AC 2008-1544: THE YEAR OF DIALOG - A SUMMARY REPORT

J. P. Mohsen, University of Louisville

Ronald Barr, University of Texas at Austin

ASEE Year of Dialog: What We Have Learned

J.P. Mohsen
University of Louisville

Ronald E. Barr
University of Texas at Austin

Jane M. Fraser
Colorado State University at Pueblo

Amir Karimi
University of Texas at San Antonio

Nelson A. Macken
Swarthmore College

John A. Stratton
Rochester Institute of Technology

John J. Uhran, Jr.
University of Notre Dame

Sandra A. Yost
University of Detroit Mercy

Abstract

During the 2006-2007 academic year, ASEE hosted a series of panel sessions at the annual ASEE Section and Zone meetings to involve the membership in an activity called the "Year of Dialog" (YOD). The central theme of the YOD was to focus on "The Scholarship of Engineering Education (SEE)." The ASEE Zone and Section leaders were charged to organize a YOD session at each of the twelve ASEE Section meetings, and indeed that happened without fail. All discussions at the Section meetings were recorded, and submitted to the ASEE Vice-President for Member Affairs. This intermediate report, written in the form of a paper, presents the preliminary results of those discussions, as compiled by the authors. The paper includes data pertaining to the meetings, number of participants, form of dialog, and major topics discussed. The topics are grouped into logical categories and presented in tabular form for ease of presentation and prioritization. A comparison of the YOD results to Boyer's general concept of "Scholarship" for the professorate is made. A vision of SEE is presented and illustrated, based on the input from all YOD discussions. Major action items that ASEE can address are presented in the conclusion.

Introduction

In January 2006, the ASEE Board of Directors endorsed the "Rising Above the Gathering Storm" (RAGS) report [1]. The issues in RAGS had been discussed at length by the Board, and as a result, a committee was organized to orchestrate a series of events during the following year. These series of events during 2006-2007, called the Year of Dialogue (YOD), was to be followed by an ASEE report on the crisis facing engineering education. The first public event was a plenary session at the National Conference in Chicago, June, 2006, called the "Socratic Dialogue". The panel of experts at this plenary session responded to a number of questions posed about the Scholarship of Engineering Education (SEE). The Year of Dialogue was thus launched. As a follow up, the ASEE Zone and Section leaders were charged to organize a YOD session at each of the twelve ASEE Section meetings during the 2006-2007 academic year. As Table 1 indicates, all twelve Sections hosted a YOD event either in Fall 2006 or Spring 2007. In addition, the Engineering Technology Leadership Institute (ETLI) conducted a YOD session at their meeting, and these data are included here also. Based on rough attendance figures, it appears that over 1,000 ASEE members participated in the YOD discussions during the past year.

In developing this report, several strategies were adopted. First, each Zone and Section Chair was asked to record the YOD panelist/speaker and audience comments during the YOD event. These Section notes were then sent to the ASEE Zones YOD Committee, which was co-chaired by the ASEE Vice-President of Member Affairs and the ASEE Immediate Past President, who had initiated the YOD in 2006. The notes were reviewed, Section by Section, and bulleted highlights of the various discussions were created for further consolidation.

Table 1: Data for the Section Meetings During YOD (2006-2007)

Section	Dialog Date	Place	Attendance	Event
St. Lawrence (St.L)	November 18, 2006	Ithaca, New York	35	Discussion
New England (NE)	April 21, 2007	Kingston, Rhode Island	35	Discussion
Middle Atlantic (MA)	November 4, 2006	Toms River, New Jersey	60	Presentation
	April 21, 2007	Newark, New Jersey	80	Speaker
Southeastern (SE)	April 1, 2007	Louisville, Kentucky	140	Speaker
North Central (NC)	March 31, 2007	Charlestown, WV	60	Discussion
Illinois-Indiana (Ill-In)	March 31, 2007	Indianapolis, Indiana	140	Discussion
North-Midwest (NMW)	October 7, 2006	Menomonie, Wisconsin	50	Panel
Midwest (MW)	September 14, 2007	Kansas City, Missouri	61	Panel
Gulf-Southwest (GSW)	March 29, 2007	So. Padre Island, Texas	151	Panel
Rocky Mountain (RM)	April 20, 2007	Provo, Utah	44	Panel
Pacific Northwest (PNW)	April 27, 2007	Pullman, Washington	50	Panel
Pacific Southwest (PSW)	April 13, 2007	Reno, Nevada	65	Panel
Engineering Technology Leadership Institute (ETLI)	October 7, 2007	Charlotte, N. Carolina	50	Presentation
		Sum Total	1021	

General themes emanating from the notes were entered into a spreadsheet table under the title "Topics" and a check mark (√) was placed under each Section that had discussed that particular topic, as shown in Table 2. Once all twelve Sections were reviewed and marked, a summation was made to determine the frequency that a particular topic had been discussed across all Zones. Using these observations and data, a draft report seeking comments and additional points of view was developed and distributed to all Zone, Section and panel leaders involved in the YOD at the 2006-2007 Section meetings. A carefully edited version of these notes and comments resulted in this intermediate ASEE Zones' report.

Results

There were 42 "Topics" listed in Table 2 that were identified by the committee as sufficiently distinct comments or points of view about SEE. The number of times each topic was mentioned was totaled in the table. In addition, for consolidation purposes, each topic was assigned to one of five major categories, labeled A-E:

A. Faculty Issues and Rewards
B. Pre-College K-12 and Outreach Issues
C. Curriculum Reform and Evaluation Issues
D. Outside Resources and Influences
E. Research Topics and Issues

Thus, some consensus of topics could be construed. It should be noted that there is no guarantee that 100% of all thoughts and comments were captured from the twelve Section YOD events.

Table 2: Topics Discussed at the Section YOD Panels

Topic	St. L	NE	MA	SE	NC	Il/In	NMW	MW	GSW	RM	PNW	PSW	ETLI	Total (√)	Category
1. Consider Educational Research in Promotion and Tenure	√		√			√	√		√	√	√	√	√	9	A
2. Discussion of "Rising Above the Gathering Storm"			√		√			√	√	√				5	D
3. Discussion of the "Engineer of 2020" Report			√		√			√	√					4	D
4. Discussion on Socratic Dialog in Chicago		√	√			√			√					4	D
5. Seek Industry Input on SEE					√	√	√	√			√		√	6	D
6. Discussed ABET Standards and Influence			√		√	√	√							4	C
7. Compared Educational Research to Technical Research	√		√	√			√	√	√		√			7	E
8. Seek Input and Support from the Engineering Deans	√		√		√	√	√		√	√			√	8	A

9. ASEE Should Compile and Promote Best Teaching Practices	√				√		√		√	√	√	√	√	8	C
10. Discuss Body of Knowledge for Engineering Education	√		√											2	C
11. Seek Opportunities to Publish Papers in JEE and AEE			√			√	√	√	√		√	√		7	E
12. Create Different Pathways for Faculty Promotion and Tenure	√		√			√							√	4	A
13. ASEE Should Create More Short Courses, Teaching Seminars, Educational Research Sessions	√				√	√				√				4	E
14. Partner with Social Scientists and Learning Scientists			√	√			√		√			√		5	E
15. Teach Creativity and Innovation			√											1	C
16. Study “How People Learn” and Learning Styles			√				√				√	√	√	5	E
17. Think Globally, Educate Global Engineers			√			√		√		√	√			5	D
18. SEE has Many Aspects Besides Rigorous Educational Research	√	√	√				√	√	√	√	√			8	E
19. ASEE Should Produce a Report on SEE	√							√						2	D
20. Look at Chemistry and Physics Education for examples			√								√			2	E
21. K-12 STEM Education and Engineering Student Recruitment.		√		√		√			√	√		√	√	7	B
22. Try Active Learning, Hands-on, Project-based, Adaptive Teaching, etc.		√			√					√			√	4	C
23. Summer Engineering and Science Camps for Students		√												1	B
24. Establish Engineering Assessment Measures for Teaching	√		√			√						√		4	C
25. What was the Influence of Recent NSF Coalitions on Engineering Education					√									1	D

26. Track the Development and Success of New Engineering Education Programs					√						√			2	E
27. Engage Research Faculty in Undergraduate Teaching					√		√							2	A
28. Teach Lifelong Learning				√										1	C
29. Promote Engineering Careers to the American Public				√					√					2	D
30. Have a General BA in Engineering				√										1	C
31. Focus on Early Science and Math Course Improvements.											√	√		2	B
32. Include Communication and Multi-cultural Skills.										√				1	C
33. Modern Students Grew-Up in a "Video Gaming" Environment.										√				1	B
34. Increased Focus on Research Because of State Funding Cuts									√			√		2	E
35. Small Teaching Schools versus Large Research Schools.				√			√		√		√	√		5	A
36. Provide Continuing Ed Credits						√								1	A
37. Increase Faculty Rewards						√	√		√					3	A
38. Develop Outreach Programs						√								1	B
39. Provide Early Mentoring						√	√		√					3	A
40. Change Culture at Conferences						√								1	A
41. Teach Graduate Students How to Teach											√	√		2	A
42. Address Diversity Issues									√					1	B

The frequency, or number of topics associated with each major category, is recorded in Table 3. Weight factors, defined as the total number of checks in a major category, are also shown in Table 3. In addition, Appendix A shows a further consolidation of this data by arranging the major categories into separate tables with topics listed in the order of the number of (√).

Table 3: Frequency Count for Major Categories

Major Categories	Frequency	Weight Factor
A. Faculty Issues and Rewards	10	38
B. Pre-College K-12 and Outreach Issues	6	13
C. Curriculum Reform and Evaluation Issues	9	26
D. Outside Resources and Influences	8	29
E. Research Topics and Issues	9	42

Discussion

The RAGS report called for broad reform in K-12 STEM education, and ASEE clearly has an opportunity to be a national leader in K-12 reform, since it impacts engineering education at the college level. K-12 is the pipeline and lifeblood for what engineering educators do and how it affects the technology base of this country. Indeed, ASEE has already begun to try and impact K-12 through a number of initiatives including the all day seminar initiated at the past three national conferences. The YOD on the other hand was an attempt to get a handle on the various aspects of engineering education through research and to build on the momentum started by such schools as Purdue and Virginia Tech, which have started engineering education programs. The RAGS report and the YOD events, as envisioned, were two very different things, but they were and are very much entwined and the discussions at many of the section meetings made that clear.

If one wants to pursue a pathway to rigorous research in engineering education, the research methodology in engineering education should be no different than the same methodological approach used in technical engineering research: 1. define the research question or hypothesis, 2. write a proposal or plan, 3. seek funding or other appropriate support, 4. do the work rigorously, and 5. publish the results in peer-reviewed journals. In this sense, engineering education research should be considered favorably in promotion and tenure. One caveat in educational research is that the student (human subject) is the target of study, and it makes the "experiment" more complicated. Thus, it is reasonable to expect engineering faculty to partner with social and learning scientists when conducting SEE research. Indeed, an analysis of recent JEE articles indicates that it is already happening. It is likely the same will be true for the new AEE on-line journal.

The issues raised by the YOD plenary discussion were mainly related to the research of engineering education. However, the word research in this context has brought some confusion to the table early on. It was misunderstood by the general audiences, perhaps because it was not articulated clearly. This is easily seen by the list of topics in Table 2. It seems preferable to use the word **scholarship** in the place of the word **research.** In this case, the term scholarship must be used in the same way that Ernest Boyer [2] did in his classic monograph "Scholarship Reconsidered: Priorities of the Professoriate." In that document he describes four types of scholarship which seem to be appropriate for this discussion:

1. The scholarship of discovery,
2. The scholarship of integration,
3. The scholarship of application, and
4. The scholarship of teaching.

It may be appropriate to expand the concept of the "Scholarship of Engineering Education" (SEE), in light of the views expressed by Boyer. Some faculty may want to perform rigorous educational research in engineering (Boyer types 1 and 2), while other faculty may prefer to implement new teaching practices (Boyer type 3), and yet others may want to just improve their teaching skills (Boyer type 4) or innovate in the classroom with new technologies. Indeed, the concept of SEE could have many branches, as illustrated in Figure 1. ASEE can take

the lead in defining these various branches, put into place efforts to address each of them by our membership, and produce an archive of best practices.

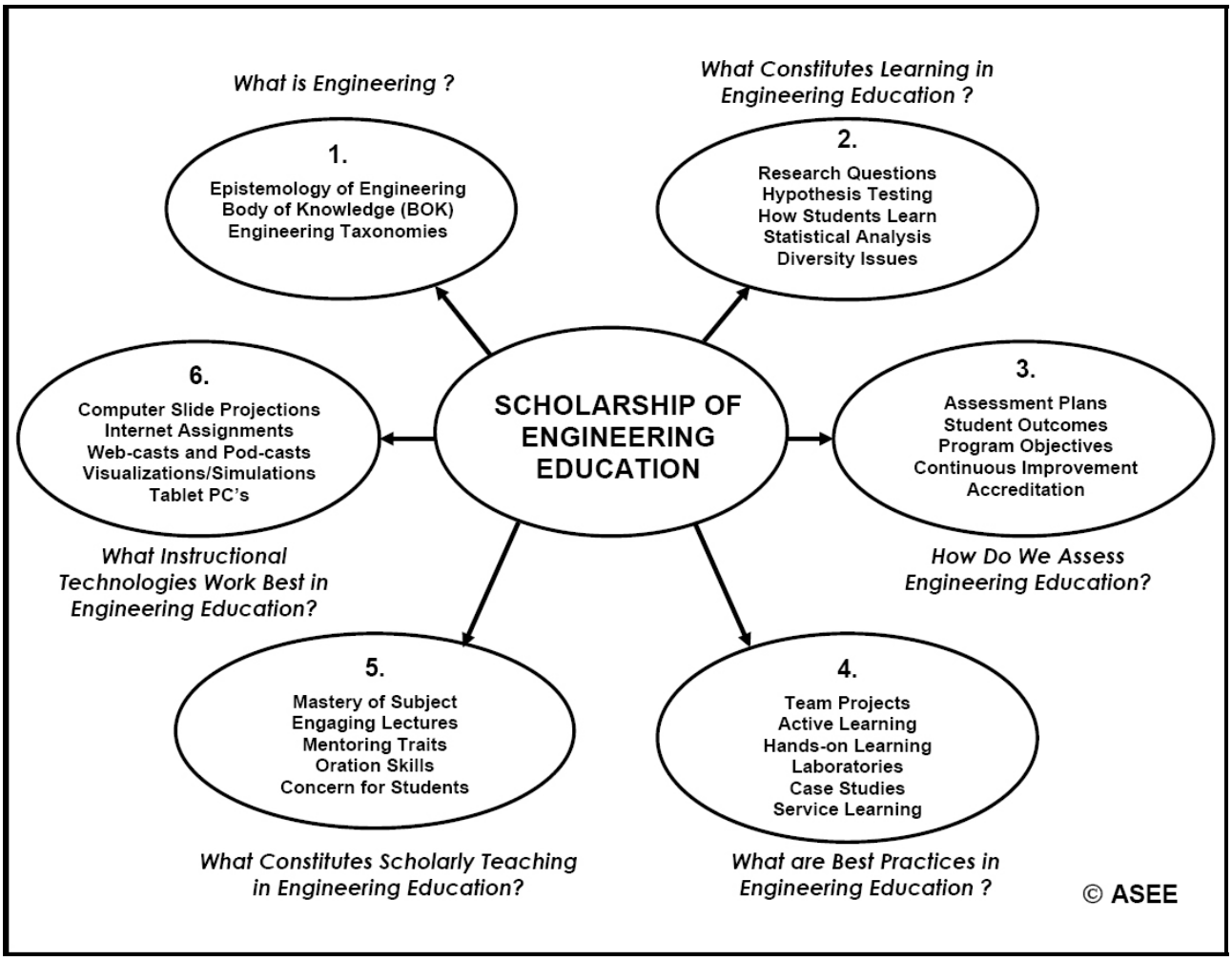

Figure 1: The Scholarship of Engineering Education (© ASEE). Boyer's Four Levels of Scholarship Can Be Mapped Clockwise Around the Branches

In particular, a citation [3] from the Pacific Northwest (PNW) Section meeting seems to have captured the diversity and spirit of YOD thinking, and fundamentally supports the ideas conveyed in Figure 1. It reads:

> Dr. Teri Reed-Rhoads (Purdue University) described five areas of engineering education scholarship: (1) knowing what students need to learn, or epistemology; (2) knowing how they learn, or learning mechanisms; (3) knowing how we teach it; (4) knowing how we can be more inclusive; and (5) knowing how we know it works, including assessment. Engineering education needs transformational change, from how we recruit students through what happens to them after they graduate, involving business, academics, and government. The engineering curriculum has changed remarkably little in 100 years. Unlike law, medicine, and policy schools, we have not

diversified even our undergraduate programs, while those fields are now working on diversifying their full partners in businesses. "I'm hoping that research in engineering education becomes the engine that drives these changes to improvement."

Conclusions and Recommendations

While it is not very easy to write a succinct report which describes the discussions that took place over time and area, it is clear that there are three observations that can be immediately made:

- There are a number of very important topics and issues that emerged from the YOD discussions and they must be discussed in an on-going fashion within ASEE and beyond.
- Actions must be taken to respond to the YOD report and the very important problems facing engineering education
- There should be a necessary prioritization of these actions, to minimize both time and effort, to achieve a maximum effect.

It is most helpful that some recommendations be made which the ASEE body can use as an agenda in the coming year or two. These include:

1. That the Board Of Directors take time to have a directed study of this YOD report and the many other issues facing engineering education and initiate a process to begin implementing recommendations from their study.

2. That the ASEE Dean's Council and Engineering Technology Council discuss these recommendations at its meeting and assist in developing a process for implementation.

3. That ASEE partner with the appropriate people at NSF to devise a plan to support efforts to energize the engineering education process, including increasing the pipeline and the image of engineering to the general public.

4. That NSF be urged to capitalize on the huge efforts and money that went into the ERC Education Coalitions that are no longer functional and to urge use of best practices discovered by them.

5. That the ASEE section conferences and the national conference organizers support the most important issues facing our enterprise through the judicious allocation of plenary sessions, invited sessions, and open sessions each and every year.

6. That the BOD designate each year as dealing with a special topic and doing a follow-up report that in some sense represents the best thinking with respect to engineering education.

7. That the ASEE sections be encouraged to have a specific session/panel/speaker on K-12 issues, and invite local STEM teachers and pupils to come as guests to this session.

It seems imperative that the most important part of this report is not delivery, but the follow-up that takes place. This requires a firm commitment on the part of ASEE that often is lacking in the initiatives of other groups or committees in the past, such as the NAE 2020 reports. The above recommendations should be taken into consideration during meetings in 2008, and plans for implementation of action items be ready by January 2009.

References

[1] Augustine, Norman (2005): *Rising Above the Gathering Storm*, National Academies Press, Washington, D.C. (available at http://www.nap.edu/execsumm_pdf/11463.pdf)

[2] Boyer, Ernest L.(1990): *Scholarship Reconsidered: Priorities of the Professoriate*, Princeton University Press, Princeton, New Jersey, 147 pages.

[3] Reed-Rhoads, Teri, (2007): *Citation*, ASEE Pacific Northwest Section Meeting, Pullman, Washington.

Appendix A

Table A.1 – Consolidated Data for Category A (Faculty Issues and Rewards)															
1. Consider Educational Research in Promotion and Tenure	√		√			√	√		√	√	√	√	√	9	**A**
8. Seek Input and Support from the Engineering Deans	√		√		√	√	√		√	√			√	8	**A**
35. Small Teaching Schools versus Large Research Schools.				√			√		√		√	√		5	**A**
12. Create Different Pathways for Faculty Promotion and Tenure	√		√			√							√	4	**A**
37. Increase Faculty Rewards						√	√		√					3	**A**
39. Provide Early Mentoring						√	√		√					3	**A**
27. Engage Research Faculty in Undergraduate Teaching					√		√							2	**A**
41. Teach Graduate Students How to Teach											√	√		2	**A**
36. Provide Continuing Ed Credits						√								1	**A**
40. Change Culture at Conferences						√								1	**A**

Table A.2 – Consolidated Data for Category B (Pre-College K-12 and Outreach Issues)															
21. K-12 STEM Education and Engineering Student Recruitment.		√		√		√			√	√		√	√	7	**B**
31. Focus on Early Science and Math Course Improvements.											√	√		2	**B**
23. Summer Engineering and Science Camps for Students		√												1	**B**

33. Modern Students Grew-Up in a "Video Gaming" Environment.										√				1	**B**
38. Develop Outreach Programs						√								1	**B**
42. Address Diversity Issues									√					1	**B**

Table A.3 – Consolidated Data for Category C (Curriculum Reform and Evaluation Issues)

9. ASEE Should Compile and Promote Best Teaching Practices	√				√		√		√	√	√	√	√	8	**C**
6. Discussed ABET Standards and Influence			√		√	√	√							4	**C**
22. Try Active Learning, Hands-on, Project-based, Adaptive Teaching, etc.		√			√					√			√	4	**C**
24. Establish Engineering Assessment Measures for Teaching	√		√			√						√		4	**C**
10. Discuss Body of Knowledge for Engineering Education	√		√											2	**C**
15. Teach Creativity and Innovation			√											1	**C**
28. Teach Lifelong Learning				√										1	**C**
30. Have a General BA in Engineering				√										1	**C**
32. Include Communication and Multi-cultural Skills.										√				1	**C**

Table A.4 – Consolidated Data for Category D (Outside Resources and Influences)

5. Seek Industry Input on SEE					√	√	√	√			√		√	6	**D**
2. Discussion of "Rising Above the Gathering Storm"			√		√			√	√	√				5	**D**
17. Think Globally, Educate Global Engineers			√			√		√		√	√			5	**D**
3. Discussion of the "Engineer of 2020" Report			√		√			√	√					4	**D**
4. Discussion on Socratic Dialog in Chicago		√	√			√			√					4	**D**

19. ASEE Should Produce a Report on SEE	√							√						2	**D**
29. Promote Engineering Careers to the American Public				√					√					2	**D**
25. What was the Influence of Recent NSF Coalitions on Engineering Education					√									1	**D**

Table A.5 – Consolidated Data for Category E (Research Topics and Issues)

18. SEE has Many Aspects Besides Rigorous Educational Research	√	√	√				√	√	√	√	√			8	**E**
7. Compared Educational Research to Technical Research	√		√	√			√	√	√		√			7	**E**
11. Seek Opportunities to Publish Papers in JEE and AEE			√			√	√	√	√		√	√		7	**E**
14. Partner with Social Scientists and Learning Scientists			√	√			√		√			√		5	**E**
16. Study “How People Learn” and Learning Styles			√				√				√	√	√	5	**E**
13. ASEE Should Create More Short Courses, Teaching Seminars, Educational Research Sessions	√				√	√				√				4	**E**
20. Look at Chemistry and Physics Education for examples			√								√			2	**E**
26. Track the Development and Success of New Engineering Education Programs					√						√			2	**E**
34. Increased Focus on Research Because of State Funding Cuts									√			√		2	**E**