

Student Response to a General Education Course on Materials

M. Grant Norton, David F. Bahr

**School of Mechanical and Materials Engineering
Washington State University Pullman WA 99164-2920**

Abstract

This paper describes the response that students have had to our general education course on materials. The course is now in its fourth year and we have been able to collect data from student surveys distributed at the end of each semester. Also included are details of some of the resources that we have found particularly useful in teaching this course.

Introduction

To increase the awareness of materials among the general student population at Washington State University (WSU) we developed a course, MSE 440 *Materials: The Foundations of Society and Technology*. This course is taught as a Tier III course in the General Education Program and was offered for the first time in Fall 2000, and has now been offered four times (fifth time in progress at time of writing). At the 2002 Annual Meeting we presented the rationale for developing the course, what we teach, and student feedback.¹ The present paper provides an update on the course, the results of student surveys, and resources that we use in the course.

Enrollment Data

Our course is targeted towards students with non-SMET backgrounds. We try to recruit students from as diverse academic disciplines as possible. Table I shows the majors that have participated in the course over each of the four semesters it has been offered. (The data for spring 2004 is based on present enrollment.) The number of different majors that have taken the course is now 29 indicating that we are being successful in reaching out to students in the broad university community. The other observation that can be made from Table I is that each time the course is offered we are often retaining students in a major that have already taken the course. The main exception to this is that there were no architecture students in the course for spring 2003. In the spring 2003 semester our course clashed with a required architecture course, in spring 2004 we are back to having several architecture students. In the first three years student word of mouth has seemed to be very important in attracting students into the course. This observation indicates that students in majors that have taken the course are enjoying it and finding it of interest and recommending it to their colleagues. We still would like to attract more students from the liberal arts. We are working with faculty in these programs to try and promote our course among their students. Interestingly, the spring 2004 course showed that few students this semester enrolled

due to word of mouth, which may be significant in that we have now offered the course in the spring, and graduating seniors were not around the next semester to pass on this information.

Table I. Majors enrolled in MSE 440 by semester (total number of students)

Fall 2000 (18)	Fall 2001 (33)	Spring 2002 (28)
Architecture Construction Management Agriculture Education Computer Science Physics Electrical Engineering Management and Information Systems	Architecture Construction Management Agriculture Computer Science Physics Marketing Crop Science Business Business Administration Mechanical Engineering Communication Genetics and Cell Biology	Architecture Construction Management Agriculture Animal Sciences Communication Management Biology Materials Science Management and Information Systems Education Physics History Natural Resources—Wildlife Ecology Bus. Admin.—Real Estate Bus.Admin.— Entrepreneurship
Spring 2003 (18)[‡]	Spring 2004 (29)[‡]	
Business Administration Accounting Microbiology Physics Mechanical Engineering Communications Agriculture Agricultural Economics	Architecture Electrical Engineering Finance Management and Information Systems Animal Science Business Administration Agricultural Economics Construction Management Interior Design Mechanical Engineering Physics Zoology Music Chemistry Communication Anthropology Marketing	

[‡] Several of the students in these two semesters had not specified their major or were currently switching majors.

Instructor Resources

We do provide extensive notes for the students on each of the course topics and, under the auspices of NSF funding, we are writing a textbook to accompany the course. There are many widely available resources that we have found particularly useful for this course. JOM, a publication of the Minerals, Metals, and Materials Society, has been publishing a series of feature articles under the topic of *Archaeotechnology*. These articles are often written by scientists and engineers but are at a suitable level for students in the course. MRS Bulletin, a publication of the Materials Research Society and Invention & Technology are also very useful resources.

There now exists an extensive range of professionally produced videos that cover topics relevant for the course and at a level easily accessible to the general student population. Videos that we have used in the past include the Nova production entitled “The Diamond Deception” and a new program “Why the Towers Fell”, which we will show and discuss this spring. The History Channel Modern Marvels series includes several titles that are very relevant to a general education course on materials. Specific titles that have proved popular with the students are “American Steel—Built to Last” and “Plastics”. We have also used selected programs from the History Channel series “Gold”.

Table II lists the videos that have been found to be suitable for the course. They all have a running time of approximately 50 minutes so can be shown during a regular class period.

Table II. Video resources used for course

Title	Producer	Date
American Steel—Built to Last	The History Channel A&E Television Networks	1996
Sports Tech Equipment	The History Channel A&E Television Networks	1997
Prosthetics	The History Channel A&E Television Networks	1998
Concrete	The History Channel A&E Television Networks	1999
Garbage	The History Channel A&E Television Networks	1999
Engineering Disasters	The History Channel A&E Television Networks	1999
Gold! The History of Man’s Greatest Obsession	The History Channel A&E Television Networks	2001
The Diamond Deception	NOVA WGBH Educational Foundation	2000
Why The Towers Fell	NOVA WGBH Educational Foundation	2002

The videos are used to generate topics for class discussion and some of the questions on the weekly quizzes are based on material in the video.

Student Feedback

The student response to date that we have received for this course has been extremely positive. In addition to receiving very high overall student responses on the standard College of Engineering student evaluation forms we have also received positive feedback from our own questionnaire that we distribute to the students at the end of each semester. The questionnaire that we developed seeks to find out how the students felt about the course, the areas/topics that they liked/found most useful and also recommendations they have for improvements in the course for future semesters.

Some of the data obtained for fall 2000 through spring 2003 is summarized in Table III. In the questionnaire 5 was classified as the strongest positive response, 3 a neutral response, and 1 the strongest negative response.

Table III. Student Responses to Questionnaire

	Fall 00	Fall 01	Spring 02	Spring 03
Did you like the course	4.6±0.5	4.1 ± 0.6	3.6±1.0	4.5±0.5
Would you recommend the course	4.9±0.3	4.6 ± 0.5	4.1±0.9	4.8±0.4
Knowing what you now know would you have taken this course	4.8±0.6	4.3±0.8	4.0±0.9	4.6±0.7
How would you compare this class to other GER courses you have taken	4.5±0.8	4.0±0.7	3.7±1.1	4.4±0.7
Was the number of topics covered about right	4.4±0.7	4.2±0.6	4.0±0.7	4.4±0.7
Were there additional topics you'd have liked covered	2.9±1.2	2.8±0.7	2.5±1.0	2.5±0.9
Was the course too heavy on engineering	1.9±0.8	2.3±1.0	2.4±1.2	1.8±1.3
Did the assignments give you a greater appreciation for the role of materials in society	4.1±0.7	3.4±0.9	2.6±1.3	4.1±0.9
Did the quizzes help you learn the course material	3.5±1.2	3.4±0.9	3.0±1.1	3.3±0.7
Would this course have benefited being co-taught by liberal arts faculty	1.5±0.8	1.7±0.9	1.5±0.7	1.8±0.9

The survey data indicate a high level of student satisfaction with the course and in particular when compared to other general education courses the students have taken. The survey indicates that students may have difficulty in seeing how materials impact their major. This result is perhaps not surprising considering the broad range of majors in the course. Architecture majors, for example, clearly see how developments in materials have changed how buildings are designed and constructed. But a student in Genetics and Cell Biology may have more difficulty appreciating what impact materials have had in that field based on the topics we cover. The

implication for us as the teaching faculty is that we have to help students make these connections, particularly as we seek to increase the number of majors represented.

We have found no evidence that students from outside engineering are reluctant to take, or regret taking, a course from engineering faculty. In fact, students have commented on their surveys that they were comfortable with the course format. One specific comment we received was that the course: “*Increased my knowledge of materials without making me feel like I needed to be an engineer*”.

Acknowledgment

We gratefully acknowledge the financial support of the National Science Foundation Division of Undergraduate Education (award number 0126794).

References

1. M.G. Norton and D.F. Bahr, ‘An Upper-Division General Education Course on Materials for Non-Engineering Students’, *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition*, Montréal, Canada (2002).

Biographical Information

M. GRANT NORTON is Professor in the School of Mechanical & Materials Engineering and Chair of the Materials Science Program. He has won several awards for teaching including the ASEE Outstanding Teaching Award for the Pacific Northwest. Dr. Norton has over 125 publications in the archival literature and is co-author of *X-Ray Diffraction: A Practical Approach* published by Plenum.

DAVID F. BAHR is Associate Professor in the School of Mechanical & Materials Engineering. He received the 2003 Bradley Stoughton Award for Young Teachers from ASM and was a recipient of a PECASE/DOE Presidential Faculty award. Dr. Bahr has over 70 publications in the archival literature.