Engineering for All (EfA) Survey
September 14, 2010

Dear Colleague,

We need and value your help. We are working on a National Science Foundation grant proposal to develop curriculum materials for engineering and technology education. The Project is called Engineering for All (EfA) and indeed it is being designed to appeal to all students, not just those who will pursue engineering careers.

We have taken this approach because we believe that the issues that are affecting the global planet are issues that affect every person's life and it is through engineering that we will develop solutions to these global issues.

We also believe that in addition to the workforce imperative, engineering and technology experiences can be pedagogically very valuable for all students – not only in providing an effective way to reinforce mathematics, science, social science, and language skills, but by mobilizing engineering thinking as a way to engage young people in addressing design challenges in social contexts that are personally meaningful to them.

EfA will rely upon engineering design activities that integrate mathematics, science, and technology. These strategies will be the predominant instructional strategy and will be consistent with national STEM standards. EfA will include two major components: 1) a K-12 ETE instructional Framework and 2) prototypical middle school (MS) curricular materials based upon it.

The Framework will include design criteria, methodologies, a K-12 curriculum scope and sequence, and guidelines for creating ETE materials and/or for adapting existing STEM materials to ensure their appeal and relevance to diverse learners. The Framework will provide a model of an K-12 ETE learning continuum that will illustrate how overarching ideas in engineering and technology can be revisited at different grade levels to provide students with a holistic view of this field of endeavor and deepen their understanding.

Once the K-12 ETE framework has been developed, revised, and validated by experts to be broadly transferable across grade levels, the Project will illustrate its use by developing six prototypical MS (grades 6-8) curriculum modules. EfA selected this school level as its initial focus since studies report that student interest in STEM subjects begins to wane in middle school because of the artificial separation of subjects and notably, due to the lack of attention to the human made world of engineering and technology).

To help guide the development of these materials, we would like to gather input from expert engineering and technology education professionals. Attached is a short survey that will take only a few minutes to complete and would provide invaluable help to us as we strive to develop materials that will be optimally useful to you, our teachers, and our students.

Thank you very much for your assistance.

Sincerely,

Michael Hacker (Co-director, Center for Technological Literacy, Hofstra University)
Barry Burke (Director, ITEEA STEM Consortium)
Elizabeth Parry (North Carolina State University and Chair-elect, ASEE K-12 Division)

Engineering for All (EfA) Survey

17-Dec-10

1. How appealing to you are engineering and technology education curriculum materialsthat address and revisit BROAD THEMES in engineering and technology (systems,design, modeling, resources, and human values) in a variety of social contexts?

#	Answer	%
5	Very Appealing 5	57%
4		32%
3		8%
2		2%
1	Unappealing 1	1%

2. To what degree do you think middle school teachers are presently using materials based on broad themes in engineering and technology education?

#	Answer	%
5	A Great Deal 5	4%
4		11%
3		31%
2		45%
1	Not At All 1	8%
	Total	100%

3. How DO YOU (as an educator and leader in the field) react to an engineering andtechnology education curriculum that is focused on designing solutions to address socialissues? (Such as the need for clean water, sustainable energy and food production, etc.)

#	Answer	%
5	Warmly 5	68%
4		25%
3		6%
2		0%
1	Coolly 4	1%
	Total	100%

4. How do you think middle school STUDENTS will react to an engineering and technology education curriculum that is focused on designing solutions to address social issues? (Such as the need for clean water, sustainable energy and food production, etc.)

#	Answer	%
5	Warmly 5	42%
4		37%
3		17%
2		4%
1	Coolly 1	0%
	Total	100%

5. How appealing will the following social contexts be to middle school students? Please ate these on a scale of 5 to 1, 5 being very appealing, 1 being unappealing.

#	Question	5	4	3	2	1
1	Food	40.00%	30.48%	20.00%	8.57%	0.95%
2	Energy	42.45%	38.68%	16.04%	2.83%	0.00%
3	Health and Safety	23.58%	38.68%	22.64%	13.21%	1.89%
4	Mobility/ Transportation	47.17%	33.96%	15.09%	3.77%	0.00%
5	Shelter	21.70%	42.45%	19.81%	16.04%	0.00%
6	Water	26.67%	36.19%	29.52%	7.62%	0.00%

6. To what degree do you think middle school teachers are presently using materials based on these social contexts in engineering and technology?

#	Answer	%
5	A Great Deal 5	1%
4		7%
3		44%
2		42%
1	Not At All 1	7%
	Total	100%

7. To what degree do you think teachers currently have access to curriculum materials to teach about engineering and technology by addressing broad themes in social contexts?

#	Answer	%
5	Materials are Available 5	6%
4		10%
3		33%
2		45%
1	Materials are Not Available 1	7%
	Total	100%

8. How appealing would design-based engineering and technology education curriculum materials be to you and your teachers that make explicit connections to SCIENCEstandards?

#	Answer	%
5	Appealing 5	49%
4		37%
3		13%
2		1%
1	Unappealing 1	1%
	Total	100%

9. How appealing would design-based engineering and technology education curriculum materials be to you and your teachers that make explicit connections to MATHEMATICS standards?

#	Answer	%
5	Appealing 5	50%
4		35%
3		13%
2		1%
1	Unappealing 1	1%
	Total	100%

10. How appealing would design-based engineering and technology education curriculum materials be to you and your teachers that make explicit connections to NAEP technology and engineering assessment benchmarks?

#	Answer	%
5	Appealing 5	40%
4		46%
3		12%
2		1%
1	Unappealing 1	1%
	Total	100%

11. In terms of implementation time, what is the optimal length of an entire set of ETE curriculum materials that you would like to have available to implement at middle school level (Grades 6-8)?

#	Answer	%
6	Six Weeks or Less	21%
10	About 10 Weeks	16%
18	One Semester	29%
36	One Year	19%
54	One Year+	11%
7	Other	4%
	Total	100%

Other
9 weeks
2 years
3 years
9 weeks = grading period

12. In terms of implementation time, what is the optimal length of a single middle school curriculum module (unit) that includes a case-based introduction, STEM knowledge and skill builders, a design challenge, and time for student reflection and presentations?

#	Answer	%
1	About One Week	3%
2	About Two Weeks	28%
3	About Three Weeks	17%
4	About Four Weeks	11%
5	About Five Weeks	4%
6	About Six Weeks	13%
7	About Seven Weeks	3%
8	About Eight Weeks	5%
9	About Nine Weeks	8%
10	About 10 Weeks	4%
15	Between 10-20 Weeks	3%
20	Over 20 Weeks	2%
	Total	100%

13. Although EfA is developing curriculum materials for middle schools students, how important is it for the Project to develop a K-12 Engineering and Technology Framework that establishes ETE curriculum design criteria, includes a scope and sequence, and illustrates how themes (e.g., systems, design, modeling) would be addressed in several different contexts (e.g., food, energy, shelter) at each grade level.*(This would be used as a tool for educators to create or adapt materials).**

#	Answer	%
5	Very Important 5	50%
4		37%
3		11%
2		2%
1	Unimportant 1	0%
	Total	100%

14. Please indicate how important you feel the following intended project deliverables are:

#	Question	Very Import	Somewhat I	No Opinion	Somewhat U	Unimportant
1	a. Illustrated student booklets and teach	65.38%	29.81%	3.85%	0.96%	0.00%
2	b. An overall program overview:	67.31%	28.85%	2.88%	0.96%	0.00%
3	c. Design journals for students to docum	44.23%	45.19%	6.73%	3.85%	0.00%
4	d. Lists of consumable and non-consuma	57.69%	32.69%	6.73%	2.88%	0.00%
5	e.Video-based introductions to each stud	47.67%	36.05%	9.30%	4.65%	2.33%
6	f. Professional development support mat	76.70%	19.42%	3.88%	0.00%	0.00%
7	g. an administrators guide	37.50%	33.65%	16.35%	11.54%	0.96%
8	h. a parent guide	26.21%	43.69%	21.36%	6.80%	1.94%
9	i. A media-rich website with simulations	58.65%	32.69%	4.81%	3.85%	0.00%

15. Would you be amendable to recommending middle school teachers to field test these materials for a stipend once they are developed?

#	Answer	%
2	Yes	80%
1	No	20%
	Total	100%

16. Please provide any additional comments in the space below:

I feel it is extremely important to introduce STEM concepts at as an earlier time as possible in a student's educational career. Perhaps your method might produce the anticipated results.

We must not forget the value of skill development and 'hand-on' creative endeavors! I well remember guiding my son in a creative problem solving competition when he was in 8th grade. When I asked why his team didn't consider an 'obvious' materials management solution, (obvious to me) his reply was, "I didn't know you could do that with copper." At middle school age, especially, we need to allow/encourage/require materials and skills development exploration and experimentation. "Know your materials and your abilities."

I believe this world is limited by the constraints that we put upon ourselves. That goes for government and civilian operations worldwide. Dreams are achievable, either through someone else's footsteps or we may tread our path. The difference in today's world is that children have everything readily available to them. They don't have to make, invent, or create. Once we build tools for them to create upon the platforms we current have, then we may progress. Common goals, throughout the country are truly needed to foster support within this system. Children need to see, feel, and understand the meaning to that their creations may have on their work.

I am already working on developing a K-12 program I call "Discovery and Science Helping Others". Opening module with a kid somewhere in the world trying to resolve a problem he has in his environment. Use of off the self items that kids can bring in, like tooth picks, gum balls, Popsicle sticks etc.(Reduced Cost to School and/or Teacher.

Commitment of the school division is critical. To introduce materials into a compatiable curriculum would require much less deviation from class objectives. Most teachers invite opportuniies to expand their skill and knowledge. The key in today's schools is whether the knowledge is tested or applicable to certification standards. Unless a change conceptuially is agreed upon by legislators and administrators the introduction of any program that does not fit the tested "4-Rs" will face opposition.

Lake Middle School was on National Research team for Bedroom Design research- we would like to model another program from the research team

Sounds like a move in the right direction. The beauty of Technology Education is that we are the pivotal piece. Technology Educators have to stay current and receptive to the changes.

Sounds a lot like a political brainwashing plan to me. I work in engineering, and here in the real world, we solve difficult economics-driven technical problems, not social problems.

Pitsco(www.pitsco.com)is one of the current suppliers of modular educational curriculum in a variety of areas - including STEM, and for different grade levels (elementary, middle, and high school).

You must focus on delivery of the models using the latest emerging information technologies.

For question #14: "a", I feel that teacher guides are VERY important, but student booklets are somewhat important. For "i", a media-rich website with simulations and animations is very important, but the learning management system is not as important because many districts force us to use whatever system they are "into" at the moment. I gave "c, g, and h" a somewhat important rating because when money is tight, teachers will only buy the essentials. Thank you for asking for my opinion!

In Bristol, CT, we provide an engineering experience to all grade 8 students. The curriculum is home grown and sorely in need of some instructional resources.

I feel tha one of the biggest challenges that instructors will face is in the various lengths of time that students have in there classes. For example 6 weeks course, 9 weeks course, 18 week course or year long course. There is consistancy in course lenght or seat time. Also the course at each grade level would need to be stand alone and not necessarily build on the previous years curriculum. I personally do not teach all student each year of their middle school career.

I teach senior high technology...I based my answers on what I suspect would be appropriate for middle school. Good luck...I know if you prepare fully supported educational materials that are very easy to use and implement, they will be used. Teachers are stressed out these days with all the expectations in and out of the classroom so when something you produce can been seen as important and easily taught with materials and resources, it may be selected over others.

One must realize the difference between disciplines and systems. Interdisciplinary educational organizational formats, (e.g., biochemistry in science and electromechanical in engineering), are artificial, while systems are authentic and are essential for a design-based curriculum.

An excellent example of this is the Institute for Systems Biology, founded by Leroy Hood. When "stuck" in the world of disciplines by his academic peers he struggled. Leaving the university, (discipline oriented), and engaging in "systems" he is revolutionizing healthcare and designing, inventing & developing the world of tomorrow. We need a curriculum effort to do the same. I would be pleased to amplify on this.... :-)

I would like to see the results of this survey if given to Middle School Teachers....I fell it would be quite different that that of established Tech and Engineering Education Professionals.....

In our state (WV) the middle school technology education is being phased out. In many counties it is also being eliminated in the high schools. We need a reason for the state and county administrators to see a need for our programs. By the time you get your materials in place there won't be a program in WV to have a field test.

The modules should be available for different geographic areas but address many if the areas in the scope of the projects. An example would be a farming module that students could relate to that live in a farming community but still has projects for big city or foreign countries. These projects MUST be hands on and written so the student has a personal interest in the subjects with useful real world outcomes. At a middle school level students are beginning to identify their potential life's calling and their place in the immediate social culture. To assist them with social cultural development, guest speakers form the engineering community MUST be engaged to show students how we apply the principles they are being taught!

Most of our middle School Courses range from 9 weeks to 18 weeks. 4-5 day units would be most desirable.

I could recommend several high-quality, highly motivated middle school ETE teachers in Pennsylvania.

I am not working with Middle School teachers now. But would have helped if i were.

There are at least three separate initiatives in this area that I know of. One I know the best is PLTW Gateway Program. One is for young women form WGBH public television in Boston. And the third is from someplace in Texas of which I know only by "technical news flash".
Your work could be based on some of these. In PLTW the curricula is linked to federal curricula standards.

This is a necessary undertaking -- but you need to get policymakers to implement and enforce engineering standards, not just make them part of existing science and math standards. Engineering curriculum should not be stuck into science and math curriculum, it should be its own set of courses.

I took an engineering workshop at Case during the summer. It was an intense week of 9 hour days and worth every minute. I have more experience and thus can implement the STEM units better. I have no behanvioral problems when doing engineering activities/units. Infact, students ask to stay after school to keep working on their projects. Once students are hooked you have them for the year. However, teachers need to keep it geniune and allow the students to 'enjoy' the experience. Don't keep too caught up in assessment. Let the enthusiasm be the initial assessment. Later comes more critical evaluations.

In addition to the national standards, the curriculum must satisfy, or at least be related, to the local and state requirements.

I think you should poll the middle school teachers for the time frame that would work best for them. Or, design so the project could be run for a short period of time or expanded to be longer. Last June I attended two presentations at ASEE where the high school teachers said they attended an NSF funded workshop focusing on the design process and then created a lesson plan to use in back in their classroom. The teachers didn't really see how this would work in their classroom, given their time constraints. They were thrilled with the results. The chemistry teacher said she will never go back to introducing new topics the way she used to.

You probably have already thought of the following, but just in case - here's my 2 cents. The projects need to be designed to be run by one teacher or as a multi-discipline effort so different components may be taught by different teachers, e.g. math component in math class, science component in science class. They need to include different levels, so the first student done can continue on with the project taking it to a higher level. They must be inexpensive. Make sure it all ties back to engineering. We just hosted middle school First Robotics competition. This year's theme was bio-engineering. The kids did a great job and the majority were really into their presentation topic. But, when I started asking the female students, after their presentation, if they now were considering engineering as a career option they gave me a blank stare. That lead to questions about enjoying the project, designing products to help others, etc. They finally made the connection and said yes, maybe I do want to be engineer.