Teacher Focus Groups
Results and Recommendations
for the Maine Public Utility Commission's
Efficiency Maine Program

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BACKGROUND INFORMATION

On December 23, 2002, the Maine Mathematics and Science Alliance (MMSA) submitted "A Plan for the Development of an Electrical Conservation Curriculum in Maine" to the Maine Public Utilities Commission (PUC). In the plan, MMSA described the steps needed to provide curriculum for Maine's students: design a curriculum for each grade level (K-2, 3-4, 5-8, and 9-12); embed assessment activities into the curriculum; introduce the curriculum materials with strong professional development; and demonstrate the viability of the materials. The Maine energy curriculum should be value-neutral and incorporate research about science teaching and learning to support the development of concepts and ideas with a Maine context and using local issues.

The PUC wanted to learn more about the potential for an electrical energy conservation curriculum, so they developed and administered an online survey. The survey, disseminated through the MMSA's science teacher listserv of over six hundred teachers, yielded about twenty five responses. All of the responding teachers stated that they currently teach energy concepts. This raised some questions about bias in the results.

To proceed with the development of the curriculum, the Maine Public Utility Commission's (PUC) Efficiency Maine Program requested that the Maine Mathematics and Science Alliance (MMSA) conduct two (2) focus groups of elementary, junior high and high school teachers in the Belfast and Portland areas. The purpose of the focus groups is to see if the teachers will utilize the electrical energy conservation curriculum if it were created and to understand the barriers teachers have about implementing new curriculum.

The focus groups serve as a follow-up to the online survey conducted by Efficiency Maine. There was some question as to the validity of the survey results because of the potential bias, so the focus groups were designed to elicit more detail about some of the key areas of interest to the PUC. The focus group questions were comprised of items from the original survey and additional probing questions to tease out more specific information around the focus areas.

OVERVIEW

Teacher's individual responses and the focus group discussions reveal an interest in and enthusiasm about, teaching energy conservation topics among many of the participants. This interest and enthusiasm was tempered by specific concerns, requirements, and preferences. The findings included in this report will offer a more detailed look at teachers' inclination to use energy conservation curriculum materials and their suggestions for facilitating that use.

OBJECTIVES OF THE FOCUS GROUPS

The key areas of interest to the PUC are listed below. The focus groups were designed and conducted to collect information to respond to these objectives.

1) To gauge teacher's familiarity with energy education materials and the frequency of their use
2) To see if teachers will utilize an electrical energy conservation curriculum if materials were made available to them
3) To determine what would make new materials most easily used by teachers in schools

METHODS

The MMSA recruited Maine teachers from the elementary, middle and high school levels. The educators were invited to participate in one hour focus groups to discuss energy related curriculum topics and were offered a $50 stipend for their participation. Two focus groups involving fourteen teachers in total were convened at the Belfast Middle School and the Westbrook school district offices on June 20 and 23, 2005. The groups included three (3) elementary, six (6) middle level, and five (5) high school teachers with a range of 1-35 years of teaching experience and an average of 15 years experience. (See Appendix A for complete information about participants)

Focus group questions addressing the three objectives were drawn from the Efficiency Maine survey with additional questions to probe about the existing situation and the likelihood of using electrical energy conservation education materials by Maine teachers. In addition to asking teachers "Have you ever taught energy concepts before" (from online survey), MMSA group facilitators asked about particular topics and materials, about how much time was spent, and about the curricular/course context for the instruction. The topic "energy" is broad and can be interpreted and addressed in many different ways. It was important to probe beyond the general topic to specific concepts. For example, light and heat, electrical circuits, the motion of particles in matter, the law of conservation of energy, and the release of energy from chemical bonds all fit

under the general topic of “energy”. The participants had the opportunity to indicate particular targeted energy and conservation related performance indicators from Maine’s *Learning Results* that they currently address in their curriculum. Here, specific concepts which relate to energy conservation, like “Categorize energy sources as renewable or non-renewable and compare how these sources are used by humans” **(**middle level H. Energy) and “Demonstrate the importance of resource management ….” (high school M. Implications of Science and Technology).

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Participants completed an information form and made notes in response to the questions at the beginning of the focus group sessions. The forms and questions were collected and used, in addition to facilitators’ notes, to respond to the three objectives. About 60 minutes were spent at each focus group session, discussing the questions and following up for clarification and specific details. An effort was made to include all the participants, to note differing opinions and situations and, more importantly, to identify areas of consensus and common thinking.

The *Participant Information Form* and *Focus Group Questions* are included with this report in Appendices B and C.

FINDINGS

The focus group findings are organized around the three objectives:

1) To gauge teacher’s familiarity with energy education materials and the frequency of their use
2) To see if teachers will utilize an electrical energy conservation curriculum if materials were made available to them
3) To determine what would make new materials most easily used by teachers in schools

Each of the three sections of findings states the objective, lists the types of questions used to address the objective, and summarizes in key points the various participants’ responses to the questions.

Objective 1
How familiar are teachers with energy education materials and how frequently do they use them in their schools?

This objective was addressed through questions such as “Do you currently teach energy related concepts, or have you taught them in the past?”, “What specific topics have you taught?” and “What materials are you familiar with for teaching these concepts?” (see Appendix C for complete list of questions).

- Eight of the fourteen teachers currently teach energy concepts and all fourteen had taught energy concepts at some point in their teaching careers.
- Most commonly, elementary teachers teach energy conservation at an "awareness" level. For example, they involve students in tracking and reflecting on their daily habits of energy use.
- Middle school teachers typically link energy conservation with concepts of renewable and non renewable resources. This energy idea is addressed Maine's *Learning Results* science and technology standard H. Energy: "Categorize energy sources as renewable and non-renewable and compare how these sources are used by humans".
- High school teachers include energy conversion and conservation of energy in biology, chemistry, and/or physics courses. In addition, resource/energy conservation is addressed in biology and environmental education course and one teacher addresses energy systems in a technology course.
- Two mathematics teachers (1 high school and 1 middle school) described using energy generation, conversion, and conservation scenarios for mathematics applications, for example an analysis of the costs and benefits of hydropower or calculating the cost savings of various conservation strategies.
- Teachers use a wide variety of materials to teach energy conservation concepts, including websites, Maine Energy Education Program materials, teacher-developed activities, and kits. One teacher mentioned a commercial kit but felt it was inadequate. Several teachers stated that there were few appropriate "packaged" materials available and instead relied on online resources. Several teachers described projects where students selected or were assigned current topics related to energy and/or energy conservation which they researched online and presented to their classmates. One teacher developed a project focused on the analysis of public relation materials published by large energy companies. The materials were solicited through letters that students wrote in English class. They then attempted to verify or refute claims made in the published materials.
- Middle level and high school teachers who include energy conservation topics in their curriculum spend from 2-10 weeks on focused units.
- Elementary teachers are more likely to integrate ongoing conversations about conservation daily or weekly throughout the year.

Objective 2
Would teachers utilize an electrical energy conservation curriculum if materials were made available to them?

This objective was addressed through questions such as, "Does the lack of energy curriculum materials contribute to the lack of instruction?", "What are the other barriers?", "Are you and your colleagues in a position to adopt and use energy education materials if they were available? If not, why not?" (see Appendix C for complete list of questions).

- Most teachers demonstrated an interest in, and enthusiasm for, teaching more energy conservation concepts if their alignment with Maine *Learning Results* could be documented and if they could integrate into existing science curriculum or be incorporated as short, stand alone units.
- Teachers expressed frustration with time restraints and stressed the need for "complete" materials with good background information for teachers, student materials, and assessments included.
- Another specific concern was the accessibility of new curriculum materials for a wide variety of learners. Curriculum materials that depend too much on reading create additional challenges for students and teachers. One teacher who works in a school with heterogeneous grouping described the need to involve students on across the ability range in meaningful ways.
- The barriers most commonly identified were changing curriculum priorities within districts in response to state initiatives, pressure to demonstrate alignment with Maine's *Learning Results* and with designated curriculum topics, lack of materials and/or resources to purchase materials (several teachers mentioned spending their own money), and the shortage of time - both to analyze, develop or adapt materials and to include "new" instructional topics.

Objective 3
What would make new materials most easily used by teachers in schools?

This objective was addressed with a list of curriculum material options for teachers to select from and then questions such as "What support would you need?", "What professional development format would you be most likely to attend?", and "Anything else that would be make you more interested in and/or able to teach energy conservation concepts?" (see Appendix C for complete list of questions).

In response to the questionnaire list asking ""Which are the things you or someone in your school would be likely to use." The following preferences were identified.

- A "school site" on the Efficiency Maine website where teachers could go for more information about the topic. (9 out of 14 participants)
- Classroom support and special guest presentations with hands-on activities. (9 out of 14 participants)
- Ready to teach lesson plans with ready to copy fliers and pre-packaged kit to use in classrooms. (8 out of 14 participants)
- Student workshops (field trips). (8 out of 14 participants)
- Bibliography of organizations that have energy programs available. (7 out of 14 participants)
- Energy efficiency related research projects for students. (7 out of 14 participants)

Note: The complete list of choices and responses is included in Appendix D.

The discussion about what would make teachers more likely to use curriculum materials led to a conversation about "quality". The teachers identified the following "Quality Descriptors" for curriculum materials.

- Standards-based with explicit alignment to Maine *Learning Results* and national standards.
- Availability of assessments aligned with standards and with the curriculum materials to serve as culminating activities for instruction and for inclusion in local assessment systems.
- Integrated materials tying energy conservation to other curriculum topics in science, mathematics, and/or social studies.
- Inquiry-based materials engaging students in hands-on activities and active investigation.
- Differentiated materials suitable for use with a wide range of learners with varying skills and abilities.
- Materials and experiences available at no cost to schools.
- Professional development made available in varying formats, including content-based professional development and training on the use of particular materials and activities.
- The availability of on-site help – personal contact with someone who can bring resources and consult with teachers – was identified as the most useful and welcomed support. One teacher mentioned that if the resource person had teaching experience, which would be a real bonus.

RECOMMENDATIONS

Although the two focus groups included a limited number of teachers, their responses did provide broad five ideas that were consistent across sites, school locations, and grade levels. These common ideas could help inform next steps in Efficiency Maine's efforts as they think about developing and supporting an energy conservation curriculum for Maine schools.

1. Teachers across grade levels appear willing to implement new curriculum materials but voiced several important conditions and concerns. The materials must have documented alignment with Maine's *Learning Results***.** Potential standards for alignment include Standard H. Energy, and Standard M. Implications of Science and Technology. Further, they should include assessments that align with the *Learning Results* and with the curriculum.

2. Any new curriculum materials are more likely to be used if they are designed for short, self-contained curriculum units, focused exclusively on energy and energy conservation topics OR if they can be readily integrated with other

content areas such as mathematics or social studies (particularly economics standards).

3. Materials should include activities appropriate for a range of learning abilities with extra support and extra challenge so all students have appropriate opportunities to learn the ideas. In particular, they should not be too text/reading focused.

4. In all ways, the curriculum materials should reflect current research about teaching and learning science.

5. Teachers need supportive background materials, the opportunity to participate in professional development, access to expertise and current information, and ongoing forums for collegial discussions, either in person or electronically.

CONCLUSIONS

Teachers are interested in energy conservation concepts but are guided, and possibly limited, by their commitment to state standards and local curriculum. They are also constrained by the amount of time available to them for developing and learning about new curriculum materials.

Curriculum materials must be targeted to selected standards and carefully designed to engage students in meaningful learning activities. The focus group participants indicated some advantages to a middle level focus. The performance indicator under H. Energy, “Categorize energy sources as renewable and non-renewable and compare how these sources are used by humans” lends itself well to a scientifically-based analysis of energy conservation. The opportunity for integrating energy topics such as cost analysis or particular light fixtures also into mathematics (as described by a focus group participant) can enhance local curriculum and make students’ learning more coherent and meaningful.

Teachers should also be provided with professional support in order to address their interest and support state and local standard without increasing teacher workload. Any new curriculum must be responsive to state standards, time, student diversity, availability of materials, and research-based practices. It is certainly possible to develop energy conservation curriculum materials that teachers will use but it requires careful attention to teacher concerns, research, and the realities of standards-based classrooms and schools.

APPENDIX A: Participants

TEACHER	GENDER	GRADE	LEVEL	YEARS EXPERIENCE	SCHOOL
1	F	3	elementary	20+	Ames Elementary
2	F	7	middle	21	Tenants Harbor MS
3	M	6	middle	35	Winslow Jr. High
4	F	3	elementary	8	Ames Elementary
5	F	5/6	middle	15	St. George School
6	M	7 & 8	middle	31	Wescott Jr. High
7	M	9-12	secondary	7	Poland Regional HS
8	F	10-12	secondary	8	Westbrook HS
9	F	7 & 8	middle	3	Skowhegan MS
10	M	3/4	elementary	1	Canal School
11	M	8	middle	6	Wescott Jr. High
12	M	9-12	secondary	26	Portland HS
13	F	10-11	secondary	8	Falmouth HS
14	M	9-12	secondary	28	Falmouth HS
SUMMARY	7F 7M	Grades 3-12	3 elementary 6 middle 5 secondary	1-35 yrs average: 15 yrs	11 different schools

APPENDIX B: Participant Information Form

- Name:
- Where do you teach?
- What do you teach (grade level, content)?
- How long have you been in your current position?
- How long have you been teaching?
- What do you know about Efficiency Maine? (please circle one)

  Been involved with it Heard of it Never Heard of it
  Comments:_____
  _____
  _____

Look at this list – which are the things would you or someone in your school likely to use?

- ☐ Template for copying fliers
- ☐ A "schools site" on the Efficiency Maine website where teachers could go for more information
- ☐ Computer CD to use in classroom
- ☐ Software package that teaches about energy
- ☐ Ready to teach lesson plan with ready to copy fliers and pre-packaged kit to use in classroom (such as bulb mete, sample compact fluorescent light, etc.)
- ☐ Posters
- ☐ Extensive guide of activities that could be done as a long-term project or in an after-school club
- ☐ Bibliography of organizations that have programs available
- ☐ Classroom support and special guest presentations with hands-on activities
- ☐ Student workshops (field trips)
- ☐ Energy efficiency related research projects for your students
- ☐ Other (specify)

Listed below are some of the performance indicators for Energy – please circle any that you teach in your class this year. List any materials, resources, and/or needs that you would find useful to you in regards to teaching this particular performance indicator.

MLR H. Energy

Elementary Grades 3-4

1. Identify different forms of energy (e.g., light, sound, heat).
2. Explain ways different forms of energy can be produced.

Middle Grades 5-8

1. Analyze the benefits and drawbacks of energy conversions (e.g. in electricity generation).
2. Demonstrate that energy cannot be created or destroyed but only changed from one form to another.
3. Compare and contrast the ways energy travels (e.g., waves, conduction, convection, radiation).
4. Describe the characteristics of static and current electricity.
5. Categorize energy sources as renewable or non-renewable and compare how these sources are used by humans.
6. Describe how energy put into or taken out of a system can cause changes in the motion of particles in matter.

Secondary Grades

1. Analyze the evidence that leads scientists to conclude that light behaves somewhat like a wave and somewhat like a particle.
2. Examine and describe how light is reflected and refracted (deflected) by mirrors and lenses.
3. Explain or demonstrate how sound waves travel.
4. Analyze the relationship between the kinetic and potential energy of a falling object.
5. Use mathematics to describe the work and power in a system.
6. Describe the relationship between matter and energy and how matter releases energy through the processes of nuclear fission and fusion.
7. Use mathematics to describe and predict electrical and magnetic activity (e.g. current, resistance, voltage).
8. Compare and contrast how conductors, semiconductors, and superconductors work and describe their present and potential uses.
9. Demonstrate an understanding that energy can be found in chemical bonds and can be used when it is released from those bonds.

APPENDIX C: Focus Group Questions

1. How many of you currently teach energy concepts? If you have taught energy concepts this year or in past years, was it part of a course? Or unit/content (science – social studies – integrated- other?)

2. If you have taught energy concepts what are the specific topics you have taught?

- ☐ Renewable/nonrenewable resources
- ☐ Energy conversion (potential, kinetic)
- ☐ Energy implications (environmental, health,
- ☐ Electricity (static, conductors, insulators, friction, induction, current electricity, circuits)
- ☐ Energy conservation
- ☐ Law of conservation of energy
- ☐ Other

3. What materials are you familiar with for teaching these concepts?

- ☐ Specific Kits
- ☐ Websites
- ☐ Packaged Materials
- ☐ Textbooks
- ☐ Reference Books
- ☐ Teaching Journals
- ☐ Other

4. How much time is being spent on this topic? At your grade level? Above and below?

5. If you don't teach energy education and energy conservation, why not?

6. Does the lack of materials contribute to the lack of instruction? Are there other barriers? If so what are they?

7. Are you and/ or your colleagues in a position to adopt and use energy education materials if they were available (time and the authority)? If not, why not?

8. Look at this list – which are the things would you or someone in your school likely to use? **REPEAT OF LIST ABOVE**

9. What other support would you need?
   - ☐ Email support,
   - ☐ on-site help,
   - ☐ web board
   - ☐ newsletter,
   - ☐ website with the most current educational materials,
   - ☐ conferences,
   - ☐ toll-free hotline,
   - ☐ other (specific)

10. What professional development format would you most likely attend?
   - ☐ Format (after school, in-service day, summer session, Saturday, on-line)
   - ☐ Time (1-2 hours, ½ day, full day, one week session)
   - ☐ Other (specific)

11. Anything else that would make you more interested and/or able to teach energy conservation concepts?

APPENDIX D: Raw Data for Resource Preferences

- ✓ 9 A "schools site" on the Efficiency Maine website where teachers could go for more information
- ✓ 9 Classroom support and special guest presentations with hands-on activities
- ✓ 8 Student workshops (field trips)
- ✓
- ✓ 8 Energy efficiency related research projects for your students
- ✓ 8 Ready to teach lesson plan with ready to copy fliers and pre-packaged kit to use in classroom (such as bulb meter, sample compact fluorescent light, etc.)
- ✓ 7 Bibliography of organizations that have programs available
- ✓ 6 Computer CD to use in classroom
- ✓ 6 Extensive guide of activities that could be done as a long-term project or in an after-school club
- ✓ 5 Template for copying fliers
- ✓ 3 Posters
- ✓ 3 Software package that teaches about energy
- ✓ 0 Other (specify)