22 through October 13, 2008 and covered teacher's energy practices, teacher participation in eesmarts professional development activities, teacher satisfaction with eesmarts professional development and curriculum, teacher perception of program impact and science professional development needs for teachers.

On September 22 and 29 and October 6, GRG sent out a reminder email to non-respondents. At the end of the first and second weeks that the survey was open, GRG sent e-mail reminders to participating teachers. GRG also requested that eesmarts program administrators encourage teachers to respond to the survey.

All teachers were offered $15 electronic gift card stipends for participating in the survey. GRG used Remark Web Survey 4 to host the web-survey and SPSS to analyze web-survey data. On October 7, GRG sent out an email to respondents whose emails we were able to correctly obtain and on October 10, GRG sent out a final reminder to all non-respondents.

In total, GRG was able to reach 423 eesmarts teachers. Of those, 122 completed the survey, giving a response rate of 29% For the comparison group, 703 flyers were faxed to administrators and curriculum coordinators at elementary and middle schools in the UI and CL&P service areas. From that batch, 68 teachers responded, yielding a response rate of about 10%.

A total of 190 teachers and science curriculum coordinators completed the survey.

- 122 of these teachers reported that they personally participated in the program.
- 16 of the 122 reported that either they were the only participant in their school or they were unsure of other's participation.
- 106 of the 122 reported that other teachers did participate in eesmarts
- 68 teachers who did not participate in the program completed the survey as well.

## ACTIVITY #4: Review of Existing Program Materials

GRG received program/curriculum materials from eesmarts staff. Included in these materials were Teacher Guidebooks for Grades K-9 with both the old and revised versions of the materials. The handouts given to the students in the program (the "consumables") were included in the mailing. Distribution materials such as the Curriculum Request Agreement (CRA), a database of workshop attendees and curriculum coordinators, a schedule of workshops, and information about various program components were included.

In addition to our internal audit of the material, GRG hired a highly experienced science curriculum specialist to review the material. Our reviews were designed to gauge the appropriateness of the materials to age and level, materials linkage

to assessment of children's abilities, adequacy of explanatory materials for teachers, organization and format, instructional strategies. Review activities will address key recommendations 5, 7, 10, and 11 and were ongoing throughout the evaluation data collection period (August and September 2008).

# RESULTS

The results and analysis of Goodman Research Group's data collection from the four main evaluation activities appears below. This report is structured by listing each of the 12 recommendations that were made in the 2006 process evaluation report. Each *recommendation* is listed, and after each recommendation, a brief summary of the eesmarts program leaders' *response* to the recommendation, followed by the outcomes or *findings* from GRG's evaluation activities of the responses to the recommendation, and finally *GRG's recommendation*.

The findings, responses, and GRG's recommendations were based on the data collection activities which included a web-survey for teachers and curriculum coordinators throughout Connecticut. The responses to the web survey are embedded in each recommendation. Below is a brief summary of the characteristics of the survey respondents.

## CHARACTERISTICS OF SURVEY RESPONDENTS

Most of the web survey respondents were from the Ansonia, Bridgeport, and Hartford school districts. Of the total 190, twenty-four were science curriculum coordinators and all but 13 had taught in grades K-9 in Connecticut schools for both 2007 and 2008. There were respondents from all grade levels that the eesmarts Program serves, with most of the respondents being Second through Sixth Grade educators (Table 1).

Table 1
Grades Taught by Web Survey Respondents

| Grade | Number of Teachers |
|---|---|
| Kindergarten | 26 |
| First | 20 |
| Second | 40 |
| Third | 37 |
| Fourth | 49 |
| Fifth | 48 |
| Sixth | 37 |
| Seventh | 32 |
| Eighth | 29 |
| Ninth | 16 |

N=190

The sample of teachers was highly energy-conscious. When asked about specific energy practices that they carried out, teachers reported that they did the following activities either *often* or *always*:

- Over 90% recycled paper, cans or glass.
- At least half unplugged at least one piece of equipment or appliance when not in use.
- Around 70% used ENERGY STAR brand appliances.
- More than 9 out of 10 respondents used glasses or mugs instead of paper cups.
- Nearly ¾ used CFLS or other energy-efficient lights and 90% turned lights off when not in use or used natural light during the day.
- Over 70% insulate and seal their home while over 90% change the thermostat setting when away from home.

All respondents were at least *somewhat* interested in incorporating more energy-saving practices into their day-to-day living, with nearly 90% claiming to be *very* or *extremely* interested. Despite their willingness and enthusiasm, only a little over 60% reported feeling prepared to actually incorporate energy practices into their lives.

## RESPONSES TO KEY RECOMMENDATIONS

### RECOMMENDATION #1: *Conduct a Needs Assessment for prioritizing program development and implementation activities and for estimating resource requirements, prior to developing new program materials or issuing the RFP for the implementation contractor.*

***Response*:** The eesmarts program decision-makers were all in accordance in deciding not to conduct the recommended needs assessment for two main reasons. First, no funding was granted to hire a firm to do a market scan as a formal needs assessment. Second, decision-makers believed that conducting a needs assessment would have required a temporary suspension of program activities to fully survey and evaluate the needs of the target audience and the program infrastructure; in that sense, a full needs assessment would have been counterproductive.

***GRG's Finding*:** In lieu of a formal needs assessment, program administrators use informal means of getting information that would otherwise be provided through a needs assessment. This information comes from various audiences and informs needs for different aspects of the program. As far as the needs of the program generally, the eesmarts Steering Committee – including the Connecticut Science Center, Connecticut Department of Education, United Illuminating, Connecticut Light & Power, the Institute for Sustainable Energy, and the Connecticut Clean Energy Fund – provide input into the program on content such as education, physical sciences, and what is needed for program advancement. Needs for the curriculum development are assessed through a teacher panel held

by the firm that writes the teacher curriculum (The Writing Company) to gain teacher input on the curriculum materials and development.

Specific needs of school districts are assessed prior to each customized workshop when PIMMS workshop coordinators send a needs assessment form to the school district contact and teachers to determine how best to meet the needs of the audience members from that district.

> *"What the needs assessment has done is allowed administrators to see the district and for us to see where the district is, and so we may end up providing a meal and all the materials and the professional development… So the needs assessment is from the teachers who we are going to train, in case there are discrepancies between where the administration thinks the teachers are and where the teachers really are."*

Among program decision-makers, there is a consensus that these mechanisms provide enough information that a full needs assessment is unwarranted and believe that the program has been more successful because it continued its activities instead of being suspended to conduct a needs assessment.

***GRG's Recommendation:*** GRG believes that the recommendation for a needs assessment for the entire program (beyond for each workshop) is fitting, especially since the program was planning to undergo major changes in the program focus and in the way the program materials are disseminated. Moreover, GRG believes that a needs assessment would be beneficial and could still be used to track program changes. However, GRG does not agree that a needs assessment should require a temporary suspension of the program and that the program could set a defined period of observation as a cross-sectional sample for determining program needs.

Having a needs assessment would allow for pre- and post- assessment of how the changes made to the program affected the program as a whole. Especially since the program plans to continue, having measurements of the program's success and needs will be necessary for evaluation of the program's progress in the future. Although the program administrators have variegated bodies of information that were pieced together in lieu of a needs assessment, these pieces of information were gathered from different sources and at different times.

A needs assessment would allow eesmarts administrators to have a gestalt of overall programmatic state. A needs assessment should be comprehensive enough to include an assessment of the leadership structure of the program, needs of the program's target audience, resources that the program needs to continue to operate as well as highlight the assets that the program already has and an assessment of whether or not program assets are being used optimally.

**RECOMMENDATION #2***: Continue to implement a K-8 energy efficiency education program for a longer—but not indefinite—period.*

***Response*:** As a program with long-term outcomes of increased energy efficiency in Connecticut homes, eesmarts program administrators have not set an end date for the program. Currently program decision-makers do not see a reason for setting an end-date to a program that is still relatively new. Decision-makers interpreted this recommendation as a suggestion for a follow-up evaluation to see whether or not changes recommended in 2005 had materialized and with what effect.

***GRG's Finding*:** Program decision-makers have not set an end-date for the program, believing that the program needs to continue in order to see how effective changes to the program have been in educating Connecticut teachers and students about energy practices. Since the program deals with discrete age populations that move through a system that continuously introduces new cohorts of students, there will always be a new student audience for eesmarts which means and could continue to serve its audience for years to come.

Currently, the Program Administrators are developing a 10-year plan for the program. In the interim, eesmarts hired GRG to do a follow-up evaluation to see whether changes made to the program based on the recommendations were effective in improving the program. Ultimately, the continuation of the program will depend on continued funding of the program.

Because of a state-wide legislative focus on making investments into energy efficient practices, program decision-makers feel eesmarts can be part of the state-wide focus on energy efficiency and foresee the program continuing for at least another 10 years. Program decision-makers are satisfied that the changes made to the program can have lasting positive impact, but that it will take more time before positive long-term outcomes can be observed and assessed.

Preliminary evidence of the program's success might be found in the teacher reports of their perceptions of the program's overall impact. One teacher reported:

> *"I only attended one workshop, but the experience was valuable for me as I grow as a professional educator. The staff was dedicated and very helpful, and I would recommend eesmarts to anyone interested."*

Drawing from all teacher participants who responded to the survey, the data shows that teachers feel that eesmarts is an easy to use program that teachers are satisfied with, and that helps both children and families increase knowledge, awareness and skills about energy, electricity and energy efficiency (Table 2).

Table 2
Teacher's Perceptions of Program Impact

| | Not at all | A little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Making *eesmarts* program materials that I can use repeatedly and incorporate into my lesson plan | 4% | 10% | 22% | 49% | 15% |
| Children acquire increased knowledge, awareness, and skills about energy, electricity, and energy efficiency | 2% | 2% | 21% | 57% | 19% |
| Families acquire increased knowledge, awareness, and skills about energy, electricity, and energy efficiency | 6% | 14% | 35% | 36% | 10% |
| Keeping me satisfied with the *eesmarts* program | 3% | 8% | 19% | 51% | 19% |

N=100-103

One of the teacher participants observed how the programs impact on children reached parents:

> *"My students enjoy the trip to the eesmarts center. Some students take their parents back to show them what they did on the trip."*

Additionally, one district coordinator cited that she observed that students were already being influenced by the program and that children were taking energy practices home. She recounted:

> *"And I have to say that the kids loved [the curriculum]. For example, I went out to the bus line and parents were saying how much kids were learning, one parent said that her son came home and had to go shopping because they had to change all the light bulbs in the house. Another kid wanted to buy litmus paper to test all the water in the house. So those are kind of comments that parents made that did make an impression on the kids who brought it home."*

***GRG's Recommendation:*** GRG agrees with the reasoning that in order to measure the program's goals of changing energy efficiency in Connecticut, the program should continue.

GRG's assessment is that the program should continue to develop its 10-year plan with specific focus on what program outcomes would be best to be assessed at the end of 10 years. With the current focus of the program being on teacher training, the program would preferably measure outcomes related to teacher training quality in the short-term and student attitudes towards

energy efficiency. In the long-term, the program may consider measuring long-terms energy use in the counties where the program exists and comparing that to towns that are not within the service area (i.e., parts of Norwalk, Norwich, Wallingford, Bozrah, Lebanon, and Groton[2]).

As development of the long-term plan proceeds, the program should use planning tools such as a logic model[3] to articulate program outputs and how those relate to program outcomes. In thinking about reporting the results in a way that policy-makers, educators and other audiences can understand, the program should consider using geo-referencing to show maps of changes to energy usage over time.

The program must also recognize that while funds for cost-effective efficiency improvements may continue to be available, current programs may not have funding priority over new initiatives. Given that fact, it is important that eesmarts make itself indispensable by specializing in a particular service (i.e. teacher training) and that it can show that it is effective in achieving both long- and short-term goals.

**RECOMMENDATION #3***: Rethink dissemination practices of program materials. Distribute program materials through gatekeepers or to teachers who have specific training in the use of the materials.*

***Response:*** Program administrators all agreed that distributing program materials through "gatekeepers" would be a more efficient means of getting teachers involved in eesmarts workshops. Rather than approaching individual teachers, eesmarts chose to reach out to these gatekeepers that would have access to large groups of teachers within their school district who then disseminate materials broadly. The program relies heavily on PIMMS' contacts in the school district to market the program to districts around the state. PIMMS' credibility greatly influenced gatekeepers' desires to be in the program for those who had been previously involved with PIMMS or had heard about them from another source.

Ordering curriculum materials is currently tied to the teacher training workshops; teacher training was made a more central program focus by hiring PIMMS to conduct the professional development workshops. Once a teacher completed a teacher-training workshop, they would qualify to order and use the curriculum material through a CRA that had to be signed off by their district's "gatekeeper".

During the summer when it may be difficult for gatekeepers and teachers to connect, eesmarts allows PIMMS to sign off on the CRA for teachers who have completed professional development workshops so that teachers have access to materials; however, the vast majority of materials will go through a gatekeeper and not directly to the teacher.

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[2] These towns are now becoming eligible for the program because of municipality involvement with the Energy Fund.

[3] See the complimentary publication "W.K. Kellogg Foundation Logic Model Development Guide" at http://www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf

***GRG's Finding:*** While program administrators and decision-makers all felt that limiting the distribution of materials to teachers who had attended workshops was efficient and effective, science curriculum coordinators and other gatekeepers had mixed responses.

On one hand, many of the gatekeepers agreed with the program that teachers should have to attend professional development workshops, as is the current practice, because it would be wasteful and unwise for a teacher to have materials but not know how to use them or how to use them correctly.

The professional development workshops were also a way for teachers to receive much-needed training on science materials, especially on how to prepare students for the Connecticut State Mastery Test. Gatekeepers felt that making the materials available conditional on being in a professional development workshop increased teacher enthusiasm in the program curricula because getting the professional development was a larger investment of their time which made them comfortable with using the materials. This proved to be especially true for elementary schools educators who do not specialize in science and who greatly lack professional development opportunities in science.

Using gatekeepers helped keep district administrators aware of what materials teachers are using. Since teachers often had to get the approval of the curriculum coordinator in order to order eesmarts materials, eesmarts direct connection with the coordinator streamlined the process of obtaining curriculum materials. Institution of the Curriculum Request Agreement (CRA) allows eesmarts to better track which teachers receive which materials, as well as requires that gatekeepers are aware of the materials teachers are receiving.

The CRA includes a contractual statement that the teacher has access to eesmarts curriculum and that in turn teachers will use the eesmarts lesson within one year and send in the evaluation form based on the lesson that is used. The CRA also includes a Lesson Material Order Form which specifies the Grade, Lesson Number, Title and Topic Area to help teachers decided which lessons to order.

GRG's review of the CRA revealed that it is easy to use and straightforward. However, considering teacher's and program gatekeeper's preoccupation with meeting Connecticut state standards, the form might be more informative for teachers if it included information on which standards and frameworks the lessons aligned with. Although extensive time is spent reviewing how the program aligns with the frameworks during the teacher training workshops, it is possible that in the time lapse between trainings and when teachers get the materials, teachers may not recall that information. Program administrators agree that use of the CRA form has helped ensure that materials are only distributed with gatekeeper permission.

On the other hand, though they felt that the gatekeeper method of distribution was effective, some gatekeepers felt that limiting the distribution of materials only to teachers who had attend workshops was unnecessary and at times prohibitive. A few of the gatekeepers felt that the eesmarts material is self-explanatory and that having that limitation does somewhat restrict teachers from using the materials. Another person reported logistical barriers to getting

teachers trained through workshops and had some suggestions for how the program could help them overcome this barrier:

> *"…people like me do need to promote it, because teachers need to have time to go to the workshops, or people need to bring it to their towns… eesmarts requires 15 teachers, but my district wouldn't get substitutes for 15 teachers and could only do 12 [substitute teachers] at one time…Even if they [only required] 12 [teachers] or combined teachers from neighboring districts to get the whole15 it might work better. Another idea would be to make workshops available at the colleges with student teachers and teach them during the training. They get trained right there, no liability to anyone. "*

Despite these issues, gatekeepers did understand why the change to the materials distribution was made and still felt that the program was of high quality and that their teachers were inspired and excited by the professional development they attended.

## Gatekeeper's Approach to Program Implementation

Under this new model of distribution, gatekeepers most commonly heard about the program through PIMMS or were approached by the program to visit the eesmarts website and/or review the program materials. Of those gatekeepers who accepted the program, many were very protective of their curricula and spent considerable time researching about the eesmarts program and about PIMMS before making their decision to be involved in the program.

Universally, gatekeepers cited that the program was attractive to them originally because it is a free program that offers professional development in science which most districts lack. The deciding factor all of the gatekeepers on whether or not use the program was how well the program's curriculum materials fit into their curriculum and especially with addressing the Connecticut Science Frameworks, which all of them were very anxious to address. Particularly, inquiry-based learning and alignment with the state-required "embedded tasks" that students in each district would have to pass were key elements of eesmarts that gatekeepers felt were compelling.

In some cases, individual teachers had been using eesmarts prior to their gatekeeper's involvement, which made the program even easier for gatekeepers to integrate into the curriculum. Gatekeepers also noted that they avoided using any lessons in the program that they felt did not match the state standards. Upon seeing the fit with their curriculum, the majority of gatekeepers wrote eesmarts curriculum directly into their existing curriculum. Then, gatekeepers specifically chose teachers from grades who would be affected by the integration of the eesmarts curriculum to the workshops.

Usually, these customized workshops were arranged during a professional development or in-service day(s) requiring teachers to attend. Those that were geographically close also sent some of the students on fieldtrips to the

SmartLiving Center and a few had used the bus reimbursement program to make these trips happen.

Several of the teachers expressed satisfaction with their visit to the SmartLiving Center and commented on it in the web survey:

> *"It was a great trip and helped the students understand the importance of conserving energy and ways to do so. As great as the concept, it is not directly related to the curriculum "*

> *"We thoroughly enjoyed the class trip to the SmartLiving Center in Orange, CT"*

> *"It helps us to have another way to expose our students to energy consumption and conservation "*

> *"I thoroughly enjoyed the free field trip to the center in Orange, Ct. The students were motivated and want to return. It's fun and educational."*

All of the gatekeepers expressed satisfaction with the interactions that they had with the eesmarts program and were particularly impressed with how invested the program was in serving school districts' specific needs. One district's science and math director recounted how an eesmarts representative visited their district and had now become a judge at their district science fair. This particular gatekeeper was also active in holding eesmarts workshops for parents, feeling that it was necessary to educate parents on the curriculum in order to achieve maximal effectiveness.

This change to using gatekeepers as the channel for distributing materials resulted in buy-in at a higher level and more widespread distribution of the program, as evidenced by recent program growth.

One program administrator noted how successful the change had been:

> "*Before we started focusing on workshops, I think we had about 30 to 50 [teachers] trained each year, and this year we're going to have over 700 this year alone of new trainees. So over the course of a few days [one district]… requested for K-9 so that was about 100 [teachers] right there, and this doesn't even count the professional development workshops to come for the rest of the year."*

Teacher's reactions and beliefs about the effectiveness of the new mode of distribution is an indicator of success. In the web-survey, teachers were directly asked if they feel distributing materials through gatekeepers or only to teachers who have attended workshops is an effective way of distributing materials. Over 80% of teacher participants in eesmarts believed that it was effective.

Likewise teachers expressed high satisfaction with eesmarts' approach of distributing curriculum materials directly to teachers at the teacher workshops; over 80% were *very* or *extremely* satisfied with this mode of delivery (Table 3).

Table 3
Percent of Teachers Satisfied with Distribution of Program Materials

| | Not at all | A little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Effectiveness of distributing materials to teachers directly | 0 | 5% | 13% | 57% | 24% |

N=75

Despite high satisfaction with it, teachers see both the pros and cons of using this method. GRG was able to document some of the benefits and barriers of using the gatekeeper method as articulated by teacher survey respondents (Table 4).

Generally, teachers were concerned that only a subset of teachers would be trained and thus only a subset would receive the program materials and that these teachers would not share with other teachers who need materials. There were also concerns about working with the gatekeepers who may not buy-in to the program and the additional time gatekeepers have to take out to be involved. Nonetheless, there was a consensus that this is the best way to distribute program materials to teachers in an efficient way.

Table 4
Summary of Teacher Comments on the Benefits and Barriers of New Distribution Method

| BENEFITS | BARRIERS |
|---|---|
| • Using a gatekeeper gives teachers a local go-to source for teacher needs | • Curriculum coordinator may not be available or buy-in to the program |
| • Materials go directly to the teachers | • Do not always get to teachers |
| • Teachers get much-needed training they otherwise might not volunteer to get | • Only districts that have a coordinator who supports the program can be in it |
| • Teachers will use them if their science curriculum coordinators (or gatekeeper) supports it | • It can be time consuming to wait for materials |
| • Curriculum coordinators stay abreast of the science materials being used in their district | • Not all schools have science coordinators, or someone to act in a gatekeeper role |
| • Materials are in the hands of people who know how to use them | • Not all teachers have access to the materials; not all teachers can attend the workshops |
| • The materials are a fit with school's existing curriculum | • Requires additional work for the curriculum coordinator to integrate it into the curriculum |

Overwhelmingly, feedback from program decision-makers, gatekeepers, and teacher participants point indicate that the program's new mode of distributing materials translates to high satisfaction and more effective dissemination of program materials.

***GRG's Recommendation:*** GRG agrees that using the gate-keeper method of dissemination has been an asset to the program and is very likely to have contributed to the program's recent growth. Only giving materials to teachers who have been trained at the workshops is a key step to ensuring that the materials are used correctly, and that all teachers operate under the same level of training.

However, there is some concern that using gatekeepers as a mode of distribution is stalling the distribution, that is, that it takes longer for teachers to get the materials after receiving teacher training. GRG experienced how this is problematic when distributing the teacher survey. In our speaking with some teacher participants personally who had not yet responded to the survey, they said they had disregarded prompts to fill out the survey because they had attended the workshops a long time ago and still had not received the curriculum materials. Separately, eight respondents in the open-ended survey said the same.

Although the CRA agreement specifies that part of the contract for receiving the materials is that the teachers use it within a year, for teacher training to be maximally effective, the eesmarts programs should help ensure that teachers receive the eesmarts materials soon after receiving training (if not immediately) when they can best retain information they learned at the training.

One possible way to do this is to create incentives for teachers who use the program within the first few months after receiving training. Even if the hold-up is on the gatekeeper end, teachers would be able to encourage their gatekeepers to distribute the materials expeditiously. Or, possibly the program might make "starter kits" available at the workshops for teachers to take and use immediately; the starter kits might have a sample of materials for teacher to start use and they would have to order the full kits later through their curriculum coordinator. Whatever the case, the eesmarts program should work toward streamlining the distribution of the program materials so that teachers get the materials in a reasonable timeframe.

**RECOMMENDATION #4***: De-emphasize the program materials as the centerpiece of the program, and consider significant expansion of opportunities and incentives for teacher training, including offering stipends and scholarships, and scaling up the number of professional development workshops across the state to focus primarily on teaching science concepts—especially to elementary school teachers—relevant to energy (as well as energy conservation and efficiency applications).*

***Response:*** In August 2006, eesmarts shifted its programmatic focus to professional development on energy practices for teachers. As incentives for teacher participation in eesmarts professional development workshops, the program started to offer stipends for teachers to attend the general workshops (ones offered to the public and are not customized for districts).

Additionally, the program increased the number of workshops offered and changed the focus to be more science-based and relevant to energy. Teachers can also earn Continuing Education Units (CEUs) for their participation in eesmarts workshops. Since 2004, over 1,172 teachers have been trained by eesmarts altogether. In 2008 alone, 292 teachers have been trained.

***GRG's Finding:*** Because of the program's focus on professional development, teacher participants in the eesmarts program were more likely to report having participated in some sort of science enrichment or professional development over the past two years compared to those who did not participate in the program.

Table 5
Number of Web Survey Respondents who have Participated in Science-Related Professional Development

| | **Non-Participant** (n=68) | **Participant** (n=122) |
|---|---|---|
| Taken a formal college/university science course. | 5 | 15 |
| Taken a formal college/university course in the teaching of science. | 77 | 16 |
| Observed other teachers teaching science as part of your own professional development (formal or informal). | 22 | 38 |
| Served as a mentor and/or peer coach in science teaching, not including supervision of student teachers. | 8 | 22 |
| Attended a workshop on science teaching. | 27 | 33 |
| Attended a national or state science teacher association meeting. | 9 | 18 |
| I have not participated in any activities related to the teaching of science. | 10 | 12 |

Based on the results of the teacher survey, the program's shift to professional development has increased participating teacher's self-perception of competence in energy practices and ability to teach on energy practices. One teacher highlighted the need for this type of program:

> *"I think it is wonderful that you are reaching out to schools to help teach an important concept."*

All teachers in the web-survey were asked to rate how successful they felt the professional development was over the past two years on several areas on a 5-point rating scale (1 = *Not at All Successful* and 5 = *Extremely Successful*). Participating teachers and non-participating teachers differed significantly in their report of receiving successful professional development on science and teaching and teaching about science.

Participating teachers were significantly more likely than non-participating teachers to feel that the professional development they had received in science had been successful at deepening their own science content knowledge, increasing their understanding of how students think about science and how to assess student learning, and increasing their own competence in using inquiry-based learning strategies (Table 6).

Table 6
Web Survey Respondents—Perceptions of Professional Development Impacts

| | **Mean for Non-participants** (n=68) | **Mean for Participants** (n=122) | **p-value** | **Overall Mean** (N=190) |
|---|---|---|---|---|
| Deepening my own science content knowledge | 2.7 | 3.4 | <.001 | 3.2 |
| Understanding student thinking in science | 2.8 | 3.4 | <.001 | 3.2 |
| Learning how to use inquiry/investigation-oriented teaching strategies | 3.1 | 3.7 | .001 | 3.5 |
| Learning how to assess student learning in science | 2.8 | 3.3 | .004 | 3.1 |

Participating teachers were also asked to rate how prepared they feel to do work with science and energy concepts in their classrooms (using a 5-point scale from *Not At All Prepared* (1) to *Extremely Prepared* (5)). Participating teachers felt more prepared than did their non-participating counterparts (Table 7).

***In fact, an ANOVA revealed that eesmarts teachers were significantly more likely to feel prepared to teach on science and energy.*** The means for teacher participants' perceptions of professional development impacts and feelings of being prepared to teach energy topics were higher than the means for non-participants, indicating that teacher participants felt more confident and competent to teach on energy topics ($p < .05$).

Table 7
Web Survey Respondents—Preparation for Teaching Energy Topics

| | **Mean for Non-participants** (n=68) | **Mean for Participants** (n=122) | **p-value** | **Overall Mean** (N=190) |
|---|---|---|---|---|
| Develop students' conceptual understanding of science and energy efficiency | 2.7 | 3.3 | <.001 | 3.1 |
| Provide deeper coverage of science concepts and energy efficiency | 2.5 | 3.3 | <.001 | 3.0 |
| Make connections between science and other disciplines | 3.3 | 3.7 | 0.01 | 3..5 |
| Teach on the topic of science in general | 3.4 | 3.7 | 0.047 | 3.6 |
| Teach on the topic of energy efficiency | 2.7 | 3.5 | <.001 | 3.2 |

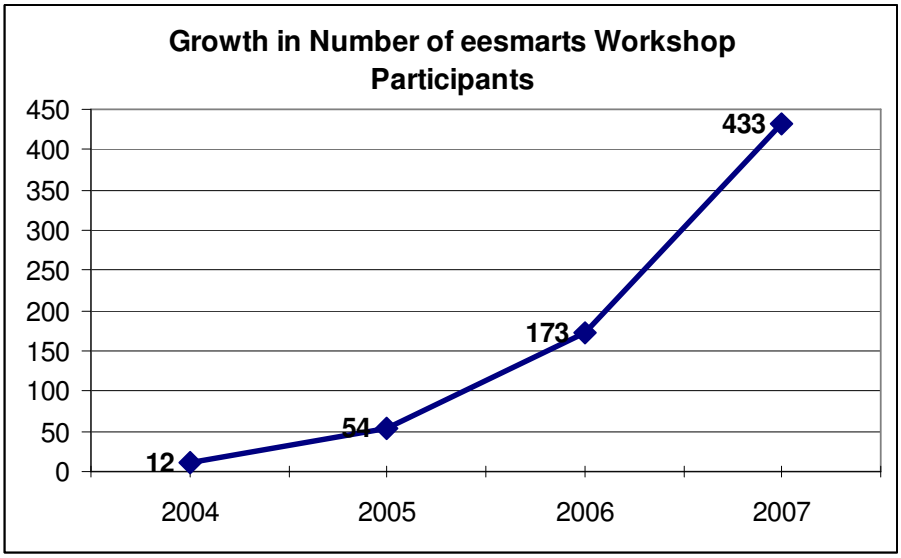
***GRG's Recommendation:*** GRG feels that changing the emphasis of the program to teacher training has been very successful. Participating teachers were significantly more likely than non-participating teachers to feel that the professional development they had received in science had been successful at deepening their own science content knowledge, heightening their understanding how students think about science and how to assess student learning, and increasing their own competence in using inquiry-based learning strategies (Table 6)

## INCENTIVES FOR TEACHERS

As recommended, the program began offering incentives for teachers to participate some of which, like providing stipends to teachers who take time off to attend professional development workshops, offering Continuing Education Units and the bus reimbursement program, have been successful at increasing usage of the program.

Notably, since the recent changes were made to the program, the number of eesmarts workshop participants has increased dramatically (Graph 1). This is likely the result of the new focus on giving teachers incentives to attend teacher workshops.

Graph 1: Growth in the Number of eesmarts Workshop Participants by Year




Though there was little specific information on how teacher stipends impacted the program, program gatekeepers indicated that the presence of the stipend program helped ensure that teachers got paid for any days that they missed due to professional development through the program.

Surprisingly, it seemed that convenience and accessibility to workshops was a major incentive, beyond stipends, CEUs or the bus reimbursement program. For instance, a teacher stated:

*"I enjoyed attending this workshop but it was in the evening out of town and it made for a very long day!! The workshop was 2 nights but it was very worthwhile. I think more teachers would be interested if it could somehow be offered after school in our school."*

Specifically, with regards to CEUs which teachers must renew annually, the program received feedback from its Summer Institute that obtaining the CEUs required teachers to give out sensitive and personal information that some did not feel comfortable making available due to past encounters with identity theft.

Additionally, teachers who were not permanent citizens could not get CEU credits due to their citizenship status. Still, this personal information requested is required by the IRS to process the stipend under new Homeland Security rules, which are beyond the program's control. Due to this feedback on workshop evaluations, eesmarts program administrators will work to communicate with workshop participants about why they need for this information in advance to resolve these issues.

As far as bus reimbursement is concerned, most curriculum directors who had used the program found it to be helpful. Those who were geographically close sent some of the students on fieldtrips to the SmartLiving Center and just a few used or even knew about the bus reimbursement program. Although the program will cover the additional costs and will process rebates above the stated limit, other directors were unsure of the extent of support that program would give them and were cautious about using it:

*"…it is a good [long] bus ride - over an hour - so I'm probably going to send one 5th Grade there this year as a pilot to see whether those teachers and those kids … I think it's worth it to make that bus expenditure. Even with the partial reimbursement from eesmarts, we would want to send all of the classes and I doubt eesmarts would pay for all of the classrooms to go, which means asking students to pay $15 to visit. So I have to seriously consider the costs."*

Of those who received eesmarts professional development training, most had attended a free CEU workshop held by PIMMS or an undifferentiated eesmarts-related workshop.

- 42 attended a free continuing education unit (CEU) general workshop by PIMMS at Wesleyan University and 27 participated in a general *eesmarts* workshop
- 28 attended a Professional Development workshop(s), customized for their school district created and given by (PIMMS) of Wesleyan University

Teachers were very satisfied with the quality of instruction they received at eesmarts workshops. Program gatekeepers emphasized that PIMMS was a major contributor to teacher satisfaction with the workshops. Teachers expressed excitement about what they had learned in the workshops:

*"I really enjoyed the lessons that were given to us and I couldn't wait to pass them on to my students. If an adult can enjoy them so much, I am sure that kids will just love them!"*

Of those who had attended some sort of professional development sponsored by eesmarts, around 80% felt the workshop quality was *Very Good* or *Excellent*.

Specifically, teachers were asked to report on the quality of specific aspects of eesmarts training (Table 8). Most teachers felt the workshop quality ranged from G*ood* to *Very Good*. Though a small minority, some teachers (4%) felt that the program did a *Poor* job of giving a realistic idea of the time needed for each activity and an even smaller percentage felt the program had done a *Poor* job at providing teachers with adequate training to be able to use the materials.

Table 8
Percentage of Teachers Reporting Quality of eesmarts Training Program

| | Poor | Fair | Good | Very Good | Excellent |
|---|---|---|---|---|---|
| Giving you an idea of the *time involved* in each activity | 3% | 5% | 27% | 48% | 18% |
| Providing you with the necessary training to use the program's materials | 1% | 5% | 20% | 44% | 30% |
| Providing you with the *skills and knowledg*e you needed to teach the lessons confidently and answer questions | 0% | 7% | 23% | 44% | 26% |
| Providing you with all the *resources* you needed to teach the activity | 2% | 8% | 21% | 42% | 27% |
| Making it clear after the training how to *access additional help* or have questions and concerns answered | 2% | 7% | 23% | 43% | 26% |
| Overall training received to conduct the activities | 0% | 6% | 19% | 42% | 30% |

N=84

It seems as if teachers felt the program was most successful at providing high-quality resources for each activity, and support after the workshops. Overall, almost 70% of teachers felt that the quality of training they received overall through the program was *Very Good* or *Excellent*.

About 70% of teacher participants in eesmarts have used the program's curriculum materials (lesson plans, books, teacher guides, and consumable handouts) at the time of the survey. Teachers spent anywhere from 10 minutes to 3 hours preparing for their eesmarts lesson. Some teachers reported that they modified program curriculum materials. Commonly teachers reported that they had to change the vocabulary or simplified the content to aid in student

comprehension. Teachers also cut some of the lessons short due to the lack of time to do the entire lesson.

Generally, teachers were satisfied with the program curriculum materials, the quality and design of the lessons, and felt the program curriculum materials were age appropriate. Over 80% of teachers reported being *Very* or *Extremely Satisfied* with each of these program elements (Table 9).

Table 9
Percentage of Teachers Satisfied with eesmarts Curriculum Materials

| | Not at All | A Little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Materials you received | 0 | 1% | 14% | 55% | 30% |
| Quality of the content of the lessons | 0 | 1% | 15% | 57% | 28% |
| Match of the lesson content with the grade level/ability of the students | 1% | 4% | 23% | 53% | 19% |
| Design and format of the activities | 1% | 4% | 14% | 55% | 27% |

N=76-78

As further evidence of their high level of satisfaction with the program, more than 8 in 10 teacher participants planned to use the eesmarts curriculum materials in the future. They noted:

> *"I definitely plan to use the eesmarts curriculum again. The curriculum is very beneficial to my students."*

> *"I am teaching 1st grade this year so I will be using the 1st grade curriculum and also the kindergarten one too."*

> *"I plan to use the lessons I used last year and I would like to add a few more."*

The remaining ones did not say they would not use the program, but that they were unsure as to future use. Further exploration revealed that teachers who were unsure had logistical issues like a lack of time in their school day, or they had misplaced their eesmarts curriculum materials. Others were unsure how well the curriculum would fit into their curriculum and would wait to see the fit before deciding whether or not to use the program in the future. The program's current requirement of the training and use of the consumables accommodates the concerns that teachers had.

Teacher participants were asked to identify one lesson they felt was most memorable (Table 10). The most popularly mentioned lessons were from the Grade 4 series; across all grades teachers were most likely to note the lessons related to solar energy and solar power as the most memorable.

While it is possible that the preference for Grade 4 materials is due to our sample having a lot of Grade 4 educators, there are not a significantly higher number of Grade 4 educators compared to other grades, so it is likely that teachers or program gatekeepers especially like the Grade 4 materials.

One curriculum coordinator pointed out that Grade 4 materials were a pick for them because they felt those were most aligned with the state science frameworks and because it would provide immediate help to teachers as they prepared students to take the CT Science Mastery test in the Fifth Grade.

Table 10
Teacher Perception of Most Memorable eesmarts Lesson Set

| | Number of Users | Percent of All Users |
|---|---|---|
| Kindergarten: Iggy and Me Saving Energy | 9 | 11% |
| Grade 1: Rosa and Effy's Adventure | 1 | 1% |
| Grade 2: I'M A DINO-SAVER™ | 7 | 9% |
| Grade 3: Hands on Energy | 12 | 16% |
| Grade 4: Energy | 22 | 29% |
| Grade 5: Adventures in Energy | 8 | 10% |
| Grade 6 Level II | 1 | 1% |
| Grade 7 Level III | 12 | 16% |
| Grade 8 Level I | 5 | 7% |

N=77

The majority of teachers reported being trained through either attending an eesmarts workshop (80%) or by a co-worker who had attended a workshop (7%). Only about 15% of respondents reported never having been trained on the materials.

Respondents were asked a subset of questions based on what they remembered from the lesson they chose as the most memorable. GRG decided to use this method to get a general idea of how participants feel about the specific program materials that they received. All of the teachers who were trained felt that they training they had received on that particular lesson was at least *Somewhat* successful. The majority of the teachers felt it was *Very* or *Extremely* successful.

Teacher participants were asked to rate the curriculum materials they received on difficulty, how well it engaged students, and the user-friendliness of the materials (Table 11). Teachers found the curriculum very easy to use, they expressed comfort with using them, and reported that the curriculum was age-appropriate and engaging for their students.

Table 11
Percent Teacher Participant Rating of Success of Curriculum Materials (N=78)

| | Not at all | A little | Moderately | Very | Extremely |
|---|---|---|---|---|---|
| In general, how difficult was it to use this lesson? | 71% | 18% | 8% | 4% | 0 |
| How comfortable were you conducting this lesson? | 4% | 5% | 15% | 49% | 27% |
| How easy to follow were the activity directions for this lesson? | 1% | 5% | 16% | 61% | 17% |
| How engaged in this lesson were your students? | 1% | 4% | 21% | 56% | 18% |
| How successful was this lesson with this age group? | 1% | 1% | 22% | 65% | 19% |

On the topic of student engagement, several teachers noted that students enjoyed the program. For instance:

> *"The students enjoy participating in the program. I hope that it continues."*

> *"The students enjoyed the two I did with them and felt encouraged and successful."*

Overall, eesmarts' current focus on teacher professional development in science-related topics has led to increased knowledge and comfort with teaching energy practices in their classrooms and their homes (Table 12). Interestingly, most teachers who had attended workshops reported that the program increased their competency either *Somewhat* or *Quite a Bit*, with fewer reporting *A Great Deal.,* This may indicate that the program does have some room to improve in assisting teachers in increasing their competency in science-related topics.

It may also reflect that there is an infinite amount of science content that teachers can be trained on, which the program could not be expected to accommodate: that is, teachers may also report that there is room for improvement because of the vast breadth of science topics. Importantly, teachers comfort with teaching energy practices received the highest endorsement, indicating that the program is reaching some its intended goals.

Table 12
Percentage of Teacher Participants Reporting Program Impacts

| | Not at All | A Little Bit | Somewhat | Quite a Bit | A Great Deal |
|---|---|---|---|---|---|
| Science content knowledge | 1% | 4% | 35% | 44% | 17% |
| Comfort with teaching energy practices | 0 | 4% | 24% | 56% | 17% |
| Understanding of how students think about/learn science | 2% | 8% | 32% | 39% | 17% |
| Ability to implement high-quality science instructional materials | 2% | 7% | 31% | 45% | 14% |
| Emphasis on energy practices in your lesson plans | 2% | 7% | 30% | 44% | 17% |
| Incorporation of more energy-efficient practices into your day-to-day life (including home, workplace) | 0 | 6% | 21% | 47% | 26% |

N=85

Teachers were positive toward the program materials and using them in their classrooms and picked out specific materials they liked:

> *"The book is the best part of the material. More books that can be used as a QUICK read aloud are often more effective than work sheets."*
>
> *"I did the eco footprint lesson for the first time last year and three other teachers liked it and did the lesson also."*
>
> *"I teach energy and energy transformations. I really liked the lesson that had kids analyze energy use within their homes. I also liked the lesson which looked at the efficiency of different light bulbs."*

***GRG's Recommendation:*** Based on GRG's review, the program still seems very much focused on energy rather than science and math topics generally. By design, the materials are focused on energy topics while the workshops focus on science in general to help the teachers teach about energy as well as other science topics. If the program is going to continue to advertise that it is a professional development program for training teachers how to teach math and science, then more emphasis needs to be placed on science generally, and math especially.

The greatest need seems to be for elementary school teachers, so the program should concentrate on efforts to increase workshops for elementary school teachers and offering incentives to them. GRG feels that the use incentives for teachers is a good idea and has most likely contributed to recent program growth.

Although there is currently no data to analyze how teacher incentives may have influenced teacher participation in the program, it is most likely that the increase in participation in workshop may be in part due to the offering of incentives. In the future, the program should be sure to record which incentives the teachers receive in order to gauge which incentives teachers are most responsive to.

**RECOMMENDATION #5***: Discontinue mass distribution of all existing program materials because the science content is not sufficiently aligned with the state's frameworks for teaching science.*

***Response:*** There were no alignment issues with the curriculum for Grades 6-8. Materials for Grades K-5 have or are currently under revision. Although the program no longer offers the older version Grade 4 and Grade 5 lessons as the primary lesson material because they do not align to the state frameworks, rather than completely throw away all of those materials, eesmarts decided to recycle the existing curriculum materials and offer them as kits for supplemental use by teachers.

***GRG's Finding:*** In light of the recent focus on the state science frameworks for teaching science, eesmarts retrofitted their program materials to match all science frameworks. This meant that some teachers would have old materials which did not align with the science framework, while others would receive those that were. Additionally, there would be surplus of outdated program materials which did not align with CT State Frameworks. Now those outdated kits can be ordered specially as teacher supplements but are not seen as part of the focus of the program any longer.

***GRG's Recommendation:*** GRG agrees that retaining the old materials as supplements that teachers can specially order is a good way of making the old materials useful. In the spirit of conservation, the program should continue to make them available until the supply runs out. Since supplies are limited, GRG suggests limiting distribution of these older materials to teachers who have used the program extensively and have experience with those program materials.

**RECOMMENDATION #6***: Extend the service of the current implementation vendor, CRI, to bridge the gap between future program redesign and the current situation, at a reduced resource level—focusing on case management and teacher training with the existing, yet out-of-date, program materials.*

***Response:*** In August 2006, eesmarts decision-makers transitioned from CRI to the current curriculum implementation vendor, PIMMS. As recommended, the program retained Karen Calechman from CRI to work with PIMMS as the eesmarts Outreach Coordinator to streamline the transition between the programs. Switching from CRI to PIMMS also represented a shift in the program's focus

from "selling" an energy efficiency curriculum to being a program about teacher professional development.

***GRG's Finding:*** From GRG's observation, the switch from CRI to PIMMS has proven to be a critical part in the eesmarts program's growth. PIMMS was chosen based on its credibility and wide recognition in math and science professional training, its many years of experience in teaching science workshops in CT, and its notoriety among teachers and education organizations throughout Connecticut. Because of PIMMS' expertise in education and teaching, the switch to PIMMS was symbolic of the programs' switch to a focus on workshops and teaching science.

PIMMS' strategic positioning in school districts has allowed it to be more than just an implementation vendor to the program; they additionally serve as "salespersons" of the program to the contacts within their school districts, which promote the program. Additionally, PIMMS has a group of fellows who have attended PIMMS workshops in the past and have become part of their membership, who also attend eesmarts workshops. In this way, the program has a combined audience of past eesmarts teachers, and the PIMMS relationships with the school districts, and the program's website and direct mailing and attendance at educator conferences.

Program administrators felt that the switch to PIMMS went very smoothly. Rather than keeping CRI involved in eesmarts to see the program though the transition, as was suggested, program administrators decided to hire one of the CRI staff members to work with PIMMS in order to keep continuity and to preserve the knowledge that they had already acquired from years of working with the program. Karen Calechman, formerly of CRI, was hired as the Outreach Representative through Wesleyan. Program administrators felt that hiring her kept a "familiar face" on the program as well as providing a bridge between the old vendor and the new.

eesmarts program decision-makers have been very satisfied with their decision to hire PIMMS as the curriculum vendor and PIMMS' expertise on teaching science curriculum. Additionally, some of the teachers and gatekeepers reported that PIMMS was an important part of their decision to be involved with the eesmarts program.

***GRG's Recommendation:*** GRG recommends continuing with PIMMS as long as the program focus is on teacher training workshops. From GRG's observation, the switch from CRI to PIMMS has proven to be a critical part in the eesmarts program's growth.

PIMMS was chosen based on its credibility and wide recognition in math and science professional training, its many years of experience in teaching science workshops in CT, and its notoriety among teachers and education organizations throughout Connecticut. Because of PIMMS' expertise in education and teaching, the switch to PIMMS was symbolic of the programs' switch to a focus on workshops and teaching science. The smooth transition to having PIMMS as the new vendor has helped the program's growth and recognition throughout the state.

**RECOMMENDATION #7***: Focus the new program material design and development on elementary science that is clearly and transparently aligned with the state's curriculum framework for science, including a strong emphasis on the inquiry approach, the students' regular use of primary sources for learning, science experimentation, and performance-based pre- and post-assessments.*

***Response:*** In light of the recent focus on the state science frameworks for teaching science, eesmarts retrofitted their program materials to match all science frameworks. The program works with a curriculum coordinator from the CT Department of Education, among others including a curriculum steering committee, to match the program materials to the state frameworks

Previously the curriculum materials were literature-based and were not designed for science. Although the subject matter was marked for science, the curriculum materials were not originally designed to match science frameworks.

Since districts teach different science concepts in different grades, the program has moved away from assigning a grade level to the lesson plans so that teachers can use lessons across many school grades. A new marketing strategy focused the materials more on science and targeted science teachers and science curriculum.

## REVIEW OF CURRICULUM MATERIALS

GRG and its subcontractor performed an independent review of the curriculum materials used in the program. The results of that review are presented in this section.

### How appropriate is the content for each grade level?

The majority of the content is developmentally and academically appropriate for the intended audience: Grades K-1 and 4-8. Grades 2 and 3 were not reviewed in depth since these curriculum materials are currently under revision; however, as part of a comprehensive review GRG did look over these materials for the sake of understanding differences between old and new materials. This review uses some examples from materials from those grades, realizing that those materials are being revised.

Notably, Grade K contains language that is scientifically accurate, but advanced for the grade level and requires explanation from the teacher.. In the future, when redesigning the illustrations for the big books, to overcome language barriers, the pictures in the books should better represent the message that the language intends to instill.

In the Big Books especially, pictures do not show explicitly what kids should learn; with young students who have limited reading abilities it is important that the materials *show* as well as *tell* the message. A prime example would be in the "Iggy & Me" Big Book which talks about turning off lights in rooms when not in

use (page 8); the picture should actually show the character turning off a light to reinforce the book's message.

Additionally, there is a lack of emphasis on developing critical skills for students in the earliest grades to make connections between what they see in the Big Books and how that relates to energy. For instance, the "Iggy & Me" Big Book pictures recycling bins (page 5) and growing tomatoes (page 6) but nowhere in the curriculum materials are teachers encouraged to explain to students what recycling bins or what they do or how growing tomatoes might be related to energy efficiency.

Still, teachers do feel that the materials are helpful to them:
*"These materials help us to have another way to expose our students to energy consumption and conservation"*

*"I took the eesmarts training in the summer a few years ago. I really enjoyed it. I liked the way I could use the lessons as necessary. I liked the hands-on lessons."*

*"I think it is wonderful that you are reaching out to schools to help teach an important concept."*

Levels I-III are developmentally appropriate for the students in the grades they were originally designed to address, Grades 6-8. One of the expressed reasons for changing the label to Levels I, II, and III is so that they can be used by teachers in Grades 6 - 9 depending upon the district's curriculum and set lessons. The curriculum materials would be at too high a level for students in Grades K-5 whose teachers who attempt to use the materials.

### *Grade-Level Appropriateness*

Some specific examples of grade-level appropriateness (or lack thereof) appear below:

- The "Patches for Big Book" contains vocabulary and sentence phrasing at far too high a level for Kindergarten or First. All of the concepts could be communicated with grade-level appropriate language. However, because of the challenges in maintaining the correct terminology while being developmentally appropriate, the program should consider greater use of pictorial representations of concepts.

- Some language on Grade K-1 consumable handouts is written above grade K/1. For example in the teacher Teacher's Guide K/1 (page 23), the checkboxes for the Grade 1 "How I use electricity" worksheet responses are *the devices you use; the devices you could use less often or less wastefully*. The words *device, often, wastefully* are approximately 4$^{th}$ grade and above (according to three published core vocabulary lists). The structure and length of that phrasing is beyond a Grade 1 reading level.

- The "coloring" of ENERGY STAR certificates in the Grade K curriculum is not a learning activity. "Coloring" in the lines of a pre-drawn figure is below the level of Kindergarten.

- The content of Grade 4 curriculum is on the mark in terms of meeting CT and national science standards. For example, the Grade 4 "Learning about Magnets" content is appropriate.

- Similarly, the Grade 5: "Using Heat from the Sun" concepts are grade-level appropriate, but just like Grade 4, the "Absorption of Light" experiment is at too low a level. The other Grade 5 experiments are more suitable for the grade level.

- As a positive, all of the middle school activities (levels I-III) *are* grade-level appropriate.

### How well do the materials incorporate what is known about current trends in science education?

The materials incorporate most trends in science education. The curriculum balances teaching science, teaching harmful effects of wastefulness, and attempting to change social norms regarding energy practices (e.g. the text that "we need to do our part" in K-1 Big Book materials). Elementary and middle school grade eesmarts materials include many hands-on activities to help students grasp concepts, and the materials provide countless examples to help students connect concepts to their own lives.

The activities employ a good balance of instructional strategies to accommodate varying learning styles. However, it is still obvious the program materials were initially geared towards students who learn best through reading materials and curriculum writers should consider the other senses that students can use to learn from. For example, students might learn from using their bodies in an activity, like having students think about and mime ways in which to save energy.

One notable trend in science education that is lacking in the eesmarts program is the integration of writing in the context of scientific inquiry. While the eesmarts curriculum integrates oral language and responses to short-answer questions (through the consumable handouts), it provides few opportunities for more comprehensive, thoughtful writing to engage students in scientific reasoning. The program would benefit from the integration of such writing tasks. To note, the program sponsors an essay contest at the middle-school level that is aligned to the Connecticut Mastery Test as an opportunity to exercise their writing skills.

Another trend is to help students develop and use higher order thinking skills (e.g., analysis, synthesis). Higher order thinking skills refers to critical thinking skills or problem-solving skills that enable students to ask appropriate questions, observe relevant information and apply the information they have gathered to draw conclusions based on their self-directed analysis. In contrast, low-order thinking skills are often reactive, conditioned or automated skills (like knowing to stop at a red light) and does not allow the thinking to judge, evaluate and assess a situation.

The program lacks this piece across the board and could be strengthened by offering more opportunities for students to think creatively and critically about all issues. The "Strategic Thinking" pieces are a good example that challenges students to use higher order thinking, but there are few "Strategic Thinking" opportunities. The program would benefit from having at least one in every lesson.

*Lack of Critical Thinking Skills, Problem-Solving and Writing Opportunities*

The discussion questions embedded within each activity are good quality, but few challenge students to use higher order, critical thinking. The program tends toward asking knowledge-based questions. More thoughtful questions (e.g., those that ask students to do more than just recall or recite information) would improve and deepen the program.

For Example: Level 1, Lesson 3 "Wired"—the assessment questions relating to the graph are completely lacking all opportunities for higher order thinking. The program basically asks lowest level comprehension (who, what) questions that only require students to read a graph. A question that requires the student to analyze and synthesize graph data in order to predict a future outcome, for example, would be a much more challenging way to engage students in critical thought. Those types of questions are noticeably lacking throughout the program.

Level 1, Lesson 4: "Fuel Spills"—this is an example of an activity that leaves little room for students' input and imagination. Students should have the opportunity to brainstorm/test other clean-up methods instead of just using/testing what the program tells them to.

As mentioned in the discussion of current science trends, the program offers few ways for students to express, analyze, and critique ideas through writing, but could be strengthened if it did so.

## How well are the target audience's intended learning characteristics and abilities stated?

Teacher's Guides do a very good job of covering intended learning objectives, alignment to standards, and expected performance. At the beginning of each set of lessons, the program includes information about student objectives and links to the CT Science Framework and CT Science Mastery Test.

The major problem in stating learning characteristics and abilities is that learning objectives are not differentiated from activities in the lessons. Learning objectives outline what the student is supposed to get out of doing the activity, while activities outline what students actually do to meet the objective.

For example, the Kindergarten, Lesson 1 "learning objective" reads:

*"Students will identify up to three ways to save electricity at home and make doorknob hangers to remind others in the household to practice them."*

This statement represents what the student will do (name electricity-saving ways and make doorknobs), and is an activity, not an objective. The learning objective, or what the students is expected to learn from doing the activity might be something like *"Students will understand the value of saving energy personally and for their families."*

The instruction sheets at the front of each of the teacher guide specify give a chart of how the lesson is linked to CMT and science standard skills. Links to the CT Science Framework and CT Science Master Test are an underestimated asset to the program that resonates with science curriculum coordinators and teacher especially, so these links should be highlighted and "played up" much more. Especially thinking ahead in terms of integrating energy practices into science curricula in the long-term, having a well laid-out way of showing how it maps onto the CT standards can only help.

The current charts show how the Connecticut Mastery Test, Connecticut Science Framework and National Science Standards link to the lessons but could be more specific about which particular activities map onto each standard, or the Learning Objectives for each lesson should be realigned to use the language from the Connecticut science standards.

## How well are the materials organized?

The Teacher's Guides, which combine lessons for multiple grades into binders, are well-organized and are laid out with much white space, good headers, etc. which makes them very easy to read through. Because teachers often use lessons from their grade level plus other grade levels within a 1-2 grade level range, eesmarts re-organized teacher guides to hold lessons for multiple grades within binders.

For instance, lessons for Grades K-2 will be one binder, Grades 3 -5 in another, Grade 6-8 (which are now referred to as Levels I, II, and III) are in another binder. Since multiple lessons are combined in the binders (that is K-2, 3-4 and Levels I-III), a table of contents or index to enable teachers to easily find what they need would be helpful.

In some cases, student materials are not as simple or as well-organized as the Teacher Guide pages. Student worksheets are overloaded with text. Having little white space may be a challenge for any student who has tracking or other visual-perceptual problems. While older students and students without reading challenges may have no problem with these, it could be a problem for younger students and those with reading challenges.

- An example of a problematic set of student materials (for the reasons stated above) appear in Level I (Grade 6) Lesson I "Energy Rollercoaster"

- An example of a "cleaner" set of student materials would be Grade 4: "Sun to Seeds to You"

### What is the format?

Teacher Guide pages are consistent and easy to read. They contain standards alignments, learning objectives, lesson instructions (if any), background content, and answer keys. Answer keys are not labeled, but should be. Since not all of the activities will have one correct answer, one recommendation would be to say "Students' answers will vary, but should include …." so that teachers leave students some room for creativity.

A terrific aspect of eesmarts is that that it recognizes that many teachers do not have a science background and therefore may need their own glossary of terms (which is included for every activity), and a mini "Cliff's Notes" which is included as *What Does It Matter*. This kind of background is critical because, according to the National Science Board in 1998, only 17 percent of middle school science teachers had a degree in science. Recent studies reveal that number is much higher in 2008, so teachers need as much content support as is available to them.

### How is suggested activity time presented? How realistic are the suggested times?

The "Timeframe" portion of the Grade K-1 Teacher's Guide gives a very specific timeframes for each lesson. While this is useful for some teachers, doing so may lead teachers to cut off rich discussion if it goes over the time limit.

Unlike the K-1 Guide, the Levels I-III Guide has no timeframe allotted for each activity. In the materials reviewed, Grades 4 and up do not provide timeframes. The "Timeframe" portion of the Grade K-1 Teacher's Guide certainly gives a very specific timeframe. While this is fine for some teachers, the problem of doing so is that teachers may cut rich discussion if it goes over the time limit.

Open-ended time allotments are often helpful, such as "One class session" because teachers can then choose to have a 45 minute "session" or a 3 hour session, depending on how much time they're willing and able to spend. That kind of flexibility is good for many classrooms.

### What is the visual style? How can it be improved?

Text and graphics are fine in the teacher guidebook. Materials used in classrooms have a modern look and feel.

Most of the student worksheet illustrations are engaging. However, the spacing and number of the blank lines (for student responses) on all worksheets is very small. Young children write with large letters and will not be able to write words, phrases, or sentence on the lines allotted. Line spacing should be much wider and there should be many more lines to encourage thoughtful writing. Studies

continually show that students in upper elementary and middle school will only write what they can put on a given line, purposely censoring their own good thinking if they feel they are being constrained.

## What are the instructional strategies? How can they be improved?

The overall inquiry-based instructional strategies are diverse and very solid. There is a very good blend of prior knowledge activation, direct instruction, class discussion, hands-on learning, and independent work. If there were more opportunities for collaborative work (in student pairs or small groups) and the integration of other content areas, the program would be that much stronger.

As a good example, the worksheets from Kindergarten, Lesson 2 have students place stickers of energy star on items in the book. This type of interactive activity helps students recognize energy practices in real-world settings as well as encourages higher-order thinking.

## How does this curriculum compare with others?

The curriculum is on par with other inquiry-based science programs in terms of content and hands-on activities. It should be noted that the hands-on activities/experiments are certainly fine, but are not unique or innovative. They can be found in most traditional science texts.

For example, in the K-1 teacher guide (page 12), there is an activity for making a doorknob hanger. While doorknob hangers are created all the time in K classes, a more relevant activity might have been for students to work collaboratively (via dramatic play, art, etc.) to create and actually incorporate energy-saving plans in their very own classroom.

The program could strengthen its appeal by offering unique and creative activities that educators can do with their students. That being said, the program could be more efficient about using every opportunity to drive home their messages on adopting energy practices.

***GRG's Finding:*** Program gatekeepers emphasized that their major criteria for deciding which eesmarts materials to use is largely determined by how aligned the program materials are to the state science frameworks. To this end, specific responses to recommendations made in the last evaluation to emphasize the inquiry approach, primary sources for learning, and science experimentation were followed closely and adopted. (See Table 13)

One of NMR's suggestions referenced FOSS (Full Option Science System)[4] and STC (Science and Tech Concepts for Middle Schools)[5]. FOSS online

[4] FOSS is Full Option Science System (http://www.fossweb.com/

makes their site interactive and easily navigable for kids of all ages; the look and feel is very inviting for children.

If eemarts wanted to do so, creating online, interactive modules for various age groups would be a powerful way to infuse state and national technology standards into their program. Further, they could offer their teacher guides and supplemental information online, for those teachers who want their curricula delivered electronically Perhaps the best part of putting "modules" or lessons online is that the eesmarts program won't be a static one as the modules can be updated easily for teachers to access.

Modules could be easily updated and/or improved, thereby always being at the forefront with the latest energy information. Many publishers have realized this fact and now have online pieces because it is more cost-effective for them to update content immediately then to publish/re-sell hard copies to entire school districts. Additionally, publishing on-line modules may allow parents to access the materials thus bringing the program directly into Connecticut homes.

Overall, the curriculum materials are developmentally and academically appropriate for their intended grade levels. However, some lessons do not meet that challenge. Improvements for these lessons are noted above. Additionally, the materials should be improved to better reflect academic needs for developing higher order thinking skills, supporting diverse learning styles, and using writing across the curriculum.

[5] Science and Tech Concepts for Middle Schools {http://www.stcms.si.edu/stcms.htm}

Table 13
eesmarts Program Responses to Specific Curriculum Revision Suggestions made by NMR

| | Adoption Status | | | |
|---|---|---|---|---|
| **Suggestion by NMR** | **Not At All** | **Partially** | **Completely** | **eesmarts Response** |
| • Focus on science and incorporate references to other disciplines, especially math, as appropriate. | | ☒ | | • Redesign of activities proposed in curriculum materials to include both science and math-related experiments.<br>• Restricted references to math and science but not other disciplines. |
| • Redesign the program material content and image for emphasis on applied science, not language arts and fantasy. | | | ☒ | • Specific re-styling of program materials to reflect a scientific focus and focus on inquiry-based learning. |
| • Ensure that all consumables for use by teachers are inexpensive… | | ☒ | | • Offers free handouts, teacher guides, worksheets, and big books to teachers who have attended workshops<br>• Offers pens, pencils, notepads, stuffed animals, stickers and other materials<br>• Does not provide all materials necessary for the experiments outlined in teacher books |
| …and easily acquired to help meet science teacher demand for hands-on and inquiry-based science experiments that are relevant to the lessons provided;… | | | ☒ | • Distributes materials through gatekeepers |
| …alternatively, include the consumables as part of the kit of program materials, thus providing an added incentive. | | ☒ | | • Inclusion of handouts for students as part of teacher guidebook kit<br>• Does not provide all materials for experiments outlined in the guidebooks, especially those that are "household products" |
| • Consider developing a purchasing, storage, and distribution system for consumables required for the science experiments… | ☒ | | | • Hired William B. Meyer, Inc to inventory, ship, track and report on program materials<br>• Track and report on specific consumables ordered, though materials needed for science experiments are NOT offered as consumables |
| …—and case management to ensure that materials for any experiments and consumables have proper onsite asset management. | ☒ | | | • Enernet tracking and management of distribution of program materials (teacher guides, books, handouts, pens, pencils, bus reimbursement, etc)<br>• Does not include tracking of materials needed for specific experiments |
| • Consider developing school- or classroom-level "energy kits" that are complete packages for teachers' use, modeled after the highly successful and widely recognized FOSS and STC kits. | | ☒ | | • Assembly of teacher guidebooks which include materials for teachers and students<br>• Does not include all materials needed to perform experiments, unlike the FOSS and STC kits |
| • Program activities should be transparently aligned with the various state curriculum frameworks,… | | | ☒ | • Consultation with Department of Education and internal curriculum committee to align materials to CT state frameworks. |

| | | | | |
|---|---|---|---|---|
| …leading with science, rather than an interdisciplinary design that does not have status under the CMT. | | | ☒ | • Use of The Writing Company, curriculum writers who specialize in energy awareness curriculum design<br>• Redesign of activities and materials for students to reflect a science and math focus<br>• Inclusion of information in each teacher guide of how the activities for students fit in with state standards and frameworks |
| • Get stakeholder buy-in, having program materials designed, reviewed, and recommended by well-known local and state experts (teachers, curriculum directors, and professors) from relevant academic disciplines. This could be achieved through the needs assessment process. | | ☒ | | • Review of program materials by teacher advisory committee and steering committee<br>• Shift to PIMMS for teacher training<br>• Pilot of new program materials in districts<br>• Collection of input of teachers from focus groups<br>• Use of The Writing Company who have expertise in developing many educational programs and curricula, in the areas of water and energy awareness and sustainability<br>• No needs assessment |

Based on all of the suggestions, the program administrators have made a concerted effort to align the materials with state and national standards in hopes of gaining credibility as a science-based curriculum that could be used in classrooms and integrated into curricula easily and that would help students pass the Connecticut embedded tasks.

However, the program still has not found a reliable way to gather information about pre- and post- assessment for students, although many of the lessons in the curriculum have material to do so. Considering the direction of the program, student pre- and post- assessment may no longer be a valid metric for gauging program performance.

Additionally, the program does not necessarily provide all of the materials necessary for the experiments in the teacher guidebook, to GRG's knowledge. For example, the "Energy Pathways" lesson for Grade 4 requires materials like a D-cell battery, insulated wire, and a wood with nails among others. eesmarts does not provide these specific materials for teachers to conduct an experiment which the FOSS kits do. However, most of the materials are household items or ones that could be easily obtained. In order to better meet the needs of teachers, GRG recommends that the program make the specific materials available by including them in the kits within limits of their funding or by seeking increased funding.

From the teachers' perspective, the program materials could still work toward fitting the materials into their school curriculum and Connecticut State Frameworks. While some teachers felt that the eesmarts program fit in with their school curriculum *Not At All* or *A Little* (12%), all participating teachers reported that they were at least *A Little* satisfied with how the program has begun to align its curriculum materials with the Connecticut State Frameworks. Over 75% of teachers are *Very* or *Extremely* satisfied with eesmarts to this effect (Table 14).

Table 14
Percentage of Teachers' Satisfied with Program Integration with the State Curriculum Framework

| | Not At All | A Little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Fit with the school curriculum | 5% | 7% | 22% | 45% | 21% |
| Curriculum's alignment with CT state frameworks | 0% | 5% | 16% | 54% | 25% |

N=76-78

Teachers expressed their thoughts on the program's alignment with the state and national standards, highlighting the connection between the program's alignment with state standards and their likelihood of using the program materials in the future:

*"The lessons match our curriculum and are very helpful. I began using them last year and plan to use them again this year as well."*

*"eesmarts curriculum aligns with our curriculum perfectly."*

*"This program is fantastic - I just need [program materials] to be more geared to the 5th grade state standards"*

***GRG's Recommendation:*** GRG agrees that the program adequately addresses energy and science topics through its workshops and curriculum materials. If the program claims to be beyond the scope of teaching about energy and science to teaching math, it should make links to math more formal. Additionally, the program should be more focused toward elementary school teachers, though not at the expense of training teachers of other grades, and target elementary teachers as a priority audience.

As outlined in recommendation #4, critical thinking and problem-solving skills should be the focus of the curriculum's design. While teachers might continue to use pre- and post-tests are for internal use for teachers to gauge student learning, the pre- and post-tests that currently appear in the guide books should focus on problem-solving, and not just knowledge acquisition. Finally, the program should be sure that all program materials distributed hereafter align with state standards and are clear about how the activities relate to those standards.

## RECOMMENDATION #8*: Produce the redesigned program materials and disseminate them to elementary schools statewide on a pilot basis with fair distribution across the state's Education Reference Groups (ERGs).*

***Response:*** Specific curriculum materials from specific grade levels from the eesmarts program are currently being revised and will be piloted in districts volunteering to do so and selected to represent the portions of the state covered by the program. Revised materials for middle schools and Grades 4, 5 and middle school grades were available at the end of 2007. Lessons from earlier grades are still being re-worked.

***GRG's Finding:*** As of October 2008, the materials for Grades K-1 are complete. Grades 2 and 3 materials, which had many issues with aligning with the Connecticut State Framework, will be piloted in December 2008 through January 2009.

Curriculum materials are piloted in districts who volunteer to be involved. The eesmarts program has intentionally recruited at least one school district from each ERG to ensure that the material resonates across socioeconomic strata.

Material is being piloted in at least 3 districts including Waterbury, Stratford and Trumbull. The Writing Company oversees pilot testing of the curriculum. The process of piloting includes having the curriculum writers watch the teacher use the lesson (like an audit) to see how it is being used.

For Grades 2-3, the budget has been approved for revising these curriculum materials. During the period of this evaluation, there was a teacher panel to discuss the new outline made to this curriculum. In October 2008, the Steering Committee reviewed the outline which includes the revisions made based on feedback from the teacher panel.

Piloting of the revised material for Grades 2-3 are slated for December 2008 through January 2009. To date, program administrators have nothing to report on the outcomes of the redesigned program and will wait until a later date to determine whether or not the changes made to the curriculum were effective based on pilot data.

***GRG's Recommendation:*** GRG feels that piloting the materials is an efficient way of testing the materials and gaining feedback before distributing them widely. Currently, the pilot materials are available to districts that volunteer, however, districts that volunteer to be a part of the pilot may be significantly different than those who would be receiving the materials otherwise.

Instead, the program should deliberately choose districts in which to pilot the program. This would help ensure that the piloting occurs in school districts across a range of characteristics so that the program can determine to which extent the materials are suitable for districts with similar characteristics.

Although the NMR recommendation focused on elementary schools for the pilot, GRG recommends that the pilot should be for schools of whichever grades the program materials are focused on in order to be developmentally appropriate.

It is unclear why NMR suggested that the pilot should last two years – GRG feels that one year of piloting should be sufficient. Elementary school teachers are an important audience, because they often have had the least training on how to teach math and science topics so their feedback on program materials is essential. It is possible this recommendation was made since Grades 6-8 have already been revised, thus it is not necessary to pilot in those schools.

Having the goal of ensuring distribution across all ERGs is commendable, however, may not be realistic. Instead the program should strive to have representation across broad categories of socioeconomic position and sample in districts that fit within these broad categories.

**RECOMMENDATION #9***: Refocus metrics away from product distribution and evaluation form collection. Redesign performance measurement (through the Needs Assessment) to include tracking program performance through teacher training, the quality of the teacher training process, teacher satisfaction and student learning.*

***Response:*** Although no Needs Assessment was formally done, eesmarts administrators used Workshop Evaluation Forms (eesmarts/PIMMS Evaluation Form) and Teacher Evaluation Forms to assess satisfaction with workshops and program materials, respectively.

Workshop evaluations are collected at the conclusion of each training session to assess the extent to which the teacher trainees report satisfaction with the quality of training. To date, evaluations collected report high levels of satisfaction, corroborating the results of the survey completed for this evaluation.

Formerly, teachers were sent reminders to fill out program curriculum evaluation forms in August, October, January, March, and May-June through the mail. Now the program will send reminders electronically approximately three times a year. Teachers and teacher receipt of materials as well as student outcomes are tracked using the Enernet database.

As far as student outcomes, eesmarts decision-makers have considered tracking changes in student energy practices, but feel that it would be difficult to isolate the cause and effect or to get a clear picture of how much energy usage changed due to the program. There was a deliberate decision not to measures impact on student actions. Other than allowing space to report the average pre- and post-test scores for students on the Teacher Evaluation forms, there have been no systematic attempts to measure learning via pre and post tests.

***GRG's Finding*:**
Program Outputs
In the 2005 evaluation, NMR suggested that the program track its performance through the outputs of teacher training, the quality of the teacher training process, teacher satisfaction and student learning.

Specific suggestions on outputs to track included: number and diversity of training programs conducted, number of school districts using the program materials, number of teachers trained and diversity of school districts using the program materials to track teacher performance. Currently the program has expanded the capabilities of the Enernet to track these programmatic outcomes by individual teacher. (See more in Recommendation #10)

Currently, teachers are encouraged to provide feedback on program materials at various points, one of which is at the workshop (Workshop Evaluation Form) and at the end of each lesson they use in their teacher

guidebook (Teacher Evaluation Form). The teacher evaluation form was developed based on what was provided in a previous evaluation by NMR which was used as a template for evaluation.

Although the program sends reminders to teachers to fill out the lesson evaluation forms, the program has somewhat reduced emphasis on collecting the teacher evaluations. This change was made since the last evaluation in response to teacher complaints about the program being too pushy about the evaluation forms.

Measuring Teacher Training Outcomes

Additionally, the NMR evaluators recommended that eesmarts measure program outcomes: teacher satisfaction with the training (through Workshop Training Evaluation Forms), teacher satisfaction with the program and program materials (through post-use of the curriculum materials Teacher Evaluation forms), teacher use by competency/certification (Teacher Evaluations/ Working Training Evaluation forms), student awareness and knowledge (through independent measurement) and family awareness and knowledge (through independent measurement).

In 2007, the Center for Research & Public Policy (CRPP) reported on responses from 209 eesmarts/PIMMS Workshop Evaluation forms distributed during July through September 2007 over various locations and dates of workshops.

CRPP notes that the "PIMMS Evaluation Form includes the following areas for investigation: rating workshop/program characteristics; determining future program use among teachers; teacher willingness to test new activities; strengths/weaknesses of program; suggestions for program improvements, and demographics." The content asks questions about to extent to which the workshop states and meets its objectives and increases teacher's abilities and content knowledge, whether the workshop materials align with state standards, the presenter style and effectiveness in communicating.

Based on CRPP's report, over 90% of workshop participants strongly agreed or somewhat agreed that the program objectives were stated and were clear from the beginning of the workshop, that they learned new ideas that were helpful and increased their content knowledge, that the materials aligned with state and district science frameworks, that the presenter was clear and responsive and the audience was engaged, and that the workshop made them comfortable with presenting the eesmarts materials. Their findings are similar to GRG's positive findings about the effectiveness of the workshops for training teachers.

In response to future plans for the curriculum materials, 70% said they would use it in their classroom while almost half of teachers reported planning to use "some of it" for their grade compared to all or a lot of it.

Often at the close of a workshop, the school district will have their own evaluation for their school district, which has similar questions to those on the eesmarts Workshop Evaluation Form. Although the administrators do not share that data with program staff, they give general feedback that teachers feel that eesmarts workshops are some of the best and most useful professional development sessions they have attended. There is also evidence from gatekeepers and teachers that both eesmarts and PIMMS have been very responsive to teacher's needs based on findings from workshop evaluation reports and informal chats with teachers.

Measuring Student Learning Outcomes

Pre- and post-tests for students appear inside each lesson in the teacher guidebook. Teachers are asked to administer the tests to the students and record the average scores for the entire classroom in a space on the Teacher Evaluation Forms both teacher and program staff can gauge how much students have learned. It seems that few teachers actually do this which limits the program's ability to gauge student outcomes.

***GRG's Recommendation:*** Since the focus is on teacher training, evaluation should go beyond teacher satisfaction with training to quality indicators of teacher training on the Workshop Evaluation Form. Articulating what the long-term outcomes and short-term outcomes through the use of a logic model can help guide which teacher training outcomes are most relevant to measure.

The Workshop Evaluation form touches on many important aspects of the workshops, but is missing questions on the overall quality of workshops, questions about convenience of attending the workshops, desires to participate in future workshops, and whether or not the trainee gained an understanding of the scope of what eesmarts offers to teachers. Also, the program should consider using more objective measures of changes in teacher knowledge as a result of the program by administering short pre- and post-tests for teachers before and after the workshop.

Nearly half of teachers reported that they would use "some" of the program materials for their grade. This positive finding is in line with the program's goals since the curriculum is designed to be used piecemeal. Notably a high percentage of teachers, 70%, teachers plan to use the materials in their curriculum.

As far as student performance – if continuing to measure this – the program should determine what is most helpful to know about changes in students (i.e. knowledge about energy or incorporation of energy practices into their own personal lives).

Currently the program collects the mean number of correct responses per classroom for pre- and post-tests. GRG questions how meaningful student knowledge is as a metric of the program's

success, especially considering the program's focus on teacher training. Instead, the metrics should focus on teacher outcomes and the pre- and post- tests could be potentially used for teachers instead of students to measure teacher learning of energy concepts.

### RECOMMENDATION #10*: Redesign teacher evaluation forms using appropriate research methods so they can be used for obtaining more useful feedback.*

***Response*:** Teacher Evaluation Forms of the program materials have been mostly based on the suggestions from the NMR recommendation. Most obvious was the change in the Likert-type response scale[6] which NMR had identified as the largest problem in the recommendation.

***GRG's Finding*:** The Teacher Evaluation Form was developed based on what was provided in a previous evaluation by NMR which was used as a template for evaluation. Although the program sends reminders to teachers to fill out the lesson evaluation forms, the program has somewhat reduced emphasis on collecting the teacher evaluations. This change was made since the last evaluation in response to teacher complaints about the program being too pushy about the evaluation forms.

Though the response scales were successfully changed, there are still some needed improvements regarding the content of the teacher evaluation forms. Teacher Evaluation Forms do not seem to reflect the current changes made to the program and program focus, thus some of the questions seem irrelevant. For instance, under "Program Characteristics" teachers are asked to rate the "eesmarts effectiveness in the reading discipline" but considering that the program now focuses on science and math, this question may no longer be relevant.

Since the program's focus is now on teacher training, the teacher training of the evaluation should be expanded to gather more extensive information of how well the workshop prepared the teacher to teach the lesson and especially teacher satisfaction with their classroom experience with eesmarts. Finally, the teacher evaluation asks a few questions about changes to student and family energy usage which are out of the range for a teacher to be able to accurately assess.

***GRG's Recommendation:*** GRG is satisfied in how the program has scaled back its focus on Teacher Evaluation Form collection and has moved from focusing on quantity of placement of materials to

[6] A Likert-type scale consists of a series of declarative statements in which the respondent indicates the degree of agreement or disagreement with each statement. Usually five options are provided: "strongly agree," "agree," "undecided," "disagree," and "strongly disagree" but some Likert-type omit the undecided position.

quality of placement of materials. Considering the recent changes to the program, the Teacher Evaluation Forms need to change to remain relevant, especially with the new gatekeeper model of dissemination.

On the forms, teachers should not be asked to assess things which are out of their scope of observation, instead teachers should be asked about their experiences with the program, changes they have seen in themselves and the way they teach material, and changes they feel that they have seen in their classrooms as a result of both changes to their own teaching style and the new content on energy. The program might consider creating a survey for gatekeepers only, to get at some of the information that is currently on the teacher survey (i.e. "eesmarts is used by all teachers in my grade level in my school).

GRG did not find any significant differences in teacher's respect for the quality of materials by teacher experience or grade level. Though the teacher data is collected, it is unclear where this data is stored and how it is used to improve the program.

Student awareness and knowledge are supposed to be measured using the pre- and post-test provided in program materials. The results that have been returned are stored in the Enernet database, but program administrators have reported that it is often difficult for them to get that data from teachers. Finally, family awareness and knowledge is only evaluated through teacher perception and lacks objective measures.

Other examples of teacher outcomes that might be assessed on the Teacher Evaluation Form are: how equipped teachers feel to teach energy (as measured in GRG's web survey), changes in their ability to teach on science concepts, changes in their teaching and presentation style, and whether or not the teachers found it difficult to obtain the materials that the lesson activity required. The program should consider using both quantitative (e.g. the evaluation forms) and qualitative (e.g. focus groups, teacher interviews, photo-voice methodology) to measure teacher outcomes.

### RECOMMENDATION #11: *Significantly invest in a case management database with access provided to the utilities and implementation staff to track inventory, school contact information, gatekeepers, participation status, correspondence, training, performance data, etc*

***Response*:** The Enernet is a customer information database that eesmarts uses to track their "leads", that is, individuals who express interest in the program, so program staff can contact them and follow-up with them over time. After making contact with the lead, the program sends them "sales" material like sample curriculums for school administrators and district curriculum leaders to assess, all of which is tracked in the Enernet.

The Enernet also interfaces with the shipping and warehouse vendors so that ordering is more efficient. Expansion of the Enernet in the aforementioned ways has helped the program to capitalize on its leads as well as enable any program administrator to access information on where program materials were sent

***GRG's Finding*:** The Enernet is an electronic case management database that holds:

- contact information for schools,
- the names and types of eesmarts products requested and used (essay contest, workshop, etc),
- changes in energy behaviors by teachers and students, teacher contact information,
- inventory of materials that each teacher ordered,
- cost to the eesmarts program spending to distribute product to teacher,
- timeline of teacher involvement in eesmarts from initial engagement to when materials are shipped,
- receipt of teacher evaluation for each lesson, report of use of the SmartLiving Center tour program,
- and average student pre and post test scores per lesson for that teacher.

Enernet accomplishes the goals of program tracking by providing information on who receives materials, where they are, when they receive them, and what are the results of using the materials. Although the Enernet has many options for teacher tracking, there was a lot of missing data which may indicate that files need to be updated or that some of the outcomes (like changes in students' energy usage) are no longer a priority to track. Also, it is unclear how this data is used in the program or how it informs program operations.

Considering the wealth of data it could provide, eesmarts should retain only those outcomes that are still relevant in the Enernet database, and analyze the remaining data to better understand the program's user base as well as gaps in the program.

***GRG's Recommendation:*** Efforts should be put forward to retrieve missing data or at least determine why the data is missing and whether to continue to seek data that is difficult to gather.

Although the Enernet has expanded the possibilities for data collection, some of the fields could be omitted if data will not be collected on them (e.g. change in energy behaviors by students). Particularly, measuring the average student pre- and post- test scores may be no longer relevant, and besides few teachers actually report this to the program. Instead, that space could be used for whichever new teacher metrics are developed.

Keeping all information from teacher evaluation and performance in the same database will help in analyzing teacher outcomes. Currently, it is unclear whether the case management database is used for analysis, but would be a wise usage for the program in tracking outcomes over the long-term.

Notably, data on students particularly was most commonly missing in the Enernet database. This fact may be an important clue that measuring student outcomes may be outside of the scope of the program to assess. Thus, data collection efforts should focus on teacher outcomes rather than student outcomes.

**RECOMMENDATION #12***: Either formally integrate the SmartLiving Center into the program and any revised program materials and enhance it along with the program redesign, or drop it as part of the program.*

***Response*:** The SmartLiving Center has not been integrated into the program nor revised to fit the program's redesign. Instead, it is cross-promoted with the program so it does not incur any risk or expense to the program's goals of teacher training and only incurs the gain of more widespread promotion and a strong alliance that can make the program's name more widely known. As recommended, the program started a bus reimbursement as an incentive for visiting

***GRG's Finding*:** The SmartLiving Center is distinct from the eesmarts program, but both programs share the same Program Administrator from UI. The programs complement each other because the main goal of both of the programs is in educating students.

Because the SmartLiving Center is located in one town and eesmarts distributes materials all across the state of CT, its role with eesmarts is limited due to its geographic limitations. However, fieldtrips for students to visit the SLC are offered as part of the eesmarts program's services along with a bus reimbursement program to pay for student transportation to the Center.

Despite those offerings, some curriculum leaders in some school districts are ambivalent about the costs and benefits of visiting the SLC. Also, some gatekeepers were unclear about what extent the SLC and bus reimbursement program could support the volume of students they would hope to send.

One educator whose school is a state-funded Technical school lamented the particular barriers to using the bus reimbursement:

*"We haven't been able to use [the bus reimbursement] because we don't take the money back into our system since we are a state-funded school so the money goes back to the state, not us. It is a barrier, so I wish we could take it as a donation or something…."*

However, this comment reflects that the respondent may have been misinformed since the program processes reimbursements to PTAs , bus companies and directly to teachers. The reimbursement form explicitly asks who the reimbursement check should be made out to.

***GRG's Recommendation:*** GRG recommends that the bus reimbursement should be continued, and the extent of the support that the program will give towards this should be made clear to gatekeepers. The barriers to the bus reimbursement use are not within eesmarts' power to resolve, however the program should remain sensitive to the barriers that are there.

Curriculum leaders who live in nearby school districts feel that promoting the SLC along with eesmarts is a positive thing and enhances their desire to use the eesmarts because it comes with a "package" that includes visits to the SLC.

GRG feels there is no need to change the existing relationship between eesmarts and the SmartLiving Center which cross-promote each other. Considering one of the eesmarts program administrators is also the program administrator for SLC it seems likely that the programs will continue to be cross-promoted as long as this is the case.

However, in order to keep SLC involved there should be another connection to the program other than the program administrator as the common denominator; that is, if this particular program administrator leaves, GRG questions whether or not the program will continue to be cross-promoted with the SLC.

The eesmarts program is advised to retain its connection with the SLC as a source of cross-promotion and to broaden the access to resources that eesmarts participants receive. Access to additional resources is an added incentive for program participation.

## INFORMATION ON POTENTIAL EESMARTS USERS

The web-survey also assessed outcomes for a sample of educators who have never participated in an eesmarts professional development. Data from these non-participants (n=68) shows that teachers in Connecticut

are highly interested in learning about and teaching energy practices.

The eesmarts program already has the infrastructure and components in place to address the reasons why these teachers do not use the eesmarts program. Findings from these teachers help highlight that eesmarts fills a gap in energy-related education in Connecticut and that the program should be continued and expanded to more Connecticut school districts. Some comments on curricular resources follow:

Almost 97% of non-participants reported being "Very" or "Somewhat Interested" in learning about energy efficiency and energy practices. In a separate question, 97% felt that their students would "Very" or "Somewhat Interested" in learning about energy efficiency and energy practices;

Exactly half of non-participant teachers claimed that they already did teach about energy efficiency in their classrooms. Still, many teachers felt that the resources they had for teaching were of poor quality or barely adequate, while some reported having no resources at all. Instead teachers found their own materials on-line or made it up based on their personal knowledge and convictions on energy efficiency.

> *"Adequate in context: Energy concepts are currently integrated in content strands: simple machines, weather, sound, Newton's Laws, etc.:. In the CT frameworks for Middle school there is no curriculum strand that is directly related to energy consumption"*
>
> *"I don't have any at all"*
>
> *"I don't really have materials but we talk about conservation - we turn out lights when we leave our classroom, we use the front and back of paper so we don't waste it."*
>
> *"I have limited instructional materials for teaching energy practices. With the exception of a blurb here and there in the textbooks I use what I can find on the internet."*
>
> *"I haven't received any. I do not teach science but teaching my students about recycling and composting on my own: both of which we are currently doing"*
>
> *"Very little provided by the district - I supply my own ideas and materials - try to go as hands on as possible"*
>
> *"We could use more resources. The quality is good, but the quantity is limited.*"

When asked about what the barriers they faced to teaching about energy practices, the two most commonly cited challenges were "lack of discretionary time in the school day" and "lack of professional

development to learn how to teach energy practices." Additionally, teachers cited a lack of resources, that it was not in the curriculum, and the need concentrate on the state framework and state mastery test as barriers.

Notably, the eesmarts program addresses many of the barriers listed. (Table 15) eesmarts encourages district curriculum writers to incorporate the eesmarts program in the curriculum which overcomes barriers of lack of time in the school day. eesmarts now uses district-level gatekeepers that can "push" the program to teachers. However, curriculum coordinator's encouraging the use of the program is largely dictated by the coordinator's own enthusiasm and without that the program may not be encouraged. To this end, eesmarts should work to embed the programs into school districts to the extent that it can.

Table 15
Match of eesmarts Program Offerings to Connecticut Teacher Needs for Professional Development in Science

| **Barrier** | **Number of Respondents** | **eesmarts Overcomes the Barrier Because It:** |
|---|---|---|
| Lack of discretionary time in the school day | 27 | ☑ Encourages district curriculum writers to incorporate the eesmarts program in the curriculum |
| No "push" from school administrators | 15 | ☑ Uses district-level gatekeepers that can "push" the program to teacher |
| Lack of professional development to know how to teach energy practices | 20 | ☑ Provides free professional development workshops to teach energy practices to teachers |
| Other: Lack of equipment, supplies or resources | 4 | ☑ Provides teacher guides and handouts for students (though does not provide all materials necessary for experiments) |
| Other: Time consuming | 1 | ☑ Comes in ready-made packages |
| Other: Not in curriculum | 1 | ☑ Encourages district curriculum writers to incorporate the eesmarts program in the curriculum |
| Other: State frameworks and test | 1 | ☑ Redesigned program activities to fit state frameworks and educates teachers on how to teach the "embedded tasks" during workshop sessions. |
| Don't face any particular barriers | 11 | |

N=68

eesmarts provides free professional development workshops to teach energy practices to teachers and handouts and teacher guides. Still, a barrier that teachers cite is equipment and supplies, which may be out of the scope of the program to provide to school districts. If possible, the program should consider offering other tangible equipment and supplies that can be used in program activities as a way of making itself an indispensable part of teaching science in schools.

Though teachers expressed a desire for more materials to help them teach energy-related concepts, non-participant teachers seemed even more concerned about a lack of opportunities for student learning than need for professional development in energy.

Still, 49 of the non-participants expressed interest in engaging in professional development in ways that the eesmarts offers professional development on energy practices.

- 27 expressed a desire for personalized training or professional development on how to teach energy practices to students
- 35 were interested in attending on-site school programs that help teach kids about energy practices
- 33 wanted to participate in fieldtrips related to energy practices

Other non-participant teachers noted that they would like district backing and cross-subject links (i.e. graphs and impact stats from a neighborhood or school) as well as instructional materials and reading resources available for professional development in science.

## PROGRAM USERS' SUGGESTIONS FOR CHANGES

Throughout the evaluation, GRG heard from eesmarts program decision-makers, district curriculum leaders and teachers who offered suggestions for improvements to the program. Most of the suggestions centered on expanding the program's content with other science-related topics and other forms of professional development and teacher support, expanding to parents as a target audience, emphasizing program alignment with state standards, and making workshops more accessible.

Teachers and curriculum coordinators felt that the program might consider covering the following new topics in student lessons:

- Light and Sound
- Global Warming
- Practicality of Geothermal Energy
- Other Science Related Topics That Can Help Better Our World.
- Natural Resources
- Solar Energy and Biofuels

## Expanding Target Audience to Parents

Additionally, teachers felt that it was not enough for teachers to be trained, but students AND their parents should be more explicitly targeted. Some respondents offered that the program could do this by presenting the program material at workshops where parents would be present, and by teaching teachers how to engage parents:

> *"Parents…need to know about* eesmarts *and conserving energy. Sending a representative to a PTO/PTA meeting to do a presentation would be great. Or providing teachers with material to do the presentation would also be good."*

> *"Although we can stimulate excitement in the classroom, often when students go home, if there isn't support at home to conserve energy, then the student can not do conserve at home."*

## Aligning with State Frameworks

Across the board, all parties felt that the program should strengthen its emphasis on aligning with state frameworks and mastery tests.

## Potential Offerings for Professional Development

When asked what other types of professional development that teachers wanted on science-related concepts, they suggested:

- Follow up workshops for teachers in afternoon professional development activities in school system.
- Teaching on how to get both students AND parents more excited about conserving energy.
- Emphasize getting children ready for the Connecticut Master Tests through on-site support in classrooms.
- Having professional development that focuses on hands on activities that you can use with household products/inexpensive products.
- Teaching schools how to "convince" Board of Education/Administrators to get on board and make their schools more energy efficient.

## Making Workshops More Accessible

Teachers especially felt that the workshops were highly effective and hoped that more teachers would be able to experience them. While some teachers fear that linking teacher training to workshops could prohibit receipt of curriculum materials, teachers had other suggestions for getting teachers to workshops including:

- Lowering the minimum required number of teachers for a workshop or combining teachers from neighboring districts to get the minimum amount.
- Making teaching training workshops open to student teachers.

# CONCLUSIONS AND RECOMMENDATIONS

GRG's observations about changes made to the program as a result of the 2006 process evaluation showed that eesmarts leaders have carefully considered and then adopted some of the recommendations and not others as a consensus.

Re-branding of the program as having a teacher training focus has been beneficial and successful as evidenced by high teacher and gatekeeper satisfaction as well as increased teacher participation in the program and number of workshops.

The program's new mode of delivery through curriculum leaders who are "gatekeepers" of science knowledge for school districts helped the program become more efficient at reaching entire populations of teachers.

eesmarts made a smooth transition from CRI to PIMMS and has created and maintained key alliances with PIMMS and the SmartLiving Center resulting in exposure to new audiences, which greatly benefited the program. In Connecticut, PIMMS has a reputation that precedes itself which has been an asset to eesmarts.

As recommended, curriculum materials were revised, but as an iterative process, GRG believes there are content and design issues that need to be addressed to maximize the usability and appeal of the program; however, these issues may be resolved with the new revised curriculum materials that have yet to be distributed.

The program has reacted well to a backdrop of changes to new science requirements for the state (Connecticut Science Frameworks, Connecticut Master Tests) by aligning its curriculum materials with state standards; however, as the most attractive element of the program, this fact should be highlighted more explicitly throughout the program's materials.

Program materials could be strengthened by capitalizing on every opportunity to reinforce messages about energy practices and energy efficiency. Adding lessons and curriculum materials that would allow the program to capitalize on these opportunities will require that program receive increased funding.

The eesmarts program is responsive to feedback from those involved at the consumer-client level to the program leadership level. Altogether, teachers, curriculum leaders and program administrators agree that the changes implemented have improved the program and made it more successful.

Program leaders anticipate continued success and expect the program to continue with no definite ending point. Continuation of the program will allow for better assessment of the program's successfulness of realizing its vision of developing an energy-efficient ethic among all school age students in Connecticut, encouraging them to incorporate energy-efficient practices and behaviors into their lives at home and at school.

## PROGRAM RECOMMENDATIONS

Based on the above findings, GRG makes the following recommendations to the eesmarts program for continued program improvement in three major areas: program focus and infrastructure, professional development and curriculum materials.

### Program Focus and Infrastructure

***Continue with the program, reach out, and expand to other school districts throughout the state.***

eesmarts is a unique program that fills a gap in science curriculum in Connecticut by being the only program to offer free curriculum materials and teacher training workshops emphasizing energy practices. Because of the program's uniqueness, it can be an indispensable program for Grades K-8. It addresses a need of school districts for better teacher training in math with the aim of instilling energy practices into today's youth for tomorrow's benefit.

As the program continues, periodic evaluation of the program's activities will be essential to documenting the successes and shortcomings of the program's work. The program has been a success in training educators and should continue to be available to Connecticut educators free of charge.

Expansion of the program to new school districts can expand the program's influence and ability to carry out its mission to inspire our communities to adopt positive energy efficiency attitudes and behaviors in the use of all forms of energy. Its newly acquired ability to extend the program to counties not under the purview of CL&P and UI will help advance this goal.

***Continue to retain the services of PIMMS and further investigate other opportunities to partner with them.***

eesmarts' affiliation with PIMMS has strengthened program credibility and helped the program gain exposure through PIMMS' existing networks within the Connecticut education system. The SLC is a low-risk addition to the program that can help promote eesmarts and make the program's name more widely known. PIMMS offers eesmarts participants an added benefit and makes eesmarts more attractive as a multifaceted "package" that offers many educational opportunities for teachers.

***Make the program more attractive by advertising its alignment with state frameworks and standards.***

Curriculum leaders in Connecticut are especially concerned with meeting the recently instated state frameworks standards. Curriculum leaders who are current users of the eesmarts program have emphasized that alignment with state frameworks was a major deciding factor to be involved with eesmarts.

As a beacon of this program, eesmarts should underscore how the program aligns with state standards to curriculum leaders and teachers in order to increase buy-in.

Especially now that the program primarily uses gatekeepers to introduce the program to schools and school districts, eesmarts should capitalize on gatekeeper's current focus on state frameworks. In doing so, it can attract new curriculum leaders to participate in the program by "playing up" the program's alignment with state standards in their interactions with gatekeepers and at other opportunistic moments.

***Think strategically about which long-term outcomes are most important and begin to track those now as part of the developing 10-year plan.***

Now that the program's focus has turned to teacher training, eesmarts administrators should think critically about which measurable outcomes would be relevant for highlighting the program's success. Since the program plans to run indefinitely and there is a 10-year plan in development, program leaders should consider attempting to measure long-term outcomes that are in line with the mission of the program.

Current measures of success are based on the subjective perceptions of educators, but there is potential for measures that are more objective. For instance, if increasing the prevalence of energy efficient practices in Connecticut homes is important, the program should seek ways to measure this for example by recruiting a cohort of parents who volunteer to be followed for measuring long-term outcomes. Rather than trying to infer this information based on teacher reports, there could be a separate data collection effort for this endeavor.

## Professional Development

***Make professional development workshops easier for all eligible teachers to attend.***

Program gatekeepers have noted select cases in which teachers within a district had difficulty attending a general workshop because it conflicted with their availability. Many of the reasons behind this are specific to each district's structure, needs and limitations. In line with offering "customized" workshops, eesmarts should strive to offer "customized" configurations using creative solutions to barriers to teacher attendance.

For instance, the program could invite teachers from neighboring districts for teacher training workshops to contribute to the minimum amount required to hold a workshop.

***Concentrate efforts on better recoding of the quality of teacher training and the impact of training on teacher classroom activity.***

Now that the eesmarts program's focus is on teacher training, tracking teachers and teacher outcomes is imperative to assessing the success of the program. Collecting data on students has been difficult and unsuccessful considering the program's focus on teachers may be of less value to the program.

Thus, program administrators should put the program's efforts toward collecting information on teacher outcomes through the Teacher Evaluation Forms, the Workshop Evaluation forms and potentially gatekeeper evaluations. The program should revise the Teacher Evaluation Form to include measures of teacher satisfaction and to fit the current focus of the program. Moving forward, the case management database should be updated frequently considering how frequently teacher's contact information changes.

## Curriculum Materials

***Advertise and highlight the program curriculum material's alignment with state standards in the teacher guide and curriculum activities.***

In accordance with emphasizing the program's alignment with state frameworks, the program should be even more explicit about how eesmarts lessons and *activities* within lessons reflect state standards and preparation for embedded tasks. Doing so can help increase teacher buy-in and the likelihood that teachers will incorporate the program into their curriculum.

***Continue to provide support for embedding the program materials in the State Frameworks and address curriculum weaknesses.***

Because of its uniqueness, this program should make itself an indispensable element to the school districts it serves. In order to do this, the program will need to address weaknesses in the curriculum materials by continuing to make revisions based on teacher feedback, expert opinion by curriculum consultants from a range of disciplines, and input from PIMMS.

Important curriculum materials weaknesses to address include:

- Activities or language that is not grade-level appropriate (too high or too low)

- Missed opportunities to infuse higher order thinking (and writing) into the program

- Lack of clear learning objectives for students

To best guide teachers, the teacher guide should establish true learning objectives and not goals in the curriculum materials. Learning objectives should be clearly stated for all materials – these are different from the activities: learning objectives outline what the student is expected to understand better as a result of doing the activity. Considering how many teachers tailor the activities to fit their classroom style and needs, having clear objectives about what the activity is supposed to teach the student will help guide teachers as they modify the lessons and increase the versatility of program materials.

In addition, the program should eliminate activities and materials that do not map onto the Connecticut state frameworks or mastery standards. Since teachers and curriculum leaders report that they avoid using materials and activities they feel do not line up with state standards, it is wasteful for the program to continue to develop them.

Finally, the curriculum materials should use every opportunity to drive home messages about energy efficiency. Adding lessons and curriculum materials that would allow the program to capitalize on these opportunities will require that program receive increased funding. Student materials should show pictorially and activities should allow them to interface with making energy-efficient decisions. As the central message, encouraging energy efficient practices should be obvious on every piece of material that students see.

# APPENDIX A: INSTRUMENTS

## DECISION MAKER INTERVIEW GUIDE

**In-depth Interviews with Program Decision-Makers**

My name is _____ and I am calling you on behalf of Goodman Research Group in Cambridge, MA for a project involving the *eesmarts* curriculum sponsored by the Connecticut Energy Efficiency Fund through CL&P and United Illuminating. This year, the *eesmarts* program focus was to make changes based on recommendations from a 2005-2006 process evaluation. We at GRG are evaluating the successes and shortcomings of those changes, and are interviewing various people who were instrumental in making decisions about what in the program should be changed and what changes were to be made. Through this interview, we hope understand why certain changes were made and not others, and what factors guided the final decisions about which changes to implement.

This interview should take less than 45 minutes, during which time I will ask you some questions about your role in the *eesmarts* program and your personal opinions about the most recent changes to the program.

Just so you know, we will protect the privacy of this conversation and will not use your name or title in our report or when we are speaking about the project, so feel free to be open and honest with your opinions.

<u>General Info</u>

1. How familiar are you with the recommendations made in the 2005-2006 evaluation?

2. What was your role in choosing which changes the program should make based on what was recommended in the in the evaluation?

3. Generally, what changes were made to the program based on the 200-2006 evaluation's recommendation?
    a. What guided decisions on which changes to make based on the evaluation?
    b. What was in place that helped make these changes go well?
    c. What were the barriers to making these changes?

4. In general, what did you think about the evaluation findings and consequent recommendations?

Key Rec 1: Needs Assessment

One recommendation was that there be a needs assessment for (1) prioritizing program development and implementation activities and (2) for estimating resource requirements. Based on conversations with the *eesmarts* team, we became aware that there was no formal needs assessment conducted.

5. What factors guided the decision-making process around whether to conduct or not conduct a needs assessment?
    a. Probe: Who was involved in making these decisions? What were their concerns?

6. To what extent did the needs assessments provide helpful information on the gaps in resources and knowledge that the program faced?

7. How priorities set for what changes were were most urgent for better program development?

8. How priorities set for what changes were were most urgent for better implementation activities?

9. How did those changes affect program development and implementation?

10. Have I missed anything regarding this topic?

Key Rec 2: Implementation of Education Program

The second recommendation was that the program be implemented for a longer period, and that the program be seen as making an early investment in a future commodity of energy-consciousness.

11. Is there a projected end date for this program? (Probe for why or why not)

12. What was the decision-making process around the length of time for future implementation?
    a. Probe: Who was involved in making these decisions? What were their concerns?

13. What changes have been made to structure the content of the K-8 energy efficiency education program? What factors guided these changes?

14. Have I missed anything regarding this topic?

Key Rec 3: Dissemination of Program Materials

We understand that a key recommendation was to restructure dissemination of program materials such that they are distributed through gatekeepers or to teachers who have specific training in the use of the materials and that emphasis should be on *quality* of

placement rather than quantity. Teachers suggested that gatekeeper buy in could increase more widespread use of program materials.

15. What was the decision-making process around restructuring dissemination of program materials towards greater use of gatekeepers?
    a. What determined how to use "quality" instead of "quantity" as a guideline for how to distribute materials?
    b. Probe: Who was involved in making these decisions? What were their concerns?

16. What do you think are the advantages and disadvantages of using gatekeepers for program dissemination?

17. What evidence is there that program material usage has changed due to the restructuring of the program?

Key Rec 8: Production & Dissemination of Program Materials

It was recommended that *eesmarts* produce the redesigned program materials and pilot them to a few elementary schools statewide before broader dissemination.

18. What is the status on this pilot test?

19. What was the decision-making process around where and when to pilot the materials?
    a. Probe: Who was involved in making these decisions? What were their concerns?

20. How has the pilot test been informative (or not) for making changes to the design and distribution of program materials?

Key Rec 4: Deemphasize Program Materials

Key recommendation 4 reads: consider significant expansion of opportunities and incentives for teacher training, including offering stipends and scholarships, and scaling up the number of professional development workshops across the state to focus primarily on teaching science concepts—especially to elementary school teachers—relevant to energy (as well as energy conservation and efficiency applications)." Taking this strategy would presumably lead to better tracking of the cause and effect of the program on long-term energy practices.

21. What was the decision-making process around the program's emphasis (or lack of emphasis) on program materials?
    a. Probes: Have they been deemphasized? How have they been deemphasized?
        i. Probe for PIMMS role

b. What has been emphasized instead, and how has it been emphasized?

22. In what ways has the program attempted to scale up professional development workshops?
    a. Probes: What is the content focus of those workshops (science in general? energy conservation?)?
    b. Who is the target audience for those workshops (elementary school? middle school?)? Teachers? Curriculum directors?

23. *If there was a shift:* In your opinion, how has the program benefited from this shift in emphasis?

24. Have I missed anything regarding the topic of program materials, regarding production, dissemination, or emphasis?

Key Rec 6: Service of the Implementation Vendor

The original recommendation was to extend the service of the implementation vendor, CRI which held the role of "selling" the program to teachers and school districts. We are aware that CRI is no longer the vendor and that PIMMS has taken over the implementation role. Whereas CRI focused on how many units were distributed, PIMMS focuses on enhancing quality of teacher training as an outcome.

25. What was the decision-making process around when and how to terminate CRI's relationship with the program?

26. How has the change from using "the number of units" as a program metric to using "quality of training" as a program metric influenced the program's reports of success or unsuccessfulness?
    a. (That is, do either or these programs sway whether or not the program looks "more or less successful" than the past?)

27. Have I missed anything regarding the implementation vendor?

Key Recs 9 and 10: Changes in Tracking Teacher Performance

Two key recommendations focused on redesigning the performance measures and tracking system of teachers who go through the *eesmarts* program through having them fill out teacher evaluation forms the Enernet.

28. At what point(s) are teachers who have used program materials contacted for feedback on program materials through teacher evaluation forms? (That is, pre-test, post-tests?)
    a. Is that information used to make changes to the program?

29. What was the decision-making process around which performance measures the teacher evaluations should include or exclude?

30. What was the decision-making process around how the Enernet was set up, in an administrative sense (e.g. updating the teacher database; having sales representatives follow-up with teachers)?

31. Are program administrators collecting information that would inform them concerning whether or not the program is successful in teaching students and changing student behaviors?

Key Rec 12: SmartLiving Center

The final key recommendation was to either formally integrate the SmartLiving Center into the program and any revised program materials and enhance it along with the program redesign, or drop it as part of the program. We understand that the role of the Center is primarily as a site for leading field trips.

32. What was the decision-making process around the SmartLiving Center in the *eesmarts* program?
    a. Probe: What factors made you want to keep the program and enhance it, rather than drop it altogether?
    b. How has the relationship of the SmartLiving Center to the EESmarts program changed?

33. In your opinion, how well has the SmartLiving Center been integrated into the program?
    a. Probe for how that relationship might be improved or better leveraged

34. Have I missed anything regarding the SmartLiving Center's role in the program?

Final Questions

I just have a few last questions about your overall opinion of the programs and its future.

35. Is there anything else you would like to add about the key recommendations or about how they have/have not been implemented?

36. What are your thoughts for the future of the *eesmarts* program and how the changes made affect the future of the program?

37. To what extent do you feel that changes made to the program in response to the evaluation recommendations have been effective in improving the program's ability to educate current and future users about the advantages of increased energy efficiency?

| Key Recommendation | Current Issues to Address |
|---|---|
| 1. Conduct a Needs Assessment for prioritizing program development and implementation activities and for estimating resource requirements, prior to developing new program materials or issuing the RFP for the implementation contractor. | -Results of the needs assessment<br>How did they determine what to change? |
| 2. Continue to implement a K-8 energy efficiency education program for a longer—but not indefinite—period. | -Implementation to this point<br>-When program will end |
| 3. Rethink dissemination practices of program materials. Distribute program materials through gatekeepers or to teachers who have specific training in the use of the materials. | -Current program decision-makers & gatekeepers |
| 4. Deemphasize the program materials as the centerpiece of the program, and consider significant expansion of opportunities and incentives for teacher training, including offering stipends and scholarships, and scaling up the number of professional development workshops across the state to focus primarily on teaching science concepts—especially to elementary school teachers—relevant to energy (as well as energy conservation and efficiency applications). | -Scope of offerings<br>-Reactions to offerings thus far<br><br>Current and planned PIMMS offerings |
| 6. Extend the service of the current implementation vendor, CRI, to bridge the gap between future program redesign and the current situation, at a reduced resource level—focusing on case management and teacher training with the existing, yet out-of-date, program materials. | -<br>CRI implementation, decision of when to terminate |
| 8. Produce the redesigned program materials and disseminate them to elementary schools statewide on a pilot basis with fair distribution across the state's Education Reference Groups (ERGs). | Redesign process-<br><br>Alignment with CT Science curricula. |
| 12. Either formally integrate the SmartLiving Center into the program and any revised program materials and enhance it along with the program redesign, or drop it as part of the program. | -Lack of Integration of SmartLiving™ Center with program |

## GATE-KEEPER INTERVIEW GUIDE

***In-depth Interviews with Program Gate-Keepers***

My name is _____ and I am calling you on behalf of Goodman Research Group in Cambridge, MA for a project involving the *eesmarts* curriculum sponsored by the Connecticut Energy Efficiency Fund and sponsored by CL&P, United Illuminating. We at GRG are evaluating the successes and shortcomings of the program, and particularly the way program materials are being used in schools. We are doing this by interviewing persons like you, science coordinators and liaisons, who are involved in curricula decisions. Through this interview, we hope understand more about the process of how school districts use *eesmarts* program materials, and what factors guide the decisions on which components of the program to use.

This interview should take less than 30 minutes, during which time I will ask you some questions about your role in the *eesmarts* program and your personal opinions about the most recent changes to the program.

Just so you know, we will protect the privacy of this conversation and will not use your name in our report or when we are speaking about the project, so feel free to be open and honest with your opinions.

General Information

1. How would you describe your role with respect to the curricula decision making done in your school or school district?

2. Which school districts, or schools, or areas do you serve?

3. What are your personal goals as a science coordinator or liaison?

Decisions Guiding Involvement in *eesmarts*

4. Please describe your role in relationship to the eesmarts program.
    a. Probe: People/entities with whom most in touch as a part of this work—other organizations, teachers, gatekeepers, etc.
    b. Probe: When did you first get involved with the program?

5. Prior to being involved in *eesmarts*, what curricula and materials were available to your students on energy conservation and energy practices? By energy practices, we are including practices related to energy conservation, energy efficiency, clean and renewable energy, electricity and electric generation and the origins or sources of energy.

6. What factors guided your decision on whether or not to incorporate products and services offered through the *eesmarts* program into your curriculum or as professional development for your teachers?
    a. What other people were part of making the decision to use *eesmarts*?
    b. Was the involvement, development and administration of workshops by PIMMS an influencing factor?

Feedback on Distribution of Program Materials

7. How do you use *eesmarts* program in your schools?

8. Currently, the *eesmarts* program only distributes materials to teachers who have attended *eesmarts* training workshops. What is your opinion of limiting distribution of materials in this fashion?

9. Which parts of the program did you choose to take part in?
    a. sending teachers to general workshops?
    b. holding customized workshops in your district?
    c. having students take a field trip to the SmartLiving Center?
    d. Bus reimbursement program?
    e. *eesmarts* on-site program?
    f. *Middle School Essay Contest?*

10. To evaluate the materials, coordinate and customize workshops, and/or promote attendance at a general workshop, you will have spoken with an *eesmarts* representative. How satisfied were you with your interactions with the representative?

11. What were your general impressions of the program materials that you received?

12. What steps did you take to encourage the use and adoption of the program materials?
    a. Who did you speak with?
    b. How exactly did the materials into the hands of the teachers?
    c. What, if anything, did you to do to ensure that teachers received materials, or to track teachers who received materials?
    d. What instructions did you give to teachers about incorporating *eesmarts* into their lessons and course plans?

13. How did teachers respond to using the course materials?
    a. Probe: Were they eager or reluctant to use them?
    b. Probe: What did you do to encourage individual teachers to use the material?

Suggestions for Future Action

14. What were your expectations for how the *eesmarts* program would influence teaching and learning?
    a. For your students? And teachers? And schools?
    b. How did the program meet or not meet your expectations?

15. How likely would you be to encourage other curriculum coordinators you know to participate in *eesmarts*?

## *EEsmarts™* Teacher Survey

[[Outline of survey sections:

A. Attitudes towards energy efficiency
B. Awareness of, participation in e*esmarts™*
C. Assessment of specific program components (activities, training based on branching)*
    a. Professional Development, including on-site trainings
    b. Curriculum materials
D. Feedback about the program overall*
E. Questions for Non-Participant Teachers Only
F. Teacher demographics and teaching background

* indicates participating teachers only, not comparison teachers]]

Welcome to the **Connecticut Energy Efficiency Fund's** science curriculum assessment for elementary school educators, middle school science educators and science curriculum coordinators in Connecticut school districts. This **confidential** web-based survey is part of an educational research project on your opinions and experiences with science curricula materials related to energy in Connecticut.

This is **NOT** a market research survey. The research will provide feedback about teacher's experiences introducing energy topics to students. The survey should take approximately 20 minutes.

As a thank-you for participation, we offer you a **$15 Amazon.com gift certificate** that will be e-mailed to you at an e-mail address you provide. Your name and e-mail address will only be used for the purposes of this survey and we will not distribute your personal information. **Feel free to pass this survey invitation on to other teachers in your school district.**

Please use the "Previous" and "Continue" buttons to move through the survey. DO NOT use your browser's "back" button; if you do so, your information will be lost. When you have completed the survey, click "Submit."

### A. Attitudes Toward Energy Efficiency

This first set of questions will ask about your current practices and attitudes towards energy practices. By energy practices, we are including practices related to energy-efficient living, energy-saving and sources of renewable energy.

**What do you feel are the advantages of using energy efficiently?**

**During the past 2 years, how frequently have you done each of these energy practices?** *Check all that apply*.

| | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| Recycle paper, cans or glass | □ | □ | □ | □ | □ |
| Bike or walk instead of drive | □ | □ | □ | □ | □ |
| Use "Energy-Star" or other energy saving brands of appliances | □ | □ | □ | □ | □ |
| Unplug equipment/appliances when not in use | □ | □ | □ | □ | □ |
| Turn off lights when not in room or use natural light during the day | □ | □ | □ | □ | □ |
| Use glasses, mugs, etc. instead of disposable cups | □ | □ | □ | □ | □ |
| Use CFLs or other efficient lights | □ | □ | □ | □ | □ |
| Insulate and seal home | □ | □ | □ | □ | □ |
| Change thermostat setting when away from home | □ | □ | □ | □ | □ |

**How interested are you in incorporating more energy-efficient practices into your day-to-day life (including home, workplace)?**

- Not at all
- A little bit
- Somewhat
- Very
- Extremely

**How prepared to do you feel to incorporate more energy-efficient practices into your day-to-day life?**

- Not at all
- A little bit
- Somewhat
- Very
- Extremely

## B. Awareness of the e*esmarts*™ Program

**Have you ever heard of the e*esmarts*™ program?**

- Yes
- No
- Not sure

**Have you ever participated in any part of the e*esmarts*™ program?**

- Yes
- No
- Not sure

(If no or not sure, skip to comparison group survey)

(If yes to above, go to next page)

*eesmarts*™ is an energy efficiency and clean, renewable energy learning initiative sponsored by the Connecticut Energy Efficiency Fund and The United Illuminating and Connecticut Light and Power Companies.

Specifically, *eesmarts*™ focuses on professional development of educators in grades K-8 by providing them with interactive, cross-disciplined, inquiry/literacy/activity based *eesmarts*™ lesson materials to teach children about energy and conservation. They are available to teachers at no cost, after a teacher completes an *eesmarts*™ Teacher Training Workshop.

**Has your school or teachers in your school ever participated in any part of the *eesmarts*™ program?**

- ○ Yes
- ○ No
- ○ Not sure

(If no or not sure, skip to comparison group survey)

(If yes to above, go to next page)

**Which *eesmarts*™ professional development components have you attended?** *Check all that apply***.**

- □ Attended a free continuing education unit (CEU) workshop by PIMMS of Wesleyan University?
- □ Attended a Professional Development workshop(s), customized for your school district created and given by (PIMMS) of Wesleyan University.
- □ Some other *eesmarts*™ related workshop
- □ None

(if none, skip to Section C-b)

C. Assessment of program components

*C-a. Professional development feedback sub-questions:*

**You have indicated that you have participated in an e*esmarts*™ professional development/CEU workshop. How would you rate the overall quality of the *eesmarts*™ training?**

- o Poor
- o Fair
- o Good
- o Very good
- o Excellent

**To what extent has participation in e*esmarts*™ science-related professional development increased your:**

| | Not at all | A little bit | Somewhat | Quite a bit | A great deal |
|---|---|---|---|---|---|
| Science content knowledge | o | o | o | o | o |
| Comfort with teaching energy practices | o | o | o | o | o |
| Understanding of how students think about/learn science | o | o | o | o | o |
| Ability to implement high-quality science instructional materials | o | o | o | o | o |
| Emphasis on energy practices in your lesson plans | o | o | o | o | o |
| Incorporation of more energy-efficient practices into your day-to-day life (including home, workplace) | o | o | o | o | o |

**Thinking about the training workshops you attended to learn how to use the e*esmarts*™ program materials, please rate the quality of the training you received from e*esmarts*™ in each of the following areas:**

| | Poor | Fair | Good | Very good | Excellent |
|---|---|---|---|---|---|
| Giving you an idea of the time involved in each activity | o | o | o | o | o |
| Providing you with the necessary training to use the program's materials | o | o | o | o | o |
| Providing you with the skills and knowledge you needed to teach the lessons confidently and answer questions | o | o | o | o | o |
| Providing you with all the resources you needed to teach the activity | o | o | o | o | o |
| Making it clear after the training how to access additional help or have questions and concerns answered | o | o | o | o | o |
| Overall training received to conduct the activities | o | o | o | o | o |

**What other types of professional development would you want *eesmarts*™ to offer?**

## C-b. Curriculum Materials

**Have you ever used any of the *eesmarts*™ curriculum materials like lesson plans, books, teacher guides or handouts?**

- o Yes
- o No

(if no, skip to section D)

**How many lessons have you used in total?**

For the following questions, please think about ALL of the e*esmarts*™ lessons you conducted.

**On average, about how much time did you spend preparing for an *eesmarts*™ lesson?** *Please indicate the number of minutes in numerals.*

**Did you modify any of the lessons or activities before (or while) using them with your students?**

- o Yes → If yes, please describe:
- o No

**Please indicate how satisfied you were with these various aspects of the *eesmarts*™ curriculum:**

| | Not at all | A little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Materials you received | o | o | o | o | o |
| Quality of the content of the lessons | o | o | o | o | o |
| Match of the lesson content with the grade level / ability of the students | o | o | o | o | o |
| Design and format of the activities | o | o | o | o | o |
| Fit with the school curriculum | o | o | o | o | o |
| Curriculum's alignment with CT state frameworks | o | o | o | o | o |
| Effectiveness of distributing materials to teachers directly | o | o | o | o | o |

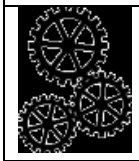
**Do you plan to use the *eesmarts*™ curriculum again in the future?**

- o Yes
- o No
- o Unsure

Please elaborate on your response:

Now we have some specific questions about an individual *eesmarts*™ lesson that you remember the most.

**Thinking about all of the *eesmarts*™ curriculum materials that you have used within the last 2 years, please review the list below and choose the one lesson that you remember the most.**

| | Curriculum Kit by Grade | Lessons /Components (may be used individually) |
|---|---|---|
|  | Kindergarten: Iggy and Me, Saving Energy | • Read Aloud Big Book - Iggy and Me, Saving Energy<br>• Classroom Poster<br>• Accompanying Teacher Guidebook |
|  | Grade 1: Rosa and Effy's Adventure | • Read Aloud Big Book - Rosa and Effy's Adventure<br>• Classroom Poster<br>• Accompanying Teacher Guidebook |
|  | Grade 2: I'M A DINO-SAVER™ | • Read Aloud Big Book - I'M A DINO-SAVER<br>• Classroom Poster<br>• Accompanying Teacher Guidebook |
|  | Grade 3: Hands on Energy | • Giant Activity Flip Book - Hands-On Energy<br>• Classroom Poster with Additional Activities<br>• Accompanying Teacher Guidebook |
|  | Grade 4: Energy<br>[If yes→ sub-table to check off which of the 4 lessons used] | • 4-1: Solar Energy and the Water Cycle<br>• 4-2: Seeds to Food<br>• 4-3: Energy Pathways: Getting Energy from Here to There<br>• 4-4: Magnetism and Electromagnets |
|  | Grade 5: Adventures in Energy [If yes→ sub-table to check off which of the 4 lessons used] | • 5-1: Learning to Use Heat<br>• 5-2: from the Sun<br>• 5-3: Wasted Energy<br>• 5-4: Tracking the Sun<br>• Measuring Solar Altitude |
|  | Grade 6+, Level I<br>[If yes→ sub-table to check off which of the 4 lessons used] | • The Energy Roller Coaster<br>• Working Efficiently<br>• Home Systems: Wired<br>• Fuel Spills and the Environment<br>• Wind Energy is Solar Energy |
|  | Grade 6+, Level II<br>[If yes→ sub-table to check off which of the 4 lessons used] | • Food, Fuel and Fire<br>• Efficiency<br>• Systems and Circles<br>• Up in Smoke<br>• Solar Energy and the Water Cycle |
|  | Grade 6+, Level III<br>[If yes→ sub-table to check off which of the 4 lessons used] | • Solar Power: Direct from the Sun<br>• Lighting the Way<br>• Overload!<br>• Fossil Fuels and Gas Blankets<br>• Using Solar Energy Step 1: Passive Solar Energy |

**Thinking about all of the *eesmarts™* curriculum materials that you have used within the last 2 years, please review the list below and choose the one lesson that you remember the most.**

- o Kindergarten: Iggy and Me, Saving Energy
- o Grade 1: Rosa and Effy's Adventure
- o Grade 2: I'M A DINO-SAVER™
- o Grade 3: Hands on Energy
- o Grade 4: Energy
- o Grade 5: Adventures in Energy
- o Grade 6+, Level I
- o Grade 6+, Level II
- o Grade 6+, Level III

**Which Grade 4 lessons did you use?** *Please check all that apply.*

- □ 4-1: Solar Energy and the Water Cycle
- □ 4-2: Seeds to Food
- □ 4-3: Energy Pathways: Getting Energy from Here to There
- □ 4-4: Magnetism and Electromagnets

**Which Grade 5 lessons did you use?** *Please check all that apply.*

- □ 5-1: Learning to Use Heat
- □ 5-2: from the Sun
- □ 5-3: Wasted Energy
- □ 5-4: Tracking the Sun Measuring Solar Altitude

**Which Grade 6, Level I lessons did you use?** *Please check all that apply.*

- □ The Energy Roller Coaster
- □ Working Efficiently
- □ Home Systems: Wired
- □ Fuel Spills and the Environment
- □ Wind Energy is Solar Energy

**Which Grade 6, Level II lessons did you use?** *Please check all that apply.*

- □ Food, Fuel and Fire
- □ Efficiency
- □ Systems and Circles
- □ Up in Smoke
- □ Solar Energy and the Water Cycle

**Which Grade 6, Level III lessons did you use?** *Please check all that apply.*

- □ Solar Power: Direct from the Sun
- □ Lighting the Way
- □ Overload!
- □ Fossil Fuels and Gas Blankets
- □ Using Solar Energy Step 1: Passive Solar Energy

**How were you trained to use the materials in this lesson?** *Check all that apply.*

- □ I attended training for this project by someone OTHER than a co-worker. The instructor was: _____
- □ I was trained by a co-worker who had attended a training conducted by: _____
- □ Other; Please explain: _____
- □ I did not receive any formal or informal training on how to use the materials. [If this last option is checked, skip next question]

**How successful was the training you received in preparing you to conduct this lesson?**

- o Not at all well
- o A little
- o Generally
- o Very
- o Extremely

**Please rate the following for this lesson:**

| | Not at all | A little | Moderately | Very | Extremely |
|---|---|---|---|---|---|
| In general, how difficult was it to use this lesson? | o | o | o | o | o |
| How comfortable were you conducting this lesson? | o | o | o | o | o |
| How engaged in this lesson were your students? | o | o | o | o | o |
| How successful was this lesson with this age group? | o | o | o | o | o |
| How easy to follow were the activity directions for this lesson? | o | o | o | o | o |

**What challenges, if any, did you experience when you led this lesson?**

## D. Overall Program Feedback

**Based on your experience, how successful has the e*esmarts*™ program been in accomplishing each of the following goals?**

| | Not at all | A little | Somewhat | Very | Extremely |
|---|---|---|---|---|---|
| Making *eesmarts*™ program materials that I can use repeatedly and incorporate into my lesson plan | o | o | o | o | o |
| Children acquire increased knowledge, awareness, and skills about energy, electricity, and energy efficiency | o | o | o | o | o |
| Families acquire increased knowledge, awareness, and skills about energy, electricity, and energy efficiency | o | o | o | o | o |
| Keeping me satisfied with the *eesmarts*™ program | o | o | o | o | o |

**Currently, e*esmarts*™ distributes program materials through science curriculum coordinators or to teachers who have specific training in the use of the materials. Do you feel that this is an effective way of distributing materials?**

- o Yes
- o No

**What do you think are the pros and cons of distributing materials in this way?**

**Please write any final comments/feedback or suggestions that you have about any aspect of the e*esmarts*™ program:**

[E. Questions for Non-Participant Teachers Only]

**How interested are you in teaching your students about energy efficiency and energy practices?**

- o Not at All Interested
- o Somewhat Interested
- o Very Interested

**How interested do you think your students would be in learning about energy efficiency and energy practices?**

- o Not at All Interested
- o Somewhat Interested
- o Very Interested

**Do you currently teach on energy efficiency topics in your curriculum?**

- o Yes
- o No

(If no, skip next question)
(If yes, complete next question)

**What do you feel is the quality of the instructional materials you have used for teaching energy practices?**

**What barriers do you face, if any, to teaching your students about energy practices?**

- □ Lack of discretionary time in the school day
- □ No "push" from school administrators
- □ Lack of professional development to know how to teach energy practices
- □ Don't face any particular barriers
- □ Other: _____

**What types of professional development would you want to have to help you teach science concepts relevant to energy efficiency and efficiency?** *Check all that apply.*

- □ Personalized training or professional development on how to teach energy practices to students
- □ On-site school programs that help teach kids about energy practices
- □ Fieldtrips related to energy practices
- □ Other: _____

## F. Teacher Demographics and Teaching Background

These last questions ask about you and your teaching experiences in Connecticut schools.

**Which grades do you teach?** *Check all that apply*.

- □ Kindergarten
- □ Grade 1
- □ Grade 2
- □ Grade 3
- □ Grade 4
- □ Grade 5
- □ Grade 6
- □ Grade 7
- □ Grade 8
- □ Grade 9

**At what school do you teach?**

**What is your school's Education Research Group?**

**In which school district do you teach?**

**Which subjects have you taught in the past 2 years?**

**Are you a science curriculum coordinator for your school or school district?**

- o Yes
- o No

**Were you a teacher in CT during 2007 and 2008 in grades K-9?**

- o Yes
- o No

**Over the past 2 years, have you participated in any of the following activities related to science or the teaching of science, BEYOND courses you may have taken as part of your undergraduate degree?** *Check all that apply.*

- □ Taken a formal college/university science course.
- □ Taken a formal college/university course in the teaching of science.
- □ Observed other teachers teaching science as part of your own professional development (formal or informal).
- □ Collaborated on science teaching issues with a group of teachers.
- □ Served as a mentor and/or peer coach in science teaching, not including supervision of student teachers.
- □ Attended a workshop on science teaching.
- □ Attended a national or state science teacher association meeting.
- □ Other; please describe: _____
- □ I have not participated in any activities related to the teaching of science.

[If this last option checked, skip next question]

**Considering all your professional development in the last 2 years, how would you rate its overall success in each of these areas?** (radio buttons)

| | **Not at All Successful** | | | | **Completely Successful** |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| Deepening my own science content knowledge | o | o | o | o | o |
| Understanding student thinking in science | o | o | o | o | o |
| Learning how to use inquiry/investigation-oriented teaching strategies | o | o | o | o | o |
| Learning how to assess student learning in science | o | o | o | o | o |

**Please indicate how prepared you CURRENTLY feel to do each of the following in your science instruction.** (radio buttons)

| | Not at all prepared | A little bit prepared | Somewhat prepared | Very prepared | Extremely prepared |
|---|---|---|---|---|---|
| Develop students' conceptual understanding of science and energy efficiency | o | o | o | o | o |
| Provide deeper coverage of science concepts and energy efficiency | o | o | o | o | o |
| Make connections between science and other disciplines | o | o | o | o | o |
| Teach on the topic of science in general | o | o | o | o | o |
| Teach on the topic of energy efficiency | o | o | o | o | o |

Thank you for completing this survey. If you would like to receive your $15 AMAZON.COM gift certificate, please provide us with your e-mail address to where the gift certificate should be sent. To protect your privacy, we will not distribute your information or link it to your survey responses. Please allow 4-6 weeks for your gift certificate to be e-mailed to you.

**44. Email address:** _____

**Thank you!**

# APPENDIX B: RECRUITMENT OF NON-PARTICIPATING TEACHERS

## FAX TRANSMISSION

**School: _____Attn: Principal's Office**
**Fax #: (_____)_____Town/City: _____ Date:_____**

Dear Principal,
I'm writing about an opportunity for your elementary school teachers and middle school science teachers to participate in **an educational research project on their opinions and experiences with science curricula**. A science extra-curricular program in Connecticut called *eesmarts™* has hired Goodman Research Group, Inc., an independent education research firm, to conduct a confidential web-based survey to assess how teachers in Connecticut are incorporating (or not) lessons for their students about energy conservation and energy practices. This is NOT a market research survey. The research will provide the program with feedback about teacher's experiences introducing energy topics to students.

*EESMARTS™* is an energy efficiency and clean, renewable energy learning initiative. As the external evaluators of *EESMARTS™*, the program developers have asked us (Goodman Research Group, Inc.) to seek out interested **elementary school teachers** and **middle school science teachers to complete a 10-minute online survey** in **September 2008.**

The schools we are contacting were selected to ensure representation of different school types around the country. ***Participation by teachers across all grade levels, and especially those who specialize in science is very important to us.*** Please pass this survey invitation on to your teachers. We need your expertise!

Web Survey Information

| | |
|---|---|
| **WHAT:** | The *EESMARTS™* program is interested in finding out how teachers introduce energy conservation and energy-related science topics to their students by surveying teachers across the state of Connecticut. The brief and confidential web-based survey* is available using **Internet Explorer** now at:<br>**www.grgsurveys.com/energy** |
| **WHO:** | Elementary School Teachers<br>Middle School Science Teachers<br>Science Curriculum Coordinators |
| **WHEN:** | September 15, to October 2, 2008. |
| **EARNINGS:** | All participating teachers will receive a **$15 Amazon.com gift certificate**. |

***If you prefer that we e-mail you the survey link for you to forward to your teachers, please contact us at *houseman@grginc.com* with your e-mail address or a list of teacher addresses to which we should send the survey link. E-mail addresses will only be used for the purpose of this survey.**
For questions about this project, please contact Lori Dean, Project Manager at dean@grginc.com.

# APPENDIX C: CURRICULUM REVIEW CRITERIA

## CURRICULUM REVIEW FORM

How appropriate is the content for each grade level?

How well do the materials incorporate what is known about current trends in science education?

How well are the target audience's intended learning characteristics and abilities stated?

How well are the materials organized?

What is the format? How can it be improved?

How is suggested activity time presented? How realistic (or how appropriate?) are the suggested times:

- Per activity?
- For unit overall?

What is the visual style? How can it be improved?

What are the instructional strategies? How can they be improved?

What are its overall instructional strengths and weaknesses?

How does this curriculum compare with others?

ADAPTED FROM "MORE AT FOUR PRE-KINDERGARTEN PROGRAM CURRICULUM REVIEW CRITERIA/RECOMMENDED CURRICULA"[7]

**1. Is the curriculum "research based"?** This criterion was conceived of as consisting of two elements. First, are elements of the curriculum clearly based on research on young children and their development - evidence of such a basis would be required. Second, substantive research had been done demonstrating the efficacy of the curriculum. Overwhelming evidence of either of these two criteria could meet the requirements of the standards, but the committee was to review both aspects of this criteria and make an informed judgment as to whether the curriculum met the full intent of the law.

**2. Scope and Sequence are both included in the design.** That is, for scope, the relevant domains of development are included as defined in the work of the Task Force -- health and physical development, social and emotional development, approaches to learning, language development and communication, and cognition and general knowledge.
For sequence, evidence that the curriculum is tied to children's developmental progress and that the materials reflect a mechanism for deciding when activities are appropriate rather than simply presenting activities in a set order regardless of children's level of development.

**3. Appropriateness of materials.** Are the materials appropriate for the age and level of development of the intended audience? Are the materials free of blatant cultural bias, and violent or otherwise unacceptable content? Are the materials appealing to children of the target ages?

**4. Balance.** The materials represent a balance of the need for teacher planning and input and child initiation of learning activities.

**5. The materials are linked to assessment of children's abilities.** There is evidence that information on assessment for instructional purposes is integral to implementation of the curriculum.

**6. Materials for teachers are appropriate.** There is adequate explanatory material for the teachers on how to implement the curriculum including use of the environment, activities, materials and instructional methods.

[7] *www.osr.nc.gov/_pdf/CurriculumReviewRecommendedCurricula.pdf*

## MATERIALS REVIEW FORM

Please complete the following by typing your responses directly in the 2nd column.
All questions about the materials should be answered by referring to information that is stated (i.e., that you can locate) in the material you are reviewing. If the information is not clearly provided in the material, please note that in the appropriate space.

For all questions that ask for a subjective response from you, please provide an explanation of your answer.

| **REVIEWER INFORMATION** | | |
|---|---|---|
| Name of Reviewer | | |
| Date of Review | | |
| **Product Information and Description** | | |
| Name of product or program element | | |
| Year Produced | | |
| Author (Individual or Organization) | | |
| How much does it cost? | | |
| What is the medium?<br>❑ printed book ❑ video ❑ CD-ROM<br>❑ online ❑ printed card ❑ poster<br>❑ other _____ | | |
| Summary/Main Purpose of the material (as stated in the material): | | |
| Is this a stand-alone educational product or part of a packet or series of materials?<br>(Based on description in material; or note if this information is not provided) | | |
| Are there any materials or equipment that should be used in conjunction with it (e.g. a CD-ROM, a computer with particular resources)? | | Are there any materials or equipment that should be used in conjunction with the e-learning course (e.g. a book or manual, a manekin)? |

| | |
|---|---|
| Is the target audience explicitly stated?<br><br>If yes:<br>- who is the stated target audience?<br><br>- where is that information stated? | |
| Are target audience's intended learning characteristics and abilities stated?<br>(e.g., reading level, access to computers, computer abilities)<br><br>If yes, describe: | |
| How/when is this product meant to be used by the stated target audience?<br>❑ before class ❑ not clearly stated in the material<br>❑ during class<br>❑ after class<br>❑ has no connection to the class | |

| **Organization and Format** | |
|---|---|
| How is the product organized?<br>(e.g., site menu, # of pages, interactive components: clicking; branching; provide feedback and/or new information based on response?) | |
| What are its subcomponents?<br>Please list: | |
| How could the organizational format be improved? | |

| | |
|---|---|
| What is the visual style?<br>(e.g., use of sidebars, text boxes, colors, diagrams or pictures? Busy? Clean? White space on page?) | |
| Describe the quality of the graphical user interface<br>(e.g., navigation, user control, video, audio, etc.) | |
| How could the visual style be improved? | |

| **Instructional Strategies** | |
|---|---|
| What instructional strategies or techniques does it employ?<br>(e.g., text presented as lecture-type info only, scenarios-based learning, questions and answers included, etc). | |
| How could use of these instructional strategies/techniques be improved? | |
| What is the reading level of the product?<br><br>- Readability level (SMOG Readability Formula for<br><br>print; Flesh-Kincaid for electronic) | |

| Assessment and Recommendations | |
|---|---|
| What are its overall instructional strengths? | |
| What are its overall instructional weaknesses? | |
| Is the medium overall appropriate for the stated audience? | |
| Overall, how could this material be improved? | |

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