

NOMINATION COVER SHEET
2008 Virginia Outstanding Faculty Awards

1. NAME Full (Legal): Edward James Berger	
Preferred First Name: Ed	
<u>2. INSTITUTIONAL INFORMATION</u>	<u>3. PROFESSIONAL INFORMATION</u>
Institution: University of Virginia	Academic Discipline: Mechanical & Aerospace Eng.
Rank/Position Title: Associate Professor	Specialization/Field: Structural Mechanics
Year Rank/Title Attained: 2002	Type of Terminal Degree: PhD
Years at Institution: 3	Year Awarded: 1996
Campus Email Address: berger@Virginia.edu	Awarding Institution: Purdue University
Campus Phone: 434-924-6424	<u>4. PERSONAL INFORMATION</u>
Campus Mailing Address: 122 Engineer's Way PO Box 400746 Charlottesville VA 22904	Home Phone: 434-284-1762
	Home Mailing Address: 1945 Ridgetop Dr Charlottesville VA 22903

Table of Contents

Cover Sheet	1
Mission Statement	2
Summary of Accomplishments	3
Personal Statement	9
Abbreviated Curriculum Vitae	11
Letters of Support (Excerpted)	13
Additional Documentation	16

Please check only ONE box:

- RESEARCH/DOCTORAL INSTITUTION NOMINEE:
MASTERS/COMPREHENSIVE/BACCALAUREATE INSTITUTION NOMINEE:
TWO-YEAR INSTITUTION NOMINEE:
RISING STAR NOMINEE:
TEACHING WITH TECHNOLOGY NOMINEE: X

President or Chief Academic Officer

Signature: _____



Printed Name:

Arthur Garson, Jr., M.D., M.P.H., Executive Vice President and Provost

Virginia Outstanding Faculty Awards - 2008 Call for Nominations

1. Mission Statement

The central purpose of the University of Virginia is to enrich the mind by stimulating and sustaining a spirit of free inquiry directed to understanding the nature of the universe and the role of mankind in it. Activities designed to quicken, discipline, and enlarge the intellectual and creative capacities, as well as the aesthetic and ethical awareness, of the members of the University and to record, preserve, and disseminate the results of intellectual discovery and creative endeavor serve this purpose. In fulfilling it, the University places the highest priority on achieving eminence as a center of higher learning.

2. Summary of Accomplishments

Dr. Berger's accomplishments in the areas of teaching, discovery, integration of knowledge, and service all support the mission of the University of Virginia in specific and demonstrable ways. Starting with his appointment as a faculty member at the University of Cincinnati in 1996, Dr. Berger has excelled in all areas of scholarship. **Notably, his current leadership in the NSF-funded HigherEd 2.0 initiative at Virginia (\$500k, 3 years) supports not only his institution's mission, but also the four key scholarship areas.** This section is divided into Boyer's four categories of scholarship, which are: (1) teaching, (2) discovery, (3) integration of knowledge, and (4) service. **Please also refer to Section 3, Personal Statement** for more details on the technology-facilitated teaching methods Dr. Berger has developed and deployed.

2.1. Scholarship of Teaching

Dr. Berger has always taken his in-class teaching responsibilities very seriously, and he always strives to deliver the highest-quality educational experience to all students in his courses. His **Personal Statement** details his approach and philosophy to education, but his record of excellence in the scholarship of teaching is summarized by the following achievements:

- (i) **exceptional in-class teaching:** Dr. Berger is regarded as among the most talented, committed, and effective instructors in his department, school, and indeed at the University. His use of technology is at the "bleeding edge" for faculty at Virginia.

involvement/participation: Dr. Berger has generally taught large-enrollment sections of both undergraduate and graduate courses, averaging about 65 students per section over the past three years. He has recently been teaching notoriously-challenging courses in sophomore-year engineering mechanics.

effectiveness/success: Dr. Berger's course evaluations are in the superior category, well above the average of his peers, and student comments and feedback (detailed later in Additional Documentation) are particularly strong in the areas of student interaction, devotion to learning, and passion.

impact/achievement: The courses taught by Dr. Berger are of the highest quality and speak directly the University's mission of placing the "highest priority on achieving eminence as a center of higher learning."

recognition/acknowledgment: Dr. Berger has been awarded several teaching awards at all levels of recognition. At the University of Cincinnati, he was the recipient of the 2002-2003 Robert Hundley Award for Excellence in Teaching, as well as the 2001-2003 College of Engineering Professor of the Year. At the University of Virginia, he was awarded a 2007 All-University Teaching Award.

- (ii) educational innovations, especially using technology: Dr. Berger has a keen interest in exploring and evaluating the use of new technology to enhance learning, and is a recognized leader at Virginia for his use of technology tools for course instruction.

involvement/participation: Dr. Berger has invested heavily in the concept of "HigherEd 2.0"--the thoughtful merger of modern web 2.0 technologies (blogs, wikis, podcasts, etc.) with higher education. He has successfully deployed this blended education approach to great effect in his engineering mechanics courses over the past 2 years.

effectiveness/success: Student response to the HigherEd 2.0 program has been extremely positive, and this is based upon survey data collected outside the usual course evaluation process. This success has led to a NSF-funded project detailed later in Section 2.2 Discovery.

impact/achievement: Students in the course use the technology interactions to develop a collaborative, social networking environment in which to develop and enhance their understanding of the course materials. The technology facilitates and promotes these informal interactions. Dr. Berger also provides a wide range of educational materials (audio and video) in support of learning goals.

recognition/acknowledgment: Dr. Berger is the recognized expert on deploying web 2.0 technologies for education on Virginia's campus. He has delivered several invited lectures to various constituencies across the University, including faculty, IT staff, and administration audiences.

- (iii) excellence in education in all settings: Dr. Berger has excelled in both undergraduate and graduate courses, for both large class sizes and small. But he has also pioneered the use of a "blended" instructional environment at Virginia. A blended environment is one which uses both face-to-face meetings and off-line, asynchronous tools for student learning. The HigherEd 2.0 initiative is a deep exploration and assessment of the blended environment for higher education.

involvement/participation: Dr. Berger has taught PhD-level courses to a class of 8 students, core undergraduate courses to 80 students, and HigherEd 2.0 seminars to an audience of more than 50. His FTE count is among the highest in the department, and his development of the blended environment places a strong emphasis on learning in informal settings (which directly impact Virginia's mission of fostering "the habits of mind and character required to develop a generous receptivity to new ideas".)

effectiveness/success: Regardless of class size or level of instruction, Dr. Berger's performance has always been among the most highly-rated in the Department and/or School. His HigherEd 2.0 seminars have been well received and have generated substantial interest from other faculty and staff at the University.

impact/achievement: Students receive the appropriate balance of one-to-one instruction, class meeting interactions, and independent learning in Dr. Berger's classes. As a result, these students learn to assimilate information from many sources, and synthesize their own understanding of the material.

recognition/acknowledgment: Dr. Berger is consistently ranked among the top faculty performers in the classroom teaching arena, when measured on a weighted scale of FTE's, course evaluations, and anecdotal feedback from students.

- (iv) *excellence in student development:* Dr. Berger routinely advises undergraduate students from his department (about 20 at a time), as well as first-year students who have yet to declare a major (about 10 at a time). He also supervises and mentors graduate student researchers in their thesis and dissertation topics, and supports student groups.

involvement/participation: Dr. Berger typically advises about 30 undergraduate students each semester, helps them with course selection, and supports their needs should academic difficulties arise. He has also mentored 4 PhD students and over a dozen MS students in the past 10 years of research. He currently serves as the MAE Department's advisor to the Tau Beta Pi honorary engineering fraternity.

effectiveness/success: Undergraduate students can be assured they are meeting all graduation requirements, and corrective action can be specified as necessary.

impact/achievement: Students appreciate the support of a faculty member in making difficult choices about their academic path.

recognition/acknowledgment: Dr. Berger is recognized in annual performance reviews for activities with students.

2.2. Scholarship of Discovery

Dr. Berger's record of discovery spans several technical engineering/scientific areas as well as research on higher education. He has made significant contributions to the engineering literature on contact of both lubricated and unlubricated dynamic systems, as well as a more recent emphasis on nanomechanics. His education-related contributions stem from assessment and documentation of the new HigherEd 2.0 initiative.

- (i) *achievements in contact mechanics and dynamic systems:* Dr. Berger's primary technical research area is the nature of mechanical contact of dynamics systems, including local and gross sliding, adhesive interactions, and nanoscale contacts.

involvement/participation: Dr. Berger has published widely in both journals and conferences, both individually and with graduate students and colleagues.

effectiveness/success: He has conducted analytical, numerical, and experimental research in this area for the past 15 years, and success is perhaps best measured by post-graduation placement of his graduate students (the large majority of whom currently work in the structural mechanics areas of aerospace or automotive companies).

impact/achievement: Dr. Berger's PhD work was the first to present a computationally-efficient, low-order dynamic model for wet clutch engagement, validated against experimental measurements. His work in low-order friction modeling is frequently cited as well.

recognition/acknowledgment: Related to his achievements and expertise in this research area, Dr. Berger has been awarded about \$1.15M dollars in research funding from federal agencies and private companies over the past 10 years.

- (ii) *scholarly publication on education:* Dr. Berger has authored several publications in the education area, two stemming from his involvement in the student chapter of the American Society for Engineering Education (ASEE) while a graduate student at Purdue,

and one on his HigherEd 2.0 initiative (Sept. 2007). One more publication is already being prepared to more comprehensively describe his HigherEd 2.0 program, and is targeted for the journal *Advances in Engineering Education (AEE)*.

Involvement/participation: Dr. Berger has published individually as well as with his peers. The AEE article currently under development includes about 10 undergraduate students (who all went through the HigherEd 2.0 program) as co-authors.

effectiveness/success: These articles all successfully navigated the peer review process, so their message was both insightful and timely.

impact/achievement: The ASEE student chapter efforts were part of the early development of a student chapter literature (Purdue had the first ASEE student chapter, formed in the early 1990's).

recognition/acknowledgment: Dr. Berger will be participating in a webcast concerning his recent Innovate article on podcasting in late October 2007.

2.3. Scholarship of Knowledge Integration

Dr. Berger's record of knowledge integration is demonstrated in two primary ways. *First*, he published a 50+ page review article on friction modeling for dynamic system simulation a few years ago. This scholarly work represents the best of what Boyer calls "serious, disciplined work that seeks to interpret, draw together and bring new insight to bear on original research". *Second*, Dr. Berger's HigherEd 2.0 represents knowledge integration not simply as a research goal, but rather as a pedagogical device in which undergraduate students themselves synthesize new knowledge as the integration a large quantities of related information from many sources.

- (i) *integration of disparate technical contributions:* Dr. Berger assembled the relevant literature across many disciplinary areas to produce his review article "Friction Modeling for Dynamic System Simulation" in *Applied Mechanics Reviews*. This article draws upon friction modeling and simulation techniques from the following technical areas: dynamics, vibrations, controls, fretting/fatigue, contact mechanics, geomechanics, nanomechanics and nanomechanical testing, and impact mechanics.

involvement/participation: Dr. Berger is the sole author of this very exhaustive article (nearly 200 references).

effectiveness/success: The article represents sustained effort for nearly one year--in addition to the usual full-time academic duties of a faculty member--and a massive effort to collect, assimilate, and understand very diverse technical content areas.

impact/achievement: This article is the unique assembly and integration of state-of-the-art friction modeling techniques into a coherent articulation of the important underlying principles and challenges.

recognition/acknowledgment: The article is frequently cited by other researchers.

- (ii) *knowledge integration as a pedagogical device:* Dr. Berger's new *HigherEd 2.0 initiative actually views knowledge integration as an effective curricular tool for teaching engineering*. This program engages students in creating new knowledge,

synthesizing new perspectives on engineering problems, and coalescing information from many sources into one coherent expression.

involvement/participation: Dr. Berger includes his students in the creation of learning materials to be shared with other students in the class. This “mashup” approach requires students to carefully weigh information from many different sources, and assemble a new expression of accumulated knowledge about the subject. This represents the best of constructivist approaches to learning.

effectiveness/success: Students in Dr. Berger’s courses have developed multi-media course materials, blog entries, and wiki pages (all authored by the students) which have supported the class learning goals. Usage data (i.e., downloads) and survey data all suggest that students view these materials--and the process of creating them--as being very valuable.

impact/achievement: Students learn engineering in a different and creative way. Synthesizing these materials requires students to think about more than simply “getting the right answer”. They must consider alternative approaches to the problem, the context of the problem, and the choices available to them as engineers. Consulting many sources and then integrating the information into a single authoritative solution makes a profound impact on understanding and retention of the material.

recognition/acknowledgment: This focus on student integration of knowledge and creation of learning materials has garnered Dr. Berger’s classes with some media attention for their creative approach to engineering education. The usage and survey data also played a key role in securing the NSF funding of the broader HigherEd 2.0 program.

- (iii) *knowledge integration and curriculum development:* Dr. Berger’s HigherEd 2.0 program inherently exploits the integration of two diverse fields--modern web 2.0 technologies and higher education. Merging web 2.0 technologies and approaches (blogs, wikis, podcasts, social networking), which students use in their daily life, with their higher education course work is itself an excellent example of knowledge integration.

involvement/participation: Dr. Berger has invested significant effort to merge key web 2.0 technologies into routine use in his classes. The results are being disseminated to, and the techniques employed by, other faculty members in engineering and across the UVa campus.

effectiveness/success: The HigherEd 2.0 experiment is a success: over 20,000 pageviews on the course blog and over 4000 media downloads during academic year 2006-2007. Students clearly engage with the course materials actively and frequently.

impact/achievement: This program has succeeded in transforming the way students study engineering mechanics. “Studying” now includes managing, consuming, and creating multimedia educational materials, and sharing them with other students in the class. This social, collaborative environment for learning--facilitated by technology--is the basis on which the HigherEd 2.0 program is built.

recognition/acknowledgment: The initial success of the HigherEd 2.0 pilot program in Dr. Berger’s class has led to journal publication, external publicity, and funding through the National Science Foundation. This program, and the student enthusiasm, also played a key role in Dr. Berger’s 2007 All-University Teaching Award from the University of Virginia.

2.4 Scholarship of Service

Dr. Berger's service to the University community and the local community is exemplary, and takes the form of both committee work (University and national society) and outreach work. The two primary areas of contributions are committees which further the academic mission of the University, and K-12 outreach which expands its transmission of "established knowledge and skills" and trains young learners in "the habits of mind and character."

Involvement/participation: Dr. Berger serves on many departmental, School, and University committees (largely on technology and academic issues), as well as two technical committees for a national engineering society; he also engages in outreach through a nascent K-12 program partnership with Micron Inc.

effectiveness/success: The committees on which Dr. Berger serves continue to make important strides toward increased quality of academic programs. Moreover, establishing the K-12 partnership with Micron was a nearly one year endeavor which is just now being formalized.

impact/achievement: In addition to supporting current Univ. of Virginia students, Dr. Berger's partnerships with industry (Micron), the Curry School of Education at Virginia, and local Charlottesville area teachers are beginning to gain momentum.

recognition/acknowledgment: Micron believes in its partnership with Dr. Berger and is in final negotiations to fund a K-12 outreach pilot project with science and math teachers from several local Charlottesville-area elementary schools.

3. Personal Statement

There are three key principles I follow in my teaching: communicate high expectations, demonstrate patience, and speak the learner's language. Of these, it is the third which presents the greatest challenges and the deepest rewards. Despite winning three teaching awards at my previous institution, I continue to wrestle with the reality that my teaching "style" may not serve all learners equally well, and I dedicate myself to continual improvement. We face the great challenge of effectively serving a student population which is more diverse in background, life experience, preparation, cognitive approach, and expectations than ever before. I believe the best approach is to amplify the students' voice, to empower them to control their educational space, and to challenge them to identify their optimal learning strategy. This is not only intuitively appealing, but is also speaks to both metacognitive and constructivist learning theories, both of which are modern notions on how students learn.

Over the past two years, I have completely torn down and rebuilt my approach to teaching, embedding the very best of modern, web 2.0 technologies into the educational experience. ***This has been a bold experiment which is also a smashing success, and the result is a very modern vision: HigherEd 2.0.*** We ignite student passions and unleash their creativity using technology in modern and innovative ways to facilitate learning. I have developed a suite of technology solutions to transform the way students interact with course materials (and, in fact, create course materials), and each has a specific purpose:

- the blog: Our course blog is the information gateway to the course. It organizes the course materials either chronologically or by category, is searchable, and uses RSS subscription-based approaches to distribution. Students can subscribe via iTunes.
- blog open threads: These asynchronous discussions encourage students to collaborate on assignments, share wisdom, and support each others' learning. They also serve as a continually-evolving FAQ for students who do not actively participate in the discussion.
- lecture podcasts: I record all lectures, resulting in an enhanced podcast of synchronized PowerPoint slides and audio. Students can review materials anywhere, anytime on their iPod or laptop.
- video solutions: These are narrated solutions to engineering problems for my courses. They are enormously popular with students (see also 6. *Additional Documentation*), and show complete solution strategies, all numerical calculations, and a detailed discussion of each step in the solution.
- student (video) solutions: Students develop these solutions for sharing with the class, and they are generated either as hand-written solutions (PDF) or as solution videos as described above. The power of this approach is that students are creating learning materials for other students, and therefore they must deeply understand the material themselves.
- the wiki: We have also experimented with a student-authored course wiki, in which students edit and manage wiki pages for the course content. Through the wiki, the details of the course material are expressed in the voice of the students (instead of the instructor or the textbook author).

The easiest way to fully appreciate these innovative materials and the overall course structure is to visit the blog: <http://people.virginia.edu/~ejb9z/Weblog>. Log in using our guest account: username: CE230Guest, password: techbloggest.

I also do many simple things in class to reinforce the collaborative environment and to focus on learning. For instance, embedded in the lecture podcasts are live hyperlinks to more information, usually web resources which support that lesson. Blog posts often have links to other information, engineering resources, and simply alternate perspectives on the topic. We do lots of problems in class (not recorded), and we also do live demos. I often do small-scale hand-held demonstrations, and use the built-in camera on my laptop to project the demo so that everyone can see. I create video problem solutions so that students can have access to examples of good problem solving techniques anytime, anywhere. We often have lengthy discussions in class, and I spend a great deal of time communicating with students outside of class via email and the blog. I essentially have an open-door policy for students, and those one-to-one meetings play an important role in meeting the students' needs. The point here is that students have great flexibility and control of their learning resources, and it is each student's responsibility to engage with the materials in the most meaningful way.

HigherEd 2.0 is a very ambitious vision, and it includes another key component: assessment of learning outcomes. I have partnered with faculty from the UVa Curry School of Education to develop assessment instruments for this program and to link these technology interventions to learning outcomes. ***Our NSF award is important precisely because its resources provide the time to accelerate the progress and implementation of the HigherEd 2.0 vision (including a faculty training component), and focus on student learning within a modern technology framework. The award also supports assessment, which will help us define best practices for technology integration in higher education and also establish us as national leaders in deploying these new technologies in thoughtful and high-impact ways.*** This new HigherEd 2.0 paradigm allows students to explore their engineering passions in new and diverse ways, to foster a collaborative and interactive environment, and to control and manage their educational space.

It is certainly gratifying to earn excellent student evaluations, and humbling to be awarded honors such as the 2007 All-University Teaching Award. But it also represents a challenge. To continually evolve. To innovate. To expand the boundaries of student expectations. To lead education in new directions. This is the modern challenge for educators, and I can think of no better way to tap into student enthusiasm and passion than to use digital tools that are already part of their everyday life: blogs, wikis, podcasts, and iTunes. We are working to transform the student undergraduate experience, to ensure quality and a high impact on learning outcomes, and to tap into the inherent energy of young people. This is an exciting time in higher education, and I am delighted to lead the charge into the future of our enterprise.

4. Abbreviated CV

Edward J. Berger, Ph.D.

Associate Professor

Department of Mechanical and Aerospace Engineering, University of Virginia
309 MEC Building, Charlottesville, VA 22903

Tel.: (434) 924-6424; Fax: (434) 982-2037; E-mail: berger@virginia.edu

Web Page: <http://mae.virginia.edu>

Professional Preparation

Penn State University	Mechanical Engineering	BS, 1991
Penn State University	Mechanical Engineering	MS, 1992
Purdue University	Mechanical Engineering	Ph.D., 1996

Appointments

1/2005 – present: Associate Professor, Department of Mechanical & Aerospace Engineering, University of Virginia

9/2002 – 12/2004: Associate Professor, Department of Mechanical, Industrial, and Nuclear Engineering, University of Cincinnati

9/1996 – 8/2002: Assistant Professor, Department of Mechanical, Industrial, and Nuclear Engineering, University of Cincinnati

Teaching Awards and Honors

nominee for State Council of Higher Education in Virginia (SCHEV) Outstanding Faculty Award for "Teaching with Technology", awards will be announced in early 2008

All-University Teaching Award, University of Virginia 2007

Robert Hundley Award for Excellence in Teaching, University of Cincinnati Dept. of Mechanical, Industrial and Nuclear Engineering, 2003

Professor of the Year, University of Cincinnati College of Engineering (highest teaching award for the UC College of Engineering), 2002

Professor of the Quarter, University of Cincinnati College of Engineering, Winter 2002

Publications (selected)

Berger, E. J., "Podcasting in engineering education: A preliminary study of content, student attitudes, and impact," *Innovate* 4(1), 2007,

<http://www.innovateonline.info/index.php?view=article&id=426> (accessed October 15, 2007).

Grande, A. W., Maher, P. C., Morgan, C. J., Ling, B. C., Radersdorf, T. C., Berger, E. J., and Kuntz, C., "Vertebral Column Subtraction Osteotomy (VCSO) for Recurrent Adult Tethered Spinal Cord Syndrome: A Cadaveric Study", *Journal of Neurosurgery: Spine*, 4(6):478-484, 2006.

Berger, E. J., Tripathy, S. et al., "An Atomic Force Microscopy Indentation Study of Biomaterial Properties", *Proceedings of the Third World Tribology Congress (WTC2005-63244)*, Washington DC, September 2005.

Berger, E. J. and Mackin, T. J., "On the Walking Stick-Slip Problem", *ASME Journal of Computational and Nonlinear Dynamics*, in press 2007.

Berger, E. J., "Friction Modeling for Dynamic System Simulation", *Applied Mechanics Reviews*, 55(6):535-577, 2002.

Li, J. and Berger, E. J., "A Semi-Analytical Approach to 3-D Contact Problems with Friction", *Computational Mechanics*, 30(4):310-322, 2003.

Li, J. and Berger, E. J., "A Boussinesq-Cerruti Solution Set for Constant and Linear Distribution of Normal and Tangential Load over a Triangular Area", *Journal of Elasticity*, 63:137-151, 2001.

Luo, J. F., Liu, Y. J., and Berger, E. J., "Interfacial Stress Analysis for Multi-Coating Systems Using an Advanced Boundary Element Method", *Computational Mechanics*, 24(6):448-455, 2000.

Luo, J. F., Liu, Y. J., and Berger, E. J., "Analysis of Two-Dimensional Thin Structures (from Micro- to Nano-Scales) Using the Boundary Element Method", *Computational Mechanics*, 22(5):404-412, 1998.

Berger, E. J., Begley, M. R., and Mahajani, M., "Structural Dynamics Effects on Interface Response—Formulation and Simulation Under Partial Slipping Conditions", *ASME Journal of Applied Mechanics*, 67:785-792, 2000.

Oakes, W. C., McComb, S. A., Mulkay, E. L., Berger, E. J., Blevins, L. G., Stamber, K., and Jones, J. D., "Equipping Undergraduates for the Graduate School Process", *ASEE Journal of Engineering Education*, 88(3):353-359, 1999.

Berger, E. J., Deifes, H., Hamaker, H., Jones, J., McComb, S., Mulkay, E., and Oakes, W., "ASEE Student Chapters: An Engineering Pipeline for Higher Education", *ASEE Journal of Engineering Education*, 87(3):231-234, 1998.

Collaborators and Other Affiliations

(a) Collaborators & Projects

Professors W. Heinecke, J. Garofalo, and G. Bull from University of Virginia School of Education--engineering education and K-12 outreach

Professors Matthew Begley, (University of Virginia), Thomas Mackin (University of Illinois), Dinar Deshmukh (University of Virginia) – continuum mechanics of partial slip frictional contacts (applications in turbomachinery).

Professors Charles Krousgrill and Farshid Sadeghi (Purdue University) – friction and discrete dynamic modeling of partial slip contacts

Professor Y. Liu (University of Cincinnati) – BEM approaches to contact and interface problems

Professor K. Vemaganti (University of Cincinnati) – hyperelastic material modeling and AFM indentation

Professor Brett Blackman (Univ. of Virginia) – biomechanical modeling and experiments on endothelial cells, specifically formation and properties of membrane lipid rafts

J. Li, J. Luo, S. Tripathy, M. Mahajani (former or current MS and/or PhD student), many researchers from Univ. of Cincinnati College of Medicine (see paper #2) above

(b) Graduate and Postdoctoral Advisor

Ph.D.: Professor Farshid Sadeghi and Charles Krousgrill, Purdue University.

MS: Professor Brian Gilmore, Penn State University

(c) Thesis Advisor and Postgraduate-Scholar Sponsor

Currently supervising 2 PhD students (R. Phadke, S. Tripathy)

(d) Funded Research

Technical research: over \$1.15M in funding since 1998

Education research: over \$500k in funding in the past 12 months

5. Letters of Support (Excerpted)

5.1 From University President John T. Casteen, III

"I am pleased to submit Edward J. Berger for the 2008 Virginia Outstanding Faculty Awards Program. Mr. Berger demonstrates a passion for the profession in all that he strives to accomplish as a teacher-scholar in the University of Virginia community and in the world at large. The dean of his school, Provost Garson, and I owe Mr. Berger a debt of gratitude and heartily endorse this nomination."

5.2 From University VP/CIO James Hilton

"I am convinced that educating the current crop of digital natives populating our undergraduate programs requires a new approach, and your notion of HigherEd2.0 is right on the mark...The idea of engaging students in content creation tracks current national trends and takes advantage of the innate talents and interests of today's students."

5.3 From Department of Mechanical & Aerospace Engineering Head, Hossein Haj-Hariri

"Ed has already received two teaching awards from U Cinn. and could have continued teaching in his old ways, ensuring the continuation of stellar student evaluation scores that you see in the packet. However, he has chosen to experiment and push to be even more effective! This is very much in line with the comment from [Univ. Vice Provost for Academic Programs] Milton Adams on the effect of the teaching award on his teaching style ("I was more willing to experiment with new ideas"). I am convinced we have in Ed a great teacher, in the mold of the some of our past winners of the award. While the breed remains the same, the styles are different. Ed is setting a trend and pushing the state of the art."

5.4 From colleague Prof. Pam Norris

"What really stands out about Ed's approach is his dedication to providing vastly different learning style options (demos, blogs, active learning exercises, podcasts, etc.) for the students. The literature clearly shows us that students all learn differently and as a female engineer I am acutely aware of this and its impact on the lack of diversity (of all types) in the STEM disciplines. Ed has totally redesigned his classes and is devoting significant time and intellectual capital on developing and providing "alternative" learning opportunities for his students. What strikes me about this obviously bold exercise is that while the better students will probably continue to learn and perform at the top level, there are other groups of students for which the alternative style will help propel them to greater performance. These students, typically in the lower academic tiers because after-all, most of us do nothing to attempt to reach these students, are the ones most likely to be strongly positively effected by the re-design. Another potential outcome of Ed's redesign, which infuses many non-traditional approaches into his courses, is the "love of learning" message that I feel he effectively conveys. So much of what we do in education (chalk and talk, test and retest, standards of learning) seems to beat the enthusiasm for learning and the joys of knowledge right out of our students. I believe that Ed's approach helps keep that child-like joy alive and hence the benefits of his teaching will long out-live the student's time in his class(es)."

5.5 From colleague Prof. Eric Maslen

"Evidence for success of Ed's efforts is exceptional. His teaching evaluations are superlative. Student comments in teaching evaluations as well as his Teaching Analysis Poll show enormous support for him and enthusiastic endorsement of his use of media. I conducted a peer

assessment of his teaching and can attest to the obvious care and skill with which he prepares his lectures, seamlessly fusing novel media components to more traditional presentation methods to produce extremely engaging, content rich lectures. Ed's use of electronic media enables much stronger integration of visual images into his lectures as well as improving the quality and information content of these images relative to more traditional delivery. Student attention in the lecture I attended was well focused with active participation in Q&A despite the large attendance: nearly 80 students. A key to achieving and maintaining this focus was the way that Ed used media tools to segment the lecture into recognizable sub-units with varying pace and manner of delivery. We are very lucky to have an instructor like Ed Berger who is not only committed to phenomenal classroom delivery but also to continual development of methods to successfully leverage media technologies in the pursuit of diversifying the learning environment he presents to his students. Even more remarkable is that Ed manages to do this at the same time as he guides very active and successful research program."

5.6 From former student Mr. Andrew Shuck (CE Class of 2008)

"Thankfully for my fellow Civil Engineering '08 students and me, Prof. Berger's authentic desire to teach is coupled with a perfect personality for the task. I have never seen him become frustrated, even at our most stubbornly incompetent moments. More than that, he came to class every day with an enthusiasm that was infectious. And if he wasn't quite up to a particularly stressful day, he would make sure to slow down and present class in the same interactive way as always."

"Finally, Prof. Berger did everything he could think of to make our education more convenient, more entertaining, and more complete. The best example that I can recall were his pod casts, from which he would record discussions of topics that we were having particular difficulty with. This tool was definitely the best learning innovation that I've come across in my 2 1/2 years here, and I would like to see other teachers use it."

"...Prof. Berger has been the best teacher I've had here because, besides providing fantastic education in the classroom, he also showed me how to make the rigors of engineering education and life much more enjoyable."

5.7 From former students Ms. Cassie Jordan and Mr. Jeff Jaeckle (CE Class of 2009)

"Edward Berger has gone above and beyond most teachers standards of reaching out to his students. In class, he uses slides to convey the main concepts of a chapter, and then does practice problems to help us understand concepts and do the homework, like most teachers. Beyond these normal expectations, he also uses a webcam on his laptop to project small in-class demonstrations onto the projection screen for everyone to see clearly. Out of class, he uses an online blog to post comments about lectures, class announcements, and the homework. The blog is interactive, so his students can ask questions on the homework and get help from other students or Professor Berger himself. Professor Berger also makes podcasts of all of his lectures so that the slides along with the lecture can be downloaded to listen to and watch if something was unclear in class. About once a week, Professor Berger does video solutions at home of example problems to help us with the homework. And last but not least he takes time out of an evening weekly to hold conference calls on a website called Vyew so his students can ask questions about the homework, and draw while we all talk on the phone. This semester, he has also asked students to help him create a "wiki" of the course, which would be in a condensed version, approximately 15-20 pages for the entire course. His logic behind

this is that students are better than he is at communicating with other students. In addition to all of this, he does all of the basics of office hours and appointments to help students who need the extra assistance."

5.8 From former student Mr. Mike San Antonio (MAE Class of 2009)

"The one thing that separates Professor Berger from all other professors I have had to date is his use of technology to facilitate the learning process. He provides countless resources for assistance with homework as well as tests. Just a few examples are his enhanced podcasts, online video solutions, a class blog, and live online problem sessions. The class blog provides an excellent way to post questions and comments about subject topics or homework problems and quickly receive aid from either Professor Berger himself or fellow students in the class."

"His class structure is also unique in the way it is split into two clear cut parts. The first half of class, his lectures, are clearly explained and well organized through PowerPoint slides. These lectures are recorded via Bluetooth technology and made into an enhanced podcast for future viewing. This is followed by numerous examples to better clarify the concepts expressed in lecture. The examples are not recorded which provides a strong incentive to attend class. An occasional demo is shown to visually prove theories, as well."

6. Additional Documentation

6.1 Quantitative Data: Course Evaluations

Professor Berger is widely recognized as a superior teacher, with course evaluation data (Figure 1) clearly illustrating this point.

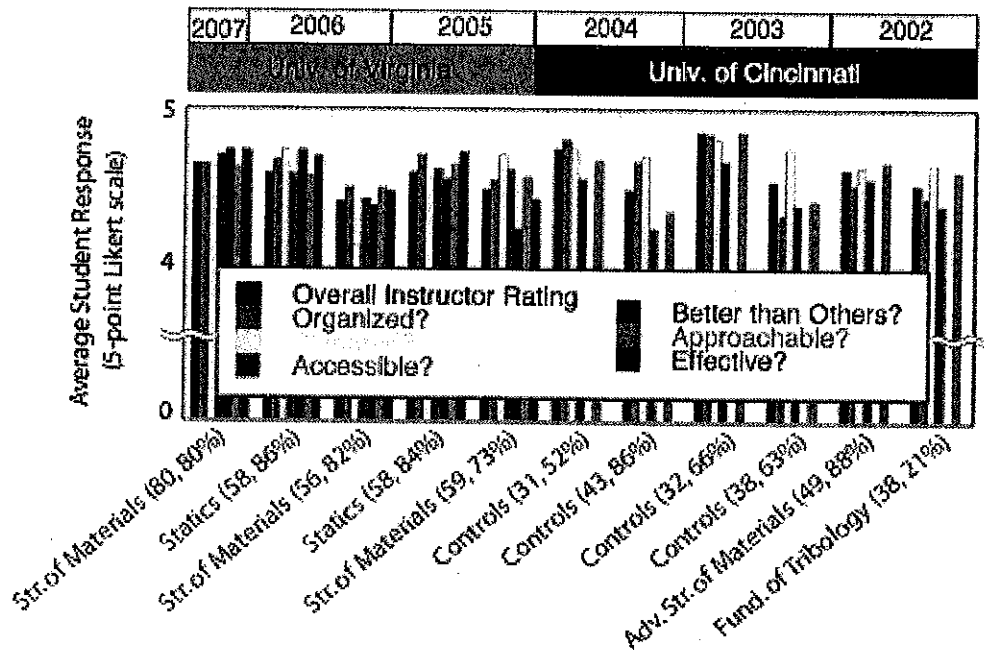


Figure 1. Teaching evaluation scores for the past 5 years.

In parenthesis behind each course name is the enrollment, and then the response rate on the course evaluation. Strength of Materials and Statics are a second-year engineering mechanics sequence, Controls is an upper-level undergraduate mechanical engineering course, and Advanced Strength of Materials and Fundamentals of Tribology are both graduate-level courses. Seven key University of Virginia evaluation scores are plotted, and the University of Cincinnati evaluations asked 5 of those same questions, as shown.

The primary deliverable from the data in Figure 1 is the conclusion that Dr. Berger is an outstanding instructor, with high marks across the board in all the important measures of effectiveness, organization, and student interactions. He has consistently taught large sections, spanning core undergraduate through popular graduate courses, and his performance has consistently been excellent. **Perhaps more importantly, over the past five years his teaching approach and philosophy have evolved substantially, yet his evaluations have remained tremendously strong.** This all indicates how seriously he takes the responsibility of teaching students, and how passionate he is about delivering that education.

6.2 Qualitative Data: Student Comments on HigherEd 2.0

Another layer of data exists in the student comments from the past few years at UVa, and they tell a story of a passionate educator who is concerned about his students. But it also shows his innovation and leadership in the classroom as he (successfully) experiments with a variety of new teaching approaches and technologies.

[Note: comments in **bold type** highlight student feedback about the technology usage.]

CE231, Spring 2005 (pre-HigherEd 2.0):

"Prof. Berger was an amazing instructor. I would definitely take another class with him. He was extremely well organized and bent over backwards to do everything in his power to help you understand the material. He also posted all of his PowerPoint slides online for everyone to print before class, which saved us a lot of work drawing diagrams and the like. I really have nothing bad to say about this class. Thank you very much, Prof. Berger, for an incredible semester."

"I cannot say enough about Professor Burger [sic]. He was awesome. He cared so much about his students doing well. He would always make time to help us with homework questions and understanding the material. His notes were always posted for the next lecture well in advance."

"Well prepared lecturer and presenter. PowerPoint slides were awesome, and made excellent use of toolkit."

CE231, Spring 2006 (the start of HigherEd 2.0):

"This is a great course! **Prof Berger truly understands how a student operates and structures his course to fit a student's life.** Very well-designed."

"Prof. Berger is one of the best professors at the University. He is very knowledgeable, friendly, and is always willing to help students. The slides he brings to class are extremely helpful. Not a single complaint about this professor."

"I was very impressed by Berger's teaching style. He is very reasonable and likes feedback from students so he can continually improve. He was a great professor and I learned a lot."

"I would say that Professor Berger is one of the best teachers I have had in my three years here at UVa. **His knowledge combined with his teaching approach is a formula that actually works for students.**"

"One of the best teachers in the SEAS. Well organized and knowledgeable. His approach and style should be spread throughout the university. His use of a tablet PC for lectures and posting slides before class is sensational. **He provides his students will all of the necessary resources to learn and succeed. I thought the podcasts were awesome.** Another great resource for students. He shows that he is willing to put in the extra effort to make his course something special. If every class at the University were taught by Berger, then the SEAS would be a top notch engineering school in the country. I seriously believe that Berger should be recognized for his exceptional effort. The Dean of SEAS needs to sit in on one of his lectures and peruse the resources that he makes available to his class and then use this as the standard for the SEAS. There is no excuse for not having every course in the SEAS to be as well designed as Berger's."

"This is one of the best teachers I've ever had. I really enjoyed the ppt/table pc, it was helpful to be able to have something ahead of time and add to it. Also, **the podcasts were helpful as well.**"

"Excellent teacher. **I appreciate the online videos.**"

"You are the best teacher I have had in the Eschool. Thanks for making the last two semesters awesome. The class was really hard, but definitely worth the work. :)"

CE230, Fall 2006:

"**The blog was especially helpful and the podcast contest was a huge help in understanding engineering outside of the classroom. I hope we get to do the podcast project next semester.**"

"**I liked the integration of technology into the course.** Also, the Dr. Berger did an excellent job of making the topics in this class clear and easy to understand."

"Professor Berger is an absolutely phenomenal teacher, and he made the class a pleasure to be in."

"Definitely one of the best courses I've taken since I've been here at UVA. Professor Berger is an amazing teacher and his use of technology in and outside of class was also very helpful."

"Prof Berger is by far one of the best/ most effective teachers I have had at this university."

"He's a great teacher, and I am lucky to have him for another semester."

"best teacher I've ever had"

CE 231, Spring 2007

"Prof. Berger is one of the best professors in the engineering school and all of UVA. He is well prepared, knowledgeable, and goes the extra mile to make sure every student in the class understands what is going on."

"Nothing is left out, everything that makes the understanding of the material better and more comfortable for the student will be present. **Slides w/ audio, pictures (worth a 1000 words), wiki, posted solutions by students...much more.** Ed-quilibrium."

"By far the best teacher I have had yet in the E-school. **His innovative teaching methods are very helpful in presenting the difficult subject matter.**"

"Berger is the best professor I have ever had in my academic career. I am not even doing that well in the class, but the course is fascinating! I finally feel like I am taking a class that will be applicable to a job. I wish I could take more classes with Berger. Brilliant professor!!"

"The use of technology in this course was well done, with the blog and the posting of lectures as podcasts. The instructor taught the material well and was very helpful in answering questions."

"Good class, Professor Berger is very well organized in terms of class notes, and uses technology well. **Also, allowing students to use technology is a great idea** in terms of problems solving and student interaction."

"I really appreciate the different graphical methods that were used by Prof. Berger to convey the concepts of the course. It is also apparent that Prof. Berger enjoys teaching and that goes a long way in keeping people interested during class. Thank you for the great work."

6.3 Quantitative Data: HigherEd 2.0 Usage

Student usage of the HigherEd 2.0 materials is illustrated in Figure 2, which shows blog activity (number of visitors) for the academic year 2006-2007.

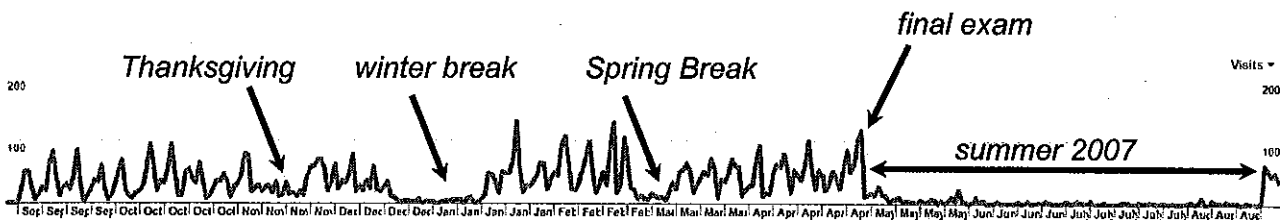


Figure 2. Daily visitors to the course blog, Sept. 1 2006-Sept. 1 2007.

The data are clearly cyclic, with activity peaking each week when homework assignments were due. **The typical number of visitors in a week was on the order of 300 (about 1 visit per student per school day).** The University holidays are also easy to see on the usage chart.

The day before the final exam in May 2007, the blog had about 120 visitors who looked at about 700 individual blog pages.

The blog was also a living, energetic companion to the course; academic year 2006-2007 data:

- nearly 200 blog posts (all by the instructor)
- nearly 400 comments (90% by students)
- over 4000 media downloads (all by students)
- **nearly 60 student uploads of problem solutions and other course material**
- **about 30 students participated in the course wiki**

6.4 Quantitative Data: HigherEd 2.0 Impact

The end-of-semester technology survey from Spring 2007 had 33 respondents. The questions generally used a 5-point Likert scale (1 = strongly disagree, 5 = strong agree).

Survey Question	Mean Response
The video problem solutions helped me do homework.	3.97
I prefer the blog format (instead of Toolkit) for course management.	4.21
In general, the student-developed solutions were clear and accurate.	3.97
Wiki development should be expanded in the future.	4.09

When asked to rank the value of the different technology elements of the course, students responded as follows (average rankings across all respondents):

- (1) video problem solutions (generated by the instructor)
- (2) the course blog and open threads (**comments authored by students**)
- (3) **student-generated** problem solutions (PDF files, during the semester)
- (4) the course wiki (**completely authored by students**)
- (5) **student-generated** video solutions (as part of the course project)
- (6) lecture podcasts

Two observations emerge: (i) student greatly value the video problem solutions (consistent with all of Mr. Berger's technology surveys over the past two years), and (ii) **the next four most popular technology elements are partly or wholly authored by students**. The HigherEd 2.0 structure, in which students create, share, and manage their own educational materials, results in rich course content, student enthusiasm and ownership, and ultimately greater satisfaction with the course.

6.5 Summary of the Evidence

The quantitative and qualitative data all support the notion that Mr. Berger's HigherEd 2.0 framework is transforming the way his students approach education. Their creation of technology-driven course materials represents a powerful engagement with the course content that the usual lecture-plus-homework course format cannot achieve. The preponderance of the evidence so far shows HigherEd 2.0 to be a powerful and creative platform for learning, and future expansions of the program (primarily through the newly-funded NSF award) will surely refine the understanding of the power and promise of these modern tools.