

AC 2008-2531: MATERIAL ADVANTAGE AT IOWA STATE: A CASE STUDY FOR STUDENT PRE-PROFESSIONAL SOCIETY SUCCESS

Michael Kessler, Iowa State University

Michael Kessler is an Assistant Professor of Materials Science and Engineering at Iowa State University. His research interests include the mechanics and processing of polymers and polymer matrix composites, thermal analysis, fracture mechanics, and biologically inspired materials.

Emily Merrick, Iowa State University

Emily Merrick is an undergraduate Materials Engineering student at Iowa State University and the president of the Iowa State chapter of Material Advantage, the ACerS-AIST-ASM-TMS pre-professional society for materials engineering majors and those interested in materials science and engineering.

Lawrence Genalo, Iowa State University

Larry Genalo is Professor and Associate Chair of the Department of Materials Science and Engineering at Iowa State University. He served as Chair for the Freshman Programs and DELOS Divisions, and runs the Toying with Technology Program at Iowa State and the recruitment program in the Materials Science and Engineering Department.

Material Advantage at Iowa State: A Case Study for Student Pre-professional Society Success

Abstract

For four years in a row, the Material Advantage student society at Iowa State University (ISU) has been selected as the nation's Most Outstanding Chapter. This paper examines, as a case study, the activities and programs of the chapter at ISU, with implications to other student pre-professional societies. Activities have included plant tours, technical meetings and seminars, special events, joint meetings, community involvement, fundraising, and participation in various technical conferences. In addition, the results of a survey are presented aimed at identifying the factors that most contribute to the society's success at ISU.

Introduction

Professional societies play an important role in the training and continuing education of scientists and engineers. These societies are also beneficial to the career progression of their members by providing networking and professional service opportunities.¹ Typically, engineers are first exposed to professional societies as college sophomores or juniors through pre-professional student chapters of the society, where students are able to join at substantially reduced fees and participate in a variety of networking, project, and service experiences.² Most often, students continue their membership upon graduation from college and as a way to stay abreast of the changes in their field and enhance their professional and technical capabilities.³

At universities, active student pre-professional societies can greatly enhance the engineering curriculum. Reid and Tiltrum⁴ noted several ways that this enhancement takes place in engineering departments, including:

- exposure to the practice and breadth of engineering,
- networking for internships and post graduation employment,
- development of teamwork, communication, and leadership skills, and
- promotion of service to the profession.

They also suggested several factors that were considered critical for student pre-professional society success:

- outstanding student leaders,
- involvement of underclassmen,
- institutional support,
- active program,
- attendance at parent society activities away from campus,
- active advisor, and
- adequate funds and fund raising activities.

Material Advantage, with more than 75 local chapters at top materials science and engineering universities globally, is a student program for Materials Engineering students. Material

Advantage is a cooperative between four partnering societies: the American Ceramic Society (ACerS); the Association for Iron and Steel (AIST); ASM International; and The Minerals, Metals, and Materials Society (TMS). Student members in Material Advantage are automatically also members in the four partnering societies.

Each year a *Chapters of Excellence* competition is held where local chapters are chosen in recognition of overall excellence in chapter programming, career development, service, social activities, and chapter management. For four years running, Iowa State University's Material Advantage chapter has been selected as the Most Outstanding Chapter. ISU's Chapter is completely organized and administered by student leaders with nearly 75 (45%) of the undergraduate Materials Engineering students enrolled.

In this paper, we will examine the factors that contributed to the success of Material Advantage at ISU and suggest how these factors may be used to improve the success of other pre-professional student led societies.



Figure 1. ISU Material Advantage students receiving the Chapter of Excellence Award in 2005 [Photo Courtesy of Iowa State, MSE Department].

Description of Material Advantage at ISU⁵

The success of any student pre-professional society is not possible without dedicated student leaders to organize and run the program. The Material Advantage chapter at ISU has several leadership positions making up an executive council: President, Vice President of Programming and Events, Vice President of Outreach and Fundraising, Secretary, Treasurer, Programs Chair, Events Chair, Outreach Chair, and Fundraising Chair. These leaders work hard to provide their members with a number of diverse programs, career development options, outreach activities, and social activities. Elections are held in early April to allow time for officer transition.

Meetings are scheduled each month of the academic year and feature speakers, free dinners, and ice breaker activities. Guest speakers at these meetings include faculty, industry representatives, and alumni that typically present a technical materials engineering seminar. In addition, these meetings are also used to present updates on past and planned activities and discuss chapter business. The executive council meets the week prior to each monthly meeting for planning and organization, enabling a smooth operation of upcoming meetings and events.

Students have a desire to attend national conferences of their societies as an opportunity to interact with other students and professionals, network with potential employers, and exchange with other practitioners or researchers.² In the 2006-2007 academic year, 50 students attended one of three different technical conferences: Materials Science and Technology (MS&T) Conference in Cincinnati, The Minerals, Metals, and Materials Society (TMS) Annual Meeting in Orlando, and the Association for Iron and Steel Technology (AIST) Conference in Indianapolis. Seven students also participated in the Federation of Materials Societies (FMS) Congressional Visit Days (CVD) in Washington DC to take part in the FMS delegation's lobbying efforts to communicate the importance of funding scientific research and education with congress.

Industrial tours are also a popular programming element. For the 2006-2007 academic year, eight industrial tours were organized to companies. In the fall students toured Guardian Glass (Dewitt Iowa), Gerdau Ameristeel (Eldridge, Iowa), and Fisher Controls/Emerson Process (Wilton, Iowa). While travelling to the MS&T annual conference, 30 students toured General Electric (Cincinnati, Ohio). In addition, a spring trip was organized to Wisconsin where four company tours were organized: Spuncast (Watertown, Wisconsin), Mercury Marine (Fond Du Lac, Wisconsin), Kohler (Kohler, Wisconsin), and Harley Davidson (Wauwatosa, Wisconsin). These tours provided the students with valuable "on-site" experience in a variety of materials related industries. Students also participated in several other career development activities. For example, members were able to attend a career tips session with a large equipment manufacturer about interviewing and resume writing.

In addition to these technical programming and career development activities the Material Advantage chapter has been active in several service projects; with service to the profession, community, and campus. One service outreach activity was assisting department chairs with two open houses for undeclared freshmen in engineering to learn more about pursuing a materials engineering degree, study abroad opportunities, co-op and internship opportunities, and research opportunities. Material Advantage members also hold presentations with materials demonstrations and discussion during Senior Visitation Day in the fall semester for high school seniors interested in ISU and engineering, and at ISU College of Engineering Scholar's Day in the spring semester (also a recruiting visit for high school seniors who have been offered scholarships from the College of Engineering). During Family Weekend in September, Material Advantage members provide tours of the MSE facilities to alumni, families, and prospective students, with a focus on undergraduate laboratories and classrooms.

Service opportunities for the community have included assisting the Society of Women Engineers organize and host a Halloween Haunted House for children from the ages of five to ten, participating in the ISU Dance Marathon fundraiser for Children's Miracle Network and

University of Iowa Children's Hospitals, serving as timekeepers, scorekeepers, and assistants at the DOE Ames Lab High School and Middle School Iowa Science Bowls, and performing demonstrations for Science Night at a local elementary school. In addition, each Christmas the chapter participates in the "Adopt-a-Family" program through the Youth and Shelter Services of Ames by soliciting gifts from chapter members and faculty and donating proceeds from their weekly pizza sale fundraiser. Chapter members then purchased, wrapped and delivered all the gifts to the participating families.

Finally, the chapter has been very active in serving the community through participation in ISU's annual VEISHEA celebration, an annual parade and festival that last year attracted more than 100,000 people from around Iowa. During the festival, the chapter presented materials demonstrations and talked to prospective students. The chapter also hosted a large outdoor concert called "Amp'd for Innovation" which had been heavily advertised in area high school Chemistry and Physics classes. In addition to the bands, the concert included materials engineering demonstrations, including a 13ft long Oobleck (cornstarch and water which exhibits extreme shear thickening behavior) sidewalk to run and play in.

Perhaps one of the biggest factors in the success of Material Advantage is the many opportunities for social interaction with fellow Materials Engineering students. Iowa State University has one of the nation's largest undergraduate engineering programs. While the University is quite large, the number of students majoring in Materials Engineering is under 200 (large for a Materials Department, but small compared to the other engineering departments on campus). As such, students in Materials Engineering have many opportunities to develop close friendships with fellow students in their major. This unique, small department on a large campus, makes the social aspects of the chapter's programs particularly attractive to students. These friendships are enhanced through the social interactions that are possible in Material Advantage. Some of the social activities sponsored by the chapter include a welcome back picnic after the first week of classes in the fall (this has been an effective recruiting tool for current members to meet potential new members), and Friday After Class (FAC) dinners at a local pizza restaurant, Mat E Mixers, and a year-end picnic.

The most successful fundraising activity is the weekly pizza sales during the academic year. The pizza, delivered by a local grocery is resold by the slice to students, faculty, and staff in a highly trafficked building which houses the Materials Science and Engineering Department. Some weeks the group sold more than 100 pizzas in this way. The officers also wrote several proposals to the Dean of Engineering, Engineering Student Council, and the MSE Faculty to receive funding for club activities such as industrial tours, club picnics, demonstration supplies, and professional conference attendance. Additional fundraising efforts included the sale of MSE Top 10 T-shirts, MSE polo shirts, and pop sales in the dedicated student room. This dedicated student room also served as a central storage and meeting area for students in Material Advantage. Communication is carried out by e-mail, a bulletin board in the student room, a newsletter, and a Facebook group on the internet.

Survey Results

A short survey was given to the student members of Material Advantage in order to assess some of the factors that contribute to the success of the society. The survey, shown in the Appendix, asked 13 questions. Questions 2-9 used a six point Likert scale to indicate if they strongly disagree, disagree, slightly disagree, slightly agree, agree, or strongly agree with each statement. A number from 1 (for strongly disagree) to 6 (for strongly agree) was assigned to each selection. The last two questions were open ended short answer questions asking the students to list strengths of the Material Advantage at ISU and comment on what the Materials Science and Engineering Department could do to improve the society. A total of 23 students responded to the survey. Question 1 found that 18% of the students responding were freshman, 5% were sophomores, 32% were juniors, 27% were seniors, and 18% were graduate students.

The next seven questions/comments from the survey are listed in Table 1 below. Histograms, showing the distribution of Likert scale responses for each question, are shown in Figure 2.

Table 1. Likert scale questions from survey.

| Question/Comment | Average Response |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 2. I am very involved with Material Advantage. | 4.1 |
| 3. The MSE Department is very supportive of the Material Advantage society. | 5.6 |
| 4. The Material Advantage students have plenty of freedom in chapter programming, service and social activities. | 5.5 |
| 5. Dedicated space for materials engineering student (3 rd floor of Hoover) enhances the success of the club. | 5.4 |
| 6. Money (from the university, student dues, and fundraisers) for programming is adequate. | 4.8 |
| 7. Field trips and outreach activities are big contributors to the society's success. | 5.4 |
| 8. Most of the materials specialties (i.e. metals, ceramics, polymers, electronic materials) are adequately represented in the society. | 4.8 |
| 9. The Chapters of Excellence (Most Outstanding Chapter) competition with Material Advantage chapters at other universities motivates me to be more involved. | 4.2 |

There was a clear correlation between the students' year of study and their degree of involvement: the freshmen and graduate students are clearly less involved. Three quarters of the freshmen and graduate students disagreed with the statement that "I am very involved with Material Advantage."

The important factor in terms of importance for the success of Material Advantage at ISU from question 10 was "programming freedom (student led vs. faculty led)" and "Funds (money) to provide service to members" with average rankings of 2.2 and 2.0 respectively. Students that ranked themselves as very involved with Material Advantage (4 or higher on Question/Comment 2) ranked the most important factor as "programming freedom", while less involved students ranked "Funds to provide services to members" as the most important factor. "Designated space in MSE building" came in third with an average ranking of 2.7, while recruiting ranked last at 3.3. From Question 11, one third of the students reported becoming involved in Materials

advantage as a result of an invitation by a friend, while another third of the students became involved after an E-mail invitation and 21% joined after an announcement in class.

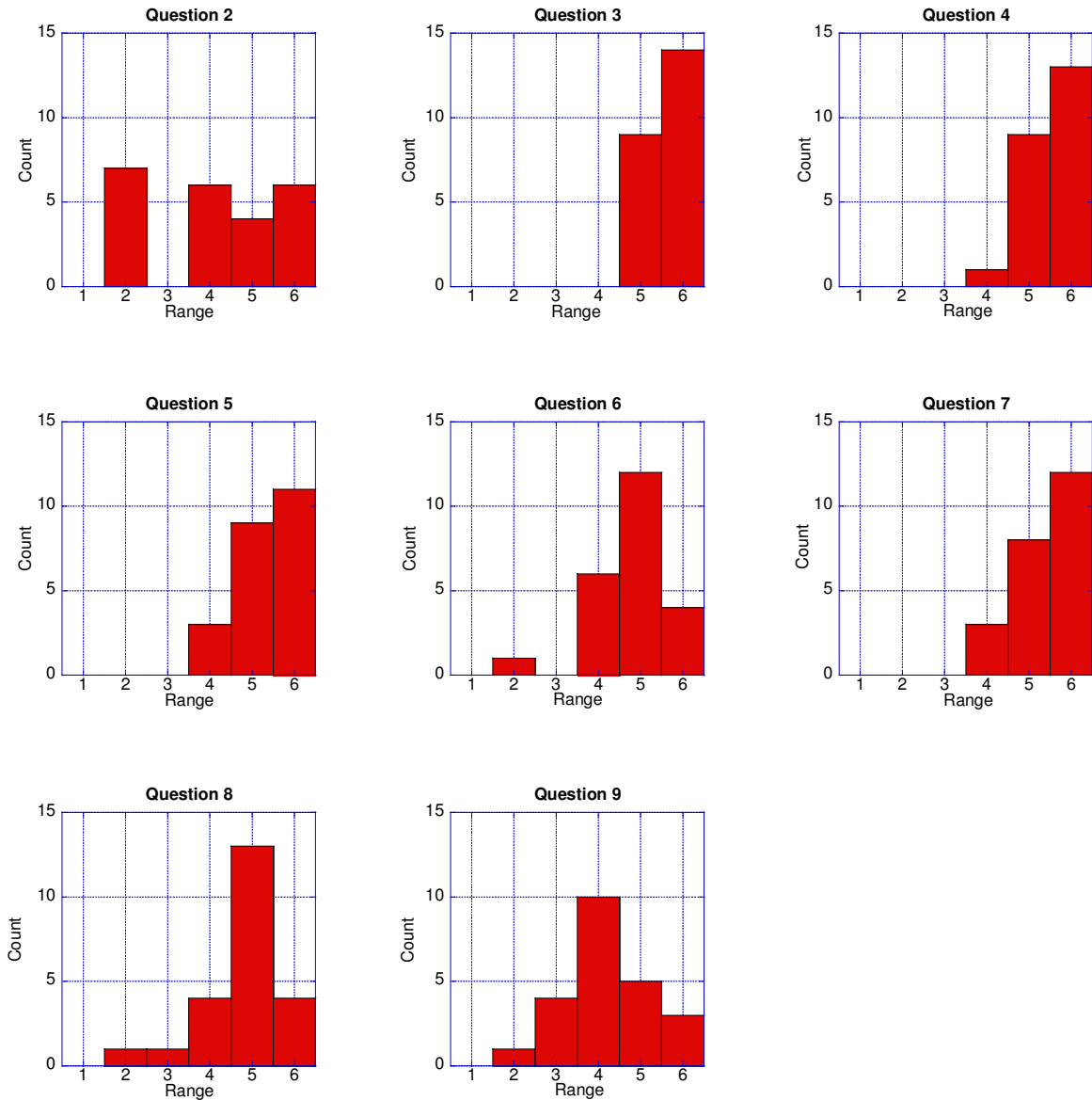


Figure 1. Histogram results for Likert scale results for comments 2 through 9. Strongly Disagree = 1, Strongly Agree = 6.

In the short answer response to the question “What are the strengths of the Material Advantage society at ISU?”, several students mentioned the great student leadership and dedication, fund raising efforts, and social activities. Some comments for this question (Question #12 in the Appendix) are shown below.

- *There are a lot of students willing to volunteer their time to improve our chapter. Many members strive for leadership positions within the chapter. One huge benefit is the amount of money we raise from both pizza sales but also from the department. I personally am very glad that our chapter is student led. This makes the students take more responsibility and also we get to decide what we want to do and where we want to go.*
- *The large number of members allows for the club to find a sufficient number of volunteers to aid in organizing and running the many trips and activities that take place throughout the year. The money raised throughout the year also provides for cheap activities so that more members will participate.*
- *Great student involvement and support from the department. Excellent sense of community. Lots of conference and tour opportunities.*
- *I think the social, close knit atmosphere of the department has a lot to do with the success of the club. The student room is great for getting to know some of the younger students and inviting them to the meetings. Also many of the professors encourage group work which really helps to form friendships. The small size of the department makes it less intimidating to get involved. There are always lots of things to get involved with, like pizza sales, demos, industry trips, and VEISHEA events. The club and department does a great job of encouraging students to attend conferences, which is a great opportunity. The large number of dedicated people on the executive board makes it possible to accomplish all the things the club does. I don't think that would happen with the typical president, vice president, treasurer, secretary structure.*
- *The students who are involved and willing to put the time in has led to a very excellent chapter. Creativity and knowledge from previous years also has contributed to the continued success of the chapter.*
- *Strong student leadership allows group to be cohesive and still goal-oriented. Field trips funded by MA make it a really fun society to be a part of.*
- *I think one of the main strengths is the high number of students that are involved in our dept. We are a small program but there are so many people that it really makes us work together better, both in the club and in classes.*
- *The strength really is that everyone (or nearly everyone) in the department is involved. It's a great place for socializing and keeping friends in the MSE department. Further, the outreach program and industrial tours make it a solid, worthwhile group.*
- *The networking that the group provides...I feel as if I know or at least recognize most materials engineering students and faculty members.... I also thing having the student room is a large part of the bonding experience. Most Mat Es spend a decent amount of time in there and some of the best ideas are created in there. It also allows us to bond in a less formal atmosphere where everyone feels at home. I think one of the strongest*

points of our group is that while it is student led, it has strong faculty support—we could never do the things we do without the support of our faculty. As students, we like to feel like we are in charge because it gives us pride in our group, but we wouldn't be able to pull off most of the stuff we do without the wonderful support system we have from our faculty. This also draws the students closer to the faculty because we know how much they support us.

Short answer response to the question “What could the Materials Science and Engineering Department do to improve the student run Material Advantage society?” (Question #13 in the Appendix) include:

- *The main way the MSE Department could improve the Material Advantage society would be to help with recruiting by hanging up posters with meeting times and locations.*
- *I think the department already does a great job of supporting the club. It might be beneficial to have some sort of student liaison between the faculty and the club that could come to faculty meetings once a month and let the department know what we're up to. Also I think there could be more coordination between the outreach that the department and the club does- maybe have students go along on demo trips and help out.*
- *Any constructive criticism and additional faculty support is more than welcomed. Though there has been solid continuity to the group as far as constant improvement goes, the faculty and staff of the department are here longer than the students are and the previous knowledge that group could provide would be a useful feature for future years.*
- *Improve the recruitment of freshmen and sophomores.*
- *Obviously we need to get the younger students more involved.*
- *Help expand our networking capability. Whether it's suggesting speakers for our meetings, interesting companies to visit, letting us know about any new and exciting discoveries in their research, etc.*

Conclusions

The active Material Advantage Chapter has had significant benefits for the Materials Science and Engineering Department at Iowa State. Some of the benefits have included a marked increase in enrollment due to the active recruiting and demonstrations to high school students and undecided engineering students that the Material Advantage members facilitated.⁶ The active student chapter has also been helpful in recruiting faculty, both by their large presence and visibility at the annual MS&T Conference and by meeting with faculty candidates during on-campus interviews. Finally, the Material Advantage Chapter has provided an effective feedback mechanism to obtain information about the needs and concerns of the students in the department. For example, members of the Material Advantage club are frequently asked to participate in the industrial advisory council meetings through student interviews and discussion.

Appendix

Material Advantage Survey

We are interested in your thoughts about factors that contribute to the success of Material Advantage at ISU. Specifically, we are hoping to write a paper for an engineering education conference describing the Material Advantage society at ISU and examining what has led to its remarkable success. There are no right or wrong answers. Just tell us what you think.

1. Year of study: (a) Freshman (b) Sophomore (c) Junior (d) Senior (e) Graduate

Read each item carefully and circle the response (strongly agree, agree, slightly agree, slightly disagree, disagree, strongly disagree) which best describes your feelings about each item.

| | Strongly Disagree | Disagree | Slightly Disagree | Slightly Agree | Agree | Strongly Agree |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|-------------------|------------------------------------------------------------------------------------------------------------------------------|-------|----------------|
| 2. I am very involved with Material Advantage. | 1 | 2 | 3 | 4 | 5 | 6 |
| 3. The MSE Department is very supportive of the Material Advantage society. | 1 | 2 | 3 | 4 | 5 | 6 |
| 4. The Material Advantage students have plenty of freedom in chapter programming, service and social activities. | 1 | 2 | 3 | 4 | 5 | 6 |
| 5. Dedicated space for materials engineering students (3 rd floor of Hoover) enhances the success of the club. | 1 | 2 | 3 | 4 | 5 | 6 |
| 6. Money (from the university, student dues, and fundraisers) for programming is adequate. | 1 | 2 | 3 | 4 | 5 | 6 |
| 7. Field trips and outreach activities are big contributors to the society's success | 1 | 2 | 3 | 4 | 5 | 6 |
| 8. Most of the materials specialties (i.e. metals, ceramics, polymers, electronic materials) are adequately represented in the society | 1 | 2 | 3 | 4 | 5 | 6 |
| 9. The Chapters of Excellence (Most Outstanding Chapter) competition with Material Advantage chapters at other universities motivates me to be more involved. | 1 | 2 | 3 | 4 | 5 | 6 |
| 10. Rank the following factors in terms of importance for the success of Material Advantage at ISU (most important is #1) | | | | | | |
| <ul style="list-style-type: none"> • Programming freedom (student led vs. faculty led) • Funds (money) to provide services to members • Recruiting | | | | <ul style="list-style-type: none"> • Designated space in MSE building • Other (please specify) _____ | | |

11. I became involved in Material advantage by:
 (a) Invitation by a friend. (b) Announcement in class. (c) E-mail invitation. (d) Seeing a poster (e) Other _____

Short Answer:

12. What are the strengths of the Material Advantage society at ISU?

13. What could the Materials Science and Engineering Department do to improve the student run Material Advantage society?

Bibliography

- ¹ Corbin, John C., Role of the professional society in the career development of engineers. IEEE Aerospace and Electronic Systems Magazine, v 3, n 3, Mar, 1988, p 12-16.
- ² Apul, Defne; Tufenkji, Nathalie, Student expectations from an environmental professional society. Environmental Engineering Science, v 24, n 9, Nov 1, 2007, p 1201-1217.
- ³ Moore, William W., What your professional society can do for you. Journal of Professional Issues in Engineering, v 112, n 3, Jul, 1986, p 186-189.
- ⁴ Reid, Richard A.; Tiltrum, Charles A., Eight factors for creating an active student professional society and how it enhances the engineering curriculum, ASEE Annual Conference Proceedings, 2003, p 4399-4409.
- ⁵ Chapter of Excellence Nomination, Iowa State University Material Advantage Student Chapter, Submitted June 1, 2007.
- ⁶ Genalo, Lawrence; Chumbley, Scott, An undergraduate materials recruitment and outreach program. ASEE Annual Conference and Exposition, Conference Proceedings, 2007, 21p.