



Tulane
BMEN

Fall 2001

Department of Biomedical Engineering

Alumni Newsletter

Tulane University

Letter from the Chair

Dear Biomedical Engineering Alumni and Friends:

In the aftermath of the tragedies that have occurred during the Fall, I'm fortunate to be able to bring news about some of our successes in the Department, and let you know that we continue to be dedicated to our mission of providing outstanding opportunities for learning and discovery in Biomedical Engineering.

We've been busy, in part with preparations for our ABET re-accreditation visit that occurred in the Fall. The preparation required a comprehensive departmental 'self-study,' with portions written by each of the faculty members but orchestrated and edited by Professor Walker. As you may know, the accreditation process has changed substantially from the one that had been used since 1981, when the Department was originally accredited. The current process seeks to encourage engineering programs to establish and follow a process for continuous improvement, while allowing programs to develop and highlight distinctive features. We have established mission and vision statements, articulated our program objectives, established assessment procedures, and continue to make improvements. Fueled by this self-improvement process, the faculty members now meet at the end of each semester to discuss our individual courses and how they fit into the curriculum. In the 'course round-up' the faculty distribute copies of the syllabus and course objectives, and discuss the prerequisite material that we expected students to have mastered (and the reality of what was retained). We also discuss the content 'threads' that the course developed that should be picked up subsequently, and any noteworthy successes or failures during the semester. These discussions encompass not just the processes over which the faculty members have control - teaching and research - but the outcomes we seek - learning and discovery.

We have been fortunate in that two departmental grant proposals, largely motivated by these discussions and led by Professor Gaver, have been funded to allow us to

improve our 'hands-on' lab facilities. We are convinced that new lab components in our courses will enrich our students' educational experiences at Tulane. In addition, the grants from the Louisiana Board of Regents and the National Science Foundation allow us to assess this conviction by studying how our students learn (see the inside article by Professor Dee). In the Spring newsletter, we will follow-up with descriptions and photos of our new teaching lab facilities.

Again, I solicit your assistance as the faculty and students strive to achieve our vision of being a "global leader in biomedical engineering scholarship." If you have a potential summer internship or other employment opportunity, please e-mail me (rthart@tulane.edu) and I will post it onto our intranet newsgroup, tulane.bmen, for students to see. If you are interested in providing a perpetual gift to the Department, I have enclosed a return envelope with the hope that you will be willing to contribute to the Department's endowment fund. (A list of contributors to the endowment is on-line at: http://www.bmen.tulane.edu/news/endowment_fund.phtml.)

I hope you enjoy reading about our efforts and successes, that you will take the opportunity to keep current via the network and e-mail, and that you'll stop by to visit us. And, by-the-way, although we will not have the official outcome until July from the ABET accreditation visit that we hosted in mid-October, I can say that I thought it went exceedingly well!!

Thanks, in advance, for your help and interest in the department — and keep in touch!

Sincerely yours,

Richard T. Hart, Ph.D.
Department Chair

Recent Awards to Faculty:

Professor Ronald C. Anderson has been awarded the John Stibbs Award for Outstanding Undergraduate Professor for the University, 2000-2001.

Professor Kay C Dee has received a \$557,611 National Science Foundation grant for the project "Acquisition of a Multiphoton Confocal Microscope for a Greater New Orleans Consortium of Biological Researchers." This grant will obtain the only multiphoton laser-scanning confocal microscope in the state of Louisiana for use by researchers from Tulane, The University of New Orleans, Xavier University, the Audubon Center for Research of Endangered Species, and the USDA Southern Regional Research Center.

Professor Dee was chosen as one of the Tulane Inspirational Undergraduate Professor Awardees for the 2000-01 academic year.

Dr. James Eason, BME Associate Research Fellow, has been awarded a Whitaker Foundation Biomedical Engineering Grant for his project "The role of phase singularities in determining defibrillation efficacy."

Professor Glen A. Livesay's BORSF grant proposal, entitled "Functional Evaluation of Soft Tissue Insertions to Bone: Establishing Design Criteria for Engineered Insertions", submitted to the Research Competitiveness Subprogram, will be funded for 3 years at \$152K.

Professor Natalia A. Trayanova has received a two-year American Heart Association grant for her project "Roles of Structure and Heterogeneity in the Induction and Maintenance of Atrial Reentry." The award is funded for \$120K in direct costs.

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Endowment Fund Remittance envelope



Professor Richard T. Hart (*center*) receives the Theo C. Pilkington Outstanding Educator Award for excellence in biomedical engineering education from Dr. Mary Verstraete (*left*) at the 2001 annual meeting of the American Society for Engineering Education. This national award recognizes individuals who, through establishing records of excellence in areas of education, research, and administrative service, have helped shape the field of biomedical engineering education. Applauding Professor Hart is Dr. William Van Buskirk, Senior Vice President and Provost, New Jersey Institute of Technology and Professor Emeritus, Department of Biomedical Engineering, Tulane. Dr. Van Buskirk received the Pilkington award when he was chair of the Tulane biomedical engineering department.

Biomedical Engineering Student Learning Styles

An ongoing educational research project at the Department of Biomedical Engineering, Tulane University

Most of the current scholarly work in the area of biomedical engineering education focuses on course topical content and student learning - in other words, **what should be taught**. We believe that it is equally important to rigorously consider **how to teach** and **how students learn**. A number of Tulane biomedical engineering faculty, in collaboration with colleagues from the Departments of Psychology and of Biostatistics at Tulane, are currently working on educational research projects to answer questions such as:

- How do our BMEN students perceive and process information - what are their learning styles?
- Do BMEN students learn in different ways from other students?
- Can the answers to these questions be used to improve student learning?

This article summarizes the main findings of "An Assessment of Biomedical Engineering Learning Styles," by Kay C Dee, Glen A. Livesay, Eric A. Nauman, David Rice, and Janet Rice, which was presented at the 2001 national meeting of the American Society for Engineering Education.

There are many ways to identify and discuss aspects of personality, mental ability, and cognitive style. We are using the 'Index of Learning Styles' created by Dr. Richard Felder of North Carolina State University, since this index focuses on cognition, was designed to be particularly relevant to engineering students and educators, and is essentially a short, easy-to-score questionnaire. Felder's Index defines four domains, or major aspects, of learning style preferences (Figure 1). Within each domain are two opposing descriptors (Tables 1 and 2) of ways to gather and process information. Although each learning style dimension is presented in this short article as an "either-or" proposition, Felder's Index does allow for distinguishing an individual's degree of preference for a particular learning style.

During the 1999-2000 academic year, the Felder's Index questionnaire was administered in selected classes to give all BMEN students (seniors through

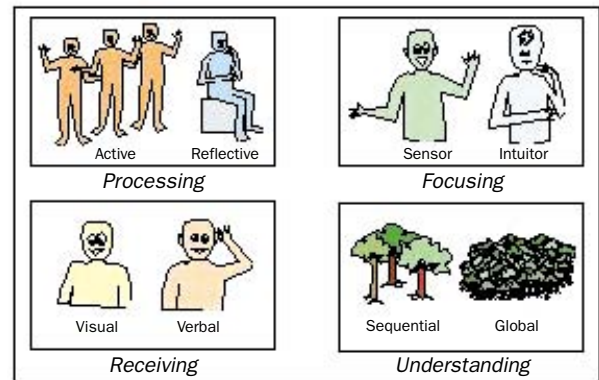


Figure 1. Schematic of Felder's Index of Learning Styles. The Index has four domains, describing how people prefer to process, receive, focus on and understand information. There are two opposing descriptors within each domain.

freshmen) the opportunity to participate in the study if they wished. Additionally, all of the students in the Fall 1999 class ENGR 241 (Statics) were given the opportunity to participate - this group was comprised of all the BMEN sophomores as well as a mix of other engineering students. Each student was identified only by a code (Tulane University IRB Approval # 200172) to allow tracking of individuals over multiple years and unbiased data analysis.

We discovered some interesting things from this study - for example, the data we collected showed essentially no correlation between students' SAT scores and their cumulative GPA at the end of their sophomore year (98 students, 29% of whom were female, with an average GPA of 3.08 and an average SAT of 1326).

Active	Reflective	Sensor	Intuitor
<ul style="list-style-type: none"> • Likes to process information while doing something active • Learns a good deal from group work <p><i>"Let's just try it out."</i></p>	<ul style="list-style-type: none"> • Likes to process information introspectively • Learns a good deal from independent work <p><i>"Let's make sure we've thought this through."</i></p>	<ul style="list-style-type: none"> • Focuses on sensory input: what is seen, touched, etc. • Prefers concrete facts and data <p><i>"How does this relate to the real world?"</i></p>	<ul style="list-style-type: none"> • Focuses on ideas, possibilities • Prefers abstractions, theories, models <p><i>"This is just plug-and-chug busy work."</i></p>

Table 1. Processing and Focusing Domains of Felder's Index. Sample characteristics of each learning style (active versus reflective, sensor versus intuitor) are given. Also listed are typical comments an instructor might hear from a student with strong learning style preferences.

Visual	Verbal	Sequential	Global
<ul style="list-style-type: none"> • Prefers to see pictures, diagrams, flowcharts, plots <p><i>"Show me the system you're talking about."</i></p>	<ul style="list-style-type: none"> • Prefers to see written word descriptions and formulae • Likes to hear spoken word descriptions <p><i>"Explain the processes that make up the system."</i></p>	<ul style="list-style-type: none"> • Can function with partial understanding, makes steady progress • Good at detailed analysis <p><i>"I need to focus on one part of the problem at a time."</i></p>	<ul style="list-style-type: none"> • Needs to see the big picture, may start slow and then make leaps • Good at creative synthesis <p><i>"I need to see how it all fits together before I can start."</i></p>

Table 2. Receiving and Understanding Domains of Felder's Index. Sample characteristics and student comments are again included.

Learning Styles, *continued*

Figure 2 compares the preferred learning styles of our biomedical engineering students to those of a sample of undergraduate engineering students from other institutions. **Tulane BMEN students were slightly more visual and were more global than the national sample of engineering students.** We found no differences between the learning styles of Tulane sophomore BMEN students and Tulane sophomores from other engineering majors. These data may confirm our anecdotal suspicions that Tulane (and New Orleans) attracts and produces unique engineers!

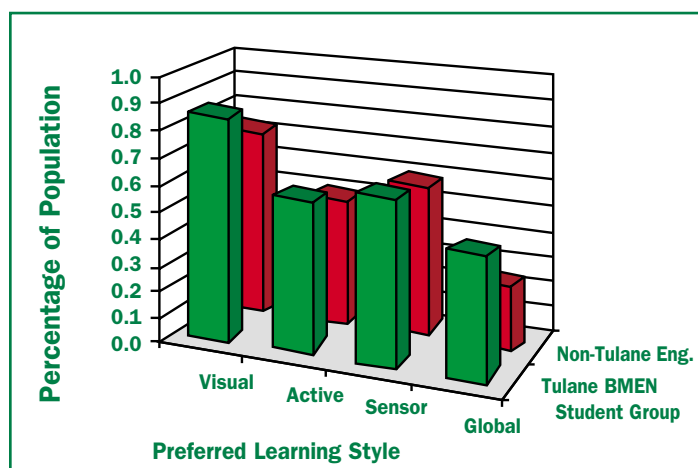


Figure 2. Learning Styles of Tulane BMEN Undergraduates Compared to a National Sample of Engineering Undergraduates. Tulane BMEN students (pooled data from freshmen through senior levels, n=128) were visual, active, sensing, and global. Data from non-Tulane engineering students (pooled across class years and across engineering majors, n=260) was taken from R.M. Felder, J.E. Stice, and R. Brent, *Proceedings of the National Effective Teaching Institute*, 1998 (p. A10).

Our students prefer active and sensing learning styles to a much greater degree than do our faculty. Figure 3 compares the learning styles of our BMEN undergraduates to the styles of our twelve BMEN faculty. Our faculty members, on the average, prefer to understand information in a more global fashion than the students.

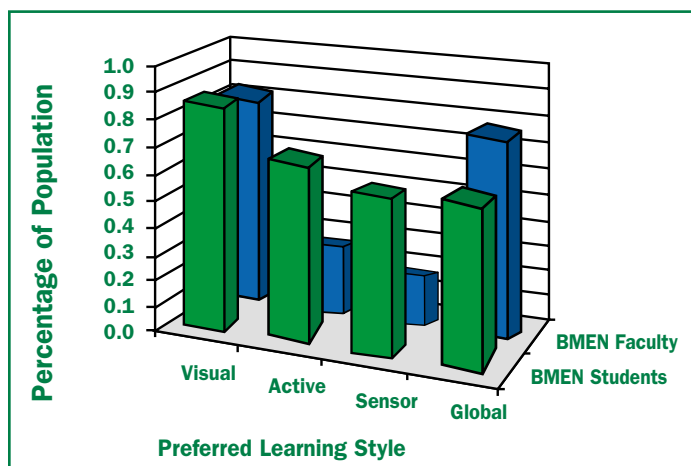


Figure 3. Learning Styles of Tulane BMEN Undergraduates and Faculty.

Our BMEN students tend to be visual (88%), active (66%), global (59%), and sensors (56%). In contrast, typical engineering course lectures tend to be organized and presented in a verbal, sequential, and intuitive manner, providing neither adequate time for learning by individual reflection nor opportunities for learning through student interaction. One way to accommodate a variety of learning modes and cognitive styles is to supplement lectures with active, “hands-on,” and experiential learning exercises. Studies in the educational literature show that supplementing lectures with active learning experiences helps students develop higher critical thinking skill levels, enhances student learning, and strengthens students’ so-called “soft skills” of teamwork and communication.

Our department is now working to increase the number of active and experiential learning opportunities within a large set of basic-to-advanced undergraduate biomedical engineering courses. We believe this will increase our students’ understanding of and enthusiasm for BMEN; optimism in their problem-solving capabilities; content knowledge and skills; and preparation for advanced coursework and learning. A recent grant from the National Science Foundation has allowed us to create a new undergraduate biomedical engineering teaching laboratory, located on the second floor of the Boggs building. We are currently in the final stages of equipping this new laboratory; when completed, the lab will be used for undergraduate student “hands-on” experiments in cell and tissue culture, biomaterials science, and mechanical testing of materials and tissues. We are also working on establishing statistically valid methods of assessing whether the new active learning experiences benefit student learning.

K.C Dee

Watch for a feature on the new teaching laboratory in the next departmental newsletter! If you would like to learn more about Felder’s Index of Learning Styles, you can visit Dr. Felder’s web site at: http://www.ncsu.edu/effective_teaching/Learning_Styles.html

We are currently writing papers about our research on learning styles and biomedical engineering education, including the results presented in this newsletter. If you would like to receive a copy of these papers when they are completed, please contact Kay C Dee (kcdee@tulane.edu).

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BMEN STUDENT ACHIEVEMENTS AND RECOGNITION

BMEN graduate and undergraduate students have presented papers at the following conferences:

Christian Maender and **Michael Roberts** at the Annual Meeting of the Orthopaedic Research Society, San Francisco, CA, February 25-28, 2001;

Richard Blidner and **J. Crawford Downs** at the Association for Research and Vision and Ophthalmology, Ft. Lauderdale, FL, May 2001;

Danielle Giliberti and **Kyle White** at the 2001 Annual Meeting of the Society for Biomaterials, St. Paul, MN, May 2001;

Stacie Tackett at the RESNA Annual Conference, Reno, NV, June 2001;

Anastacia Bilek, **Danielle Giliberti**, **Kyle White**, **Inchan Youn**, and **Qiliang Zhu** at the ASME Bioengineering Conference in Snowbird, UT, June 27-July 1, 2001;

Elijah Weisberg at the Twelfth Annual Conference for Special Educators, New Orleans Public Schools, New Orleans, LA, August 2001;

At the annual meeting of the Biomedical Engineering Society, Durham, NC, October, 2001:

Felipe Aguel
Anastacia Bilek
Rebecca Brennan
Craig Campbell
Sarah Cohen

Eileen Gentlemen
Andrea Lay
Jason Meunier
Ashton Oldendorf
Bryan Smith

Kristina A. Smith
Kyle K. White
Inchan Youn
Qiliang Zhu
Maximillian Zimmer

Jaydrian Young at the 2001 Annual Biomedical Research Conference for Minority Students, Orlando, FL, November 2001;

Michael Roberts at the ASME IMECE meeting in New York, November 10-15, 2001.

Andrea N. Lay has won a "Rita Schaffer Award" from the Biomedical Engineering Society. Andrea, a member of the Biomedical Engineering class of 2001, is a 5th-year BS-MS student at Tulane. The Rita Schaffer Award is conferred each year to one undergraduate student from each of the ABET-accredited biomedical engineering programs. Andrea was cited for her "extraordinary leadership in the department and community, dedicated teaching and mentoring service, excellence in research, and maintenance of the highest academic standards." The award was established to honor the memory of former BMES Executive Director Rita Schaffer, who left her estate to BMES. It consists of a certificate from BMES and a stipend in the amount of \$200.