

Report
on the
BME-IDEA
Meeting

Baltimore, MD
September 28, 2005

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Status of BME-IDEA

The goals of BME-IDEA continue to be to

- Share best practices
- Develop joint educational resources
- Build community

The Planning committee for this meeting included: Robert Allen, Johns Hopkins University, Bruce Hamilton, NSF; Paul King, Vanderbilt University, Jack Linehan, Whitaker Foundation, Phil Weilerstein, NCIIA, Paul Yock, Stanford University and Christine Kurihara, Stanford University. In addition, Pat Horner, BMES, provided organization support and Stanford University, Vanderbilt University, Johns Hopkins University, NCIIA, NSF and the Whitaker Foundation provided personnel and financial support.

History of BME-IDEA

Our first meeting was held in conjunction with IEEE/EMBS-BMES (Houston, TX, 2002) where 11 universities, 18 faculty members attended. Groups formed around the topics:

- Structures for teaching design
- Industry involvement in design
- Design tools & contest
- Issues in design instruction

The second meeting, the SF Forum, was held in San Francisco, CA 2003 and included 19 universities. Each university presented program snapshots and breakout groups were held on:

- Life sciences & Core engineering science
- Design & Business/entrepreneurship
- Resources for funding
- Shared educational resources

The third meeting was the first held in conjunction with BMES in Nashville, TN in October, 2003. There were 44 universities represented many of whom presented program snapshots and breakout groups were held on:

- National contest
- Bmesource portal
- Industry needs

At that time we established name (BME-IDEA for BioMedical Engineering – Innovation, Design and Entrepreneurship Alliance).

The meeting held in October 2004 included 64 attendees and represented 48 universities. Approximately 60% were universities that had representatives at an earlier BME-IDEA meeting. We formally announced the contest at this meeting and continued to promote and recruit for participation in the bmesource.org portal. Breakout sessions covered topics including

- Achieving Entrepreneurial Literacy
- What is industry looking for?
- How do you assess students/teams?

BME-IDEA, September 2005 Meeting

For the September 28, 2005 meeting we broke all records for attendance. We had over 80 attendees including university faculty, government colleagues and foundation representatives. Sixty-seven Universities sent representatives; eighteen universities were new participants - having never sent a representative to the BME-IDEA meeting before. Of the repeat Universities, 14 sent new representatives. Twenty-two of those attending are chairs of their respective departments. Twelve of the faculty were women, representing 18% of the university attendees. Interestingly, of the presenters, 33% were women. Two Canadian universities participated for the first time this year.

We maintain a catalog of BME-IDEA programs and resources on our own website: <http://www.bme-idea.org/> . We also maintain a discussion forum through this site.

The agenda for the day was as follows:

7.30 – 8.00 Continental Breakfast

Morning session – Fostering innovation

8.00 – 8.15 Welcome, Robert Allen & Paul Yock

8.15 – 9.45 Perspectives on Innovation

8.15 - 9.00 University Perspectives on Innovation
William Brody, President, Johns Hopkins University

9.00 - 9.45 Industry Perspectives on Innovation
John Abele, Founding Chairman, Boston Scientific

9.45 – 10.00 Break

10.00 – 11:30 Panel discussion
Fostering Innovation: the role of the Federal Government in our future

Jack Linehan, Whitaker, Moderator
Semahat Demir, NSF
Rod Pettigrew, NIH/NIBIB
Joel Myklebust, NIDRR

Donna-Bea Tillman, FDA

11:30 – 12:00 Foundation Perspectives
Phil Weilerstein, NCIIA (slides - ppt)

12.00 – 1.00 Lunch

Afternoon session – Teaching Innovation and Design (Paul King)

1.00 – 2.00 BME-IDEA Project updates
BME national design contest (Phil Weilerstein, Jay
Goldberg, Humera Fasihuddin)
BMEsource portal (Christine Kurihara)
IP Survey Results (Gary Brandenburger)

2.00– 3.30 Challenges in creating high-quality innovation and
design experiences for students

Breakout Session I: Courses and Curricular Design
(Willis Tompkins, Amy Lerner, Art Shoukas)

Breakout Session II: Resources for Teaching
(Richard Schoephoerster, Lead; Matthew O'Donnell,
Harvey Borovetz, Matt Glucksberg)

3.30 – 3.45 Break

3.45 – 4.30 Reports from Breakouts

4.30 – 5.00 Wrap-up: moving forward

5.00 – 6.00 Reception

5.30 Presentation of Awards to BME-Idea Contest Winners
Poster Display of Winners

Break-Out Session I

Courses & Curricular Design

Co-Moderators

Willis Tompkins, Amy Lerner, Artie Shoukas

Discussion Summary

Drs. Tompkins, Lerner and Shoukas described their three, very disparate courses and how they have chosen to create these courses in the context of the overall curriculum in their respective programs.

Their slides have been posted to the BME-IDEA website so that others can see how these courses are run.

Audience members then asked questions of the session leaders.

Q. Can Design of Research can be considered part of the ABET criteria for design?

A. It was felt that design in ABET was particularly focused on projects and not research. Dr. Shoukas mentioned that software design is used in his course. The process is the important aspect - not necessarily the end product.

Ken Lutchen was recently on an Ad Hoc Committee for BMES - how do you integrate design into the senior class and what is an acceptable project; any design that allows the student to experience the process. Research experience without the use of an explicit and systematic design process is not acceptable to ABET. Taking data Active process - identify problem, propose and defend solution, implement solution and defending the results as to whether they met the goal of the project.

When programs offer other courses that allow research design the senior capstone courses don't do research design.

Research is required for projects and is done in all of these projects. It's difficult to distinguish between research and design at that stage.

Q. Credits for these courses?

A. 3 credits for course at JHU apply toward major, 6 can apply to graduation, they can take more but these don't apply to credit; Lerner had 6 credits;

Q. How do you assess innovation?

A. Lerner is concerned that industry projects don't come with the solution. Problems need to be open-ended. She introduces brainstorming and concept creation and screening. Evaluating the success of the project involves

determining how well the result meets the goals. She does give credit for projects that were risk-taking and may have fallen short of goals.

Q. What is the role of failure in your courses?

A. Tompkins recognizes that this is part of learning. After failing several times one team indicated they learned more from the failures; but they don't pass if they fail. Shoukas disagreed with that - failure sometimes indicates risk-taking and can, in some cases, be rewarded. Someone indicated that only 20% of medical device ideas in industry actually make it to market.

Lutchen has students coming to his office that say "It's not going to work" - he asks why not - because you're not working on it? A negative result is still a result. You did produce results - this is NOT a way to answer this problem. Something new was discovered.

Lerner's structure emphasizes the documents, reports, etc. Sometimes the report takes precedence over whether the project worked. Both are important and need to balance the learning process and the success of the device as aspects of evaluation.

Shoukas uses students to evaluate students. It's amazing to see what they say about each other.

Q. The new privacy laws are causing issues with allowing students to observe procedures. How do you deal with that?

A. Shoukas said he gets IRB approval and HIPAA training for all of his students. They use the students as subjects testing them on roller coasters. It just has to be done.

Q. How many programs have projects evaluated by industrial programs?

A. Ten (1/4 of the group of 40)

Q. How many programs have projects evaluated by medical personnel?

A. Thirteen

Q. How many projects evaluated by the faculty only?

A. Two or three

Q. How many use peer evaluation (students)?

A. About 20

If anyone is looking for a way to get more industrial support - invite them in and let them evaluate - they'll come back next time with projects.

Q. Mechanical Engineering programs - every year they work on the SAE Racecar - it's a constant project that everyone knows about. Can we come up with something like this?

A. National competitions exist - BME-Idea; others. We may need to come up with a new one.

Q. Advice to get funding to start a program.

A. Talk to Phil Weilerstein of NCIIA for program funding to start. Funding is targeted to design. Leveraged to other funding sources so good place to start.

Whitaker is nearly gone, so nothing there; others?

Q. How do you avoid discrepancies on projects if funding levels are different?

A. Lerner's senior capstone students' projects are funded through lab fees. In general, the budget has rarely been the problem. Time is much more of an issue. They also get things from companies - material, borrowed equipment, etc. They do ask industry to sponsor if project is pricey. She has to ensure that other resources are distributed appropriately. Funding of faculty time is an issue.

Shoukas gives \$500 per team for base funding - sponsors have to provide additional funding and they have to approve the budget the students define. But as with Lerner, time is a much bigger issue. What's nice about the longitudinal design teams is that they can go on for several semesters.

Break-Out Session II

Resources for Teaching

Co-Moderators:

Richard Schoephoerster
Harvey Borovetz
Matt Glucksberg
Matthew O'Donnell

Discussion Summary

Resources for Teaching

Funding - Harvey Borovetz
Shayne Peirce-Cottler
Robert Radwin
James Antaki
Vincent Pizziconi
Gerald Miller
Krishnan Chandran

Issues:

- Budgetary constraints
- Funding for Projects
- Adequate monetary Support
- Funding
- Industrial Funding
- Difficulty Getting Technical Advisors (and often funding) for projects sponsored by clinicians or other non-engineers
- Finding Funding that will allow high quality designs
- Financial Support
- Finding the necessary resources and support
- Obtaining funding for prototyping materials and custom components
- Limited financial resources

Discussion Results:

Fortunate to have industry sponsors
Wealthy individuals contributing
Clinical departments
Industry client self funding
Grants within university
Some students are self-funding projects
Government funding
NCIIA funded projects
Intra-departmental funding, some are 30 project per term

Extra Discussion

Lab fees charged for credit hours using facilities, charged through the university tuition and then given back to the class. This does not cover the costs but can help with the extras

Industry Involvement - Matthew O'Donnell

Humera Fasihudden

Daniel Kamei

Gerard Cote

William Tang

King Yang

Issues:

Developing effective industry partnerships

Difficulty getting technical advisors (and often funding) for projects sponsored by clinicians or other non-engineers

Establishing external collaborations appropriate for students

Sponsors

Industry Involvement

Industrial funding

Resolution of IP concerns from industrial sponsor providing real projects for our

Masters of Engineering (M.Eng) Program

Developing and sustaining good corporate partnerships

Identifying/recruiting external mentors for projects

Experienced design mentors

Support from industry

Discussion Results

Boot strapping, with larger student numbers

Leverage industrial involvement internships

Projects (funded or project ideas) in conjunction with Major medical school or vet school involvement, National labs, VA centers, charity organizations, global organizations, Angels (but may not be sustainable)

IP: Bigger issue for faculty than industry, for faculty that rely on design projects

Extra Discussion

Engineers without Borders

Engineer World Health

Facilities/Resources - Richard Schoephoerster

Sherry Voytik-Harbin

Thomas Papathomas

Samatha Richerson

Edward Guo

David Schneeweis

Maria Oden

Issues:

- Available lab Space
- Prototyping Facilities
- Laboratory Facilities
- Finding adequate space for all projects
- Obtaining good office and lab space for M.Eng students
- Finding good resources to teach the FDA process
- Finding good resources on industrial standards
- Finding needed equipment and protocol approval
- HIPAA impact on patient interface
- Dedicated resources and facilities
- Limited staffing resources

Discussion Results

Anticipate needs of students requires forethought from faculty

Not much input from ABET, needs to be criteria

Training for students by mentors or technical advisors

Technical support staff, university wide, combination lab managers

Clinical facilities, clinical stakeholders, for students to see procedures that they will have as projects

Testing resources for the projects, if the students get that far during the senior design projects

Extra discussion

Safety aspects and clean up for labs has been a problem, can be solved by a dedicated facility or lab manager

Role of TAs in senior design classes, can not always get students back on track

Faculty - Jay Goldberg

Steve Jones

Matt Glucksburg

Dan Bogen

Raymond Fish

Issues:

Making faculty aware of non-technical design constraints

Sufficient Time among faculty

Faculty and staff experience in design

Faculty interest

Advisor participation

Resources for faculty with limited industry experience

Convincing faculty that design is important

Discussion Results

Faculty is used very differently through the university in the discussion

Role of faculty - clients, experts (technical advisors, generate most ideas for projects), lectures (teaching resources from TAs), dedication from all involved in any way

Most faculty enjoy the projects

Extra discussion

Postdoc is used as mentor/customer for the projects in lieu of the professor, project provided by postdoc. Not all faculty have enough staff.

Use the faculty as facilitators and let projects come from outside

Use a committee to decide the projects that are submitted by the various courses and faculty

Non-technical design constraints from industry, provide lectures to educate the faculty

Going Forward – Action Items

Co-Moderators

John (Jack) Linehan
Stanford University

Discussion Summary

1. Ongoing community of interest

- Group felt that BMES meeting is best “home” for the BME innovation/design/entrepreneurship community on annual basis
- Continue meeting in conjunction with BMES, next October, 2005 in Chicago, IL. Matt Glucksberg, Chair, Northwestern BME Department agreed to be local host.

2. National BME design contest

- Working group: Jay Golberg, Phil Weilerstein
- Contest recommitted; second round announced - projects due Apr, 06

3. BME design portal

- Working group: Abby Garner, Christine Kurihara, Paul Yock, John Linehan
- Continued recruitment of site, section editors
- Continued marketing to students

4. Topics for future meeting

- Case studies in medical device design
 - Jan Stegeman, Amy Lerner to participate
 - BME-IDEA website to be used
- Devices for underserved population strategies (e.g. designing devices that can feasibly reach third world countries)