15 April 2007

Dr. Dorothy Zinsmeister
Assistant Vice Chancellor for Academic Affairs
University System of Georgia
270 Washington Street
SW Atlanta, GA 30334-1450

Dear Dr. Zinsmeister:

I am delighted to nominate Dr. Marguerite (Peggy) Brickman for the Regents' Scholarship of Teaching and Learning Award.

Dr. Brickman is an Assistant Professor in the Biological Sciences Division and the Plant Biology Department here at the University of Georgia. She is on the cusp of promotion to Associate Professor and the awarding of tenure; her promotion and tenure dossiers are currently before the Board of Regents for final approval. Dr. Brickman's appointment is 80% instruction and 20% research, (EFT distribution: 0.60 instruction and 0.15 research) where her research is in the scholarship of Biology instruction.

Dr. Brickman is one of our finest classroom instructors. She teaches introductory Biology to non-science majors with 4 sections per year of more than 300 students per section. This is not an easy student audience to please, as many of the students are there simply to fulfill requirements; in spite of this, Dr. Brickman always receives outstanding student evaluations. She has received multiple teaching awards during her time here, including the Franklin College Sandy Beaver outstanding teaching award, the University of Georgia Disability Resources Center outstanding faculty member award, and the University of Georgia Richard B. Russell teaching award. Dr. Brickman was also named a National Academy of Sciences Education Fellow.

What makes Dr. Brickman an especially appropriate and deserving choice for this Regents' award is her research and scholarship in new methods of teaching introductory Biology, particularly to non-science majors. She investigates new ways to teach introductory Biology in large lecture classes and their associated laboratories. Dr. Brickman publishes the results of her research in refereed journal articles (with five of them in the last two years). She also distributes educational materials she has prepared that others can use, including a number that are peer-reviewed publications, as well as preparing media materials and supplements for Biology textbooks. She presents her work and ideas in seminars at other Universities and at national Conferences of biology educators. Her work is funded by external grants, including one from the National Science Foundation, as well as internal UGA funds. Dr. Brickman's contributions to the scholarship of teaching are becoming well-known nationally and are highly respected.

One area where Dr. Brickman has worked is in using case-study methods to help motivate students to learn. For example, she finds topics that are health-related, such as the causes of flatulence, and then uses this to get students interested in carbohydrates and their digestion and metabolism. A second area in which she has worked is developing cooperative learning within a large class setting, by dividing the students into small groups during class to discuss topics and answer questions. Dr. Brickman has broken out of the traditional lecture-for-50-minutes paradigm, and found new ways of getting students actively involved in problem-solving. A third area of her efforts has been promoting active-learning in laboratories – developing labs that allow, and require, the students to help design experiments to be performed, as opposed to simply following cookbook recipes. This gives the students a much better feel for how science is actually done, and also involves them in the hypothesis generating and testing process.

Dr. Brickman develops and tests these new instructional methods in rigorous ways. This requires a well-developed sense of appropriate experimental design on her part, to ensure that the results she gets are statistically valid. One early study of hers demonstrated that, contrary to accepted dogma, certain kinds of high technology instructional approaches did not lead to improved results by the students. Dr. Brickman publishes the case-studies and instructional innovations as she develops and tests them, to make her ideas and results available nationwide. She is also active in programs to help improve science education in general on campus, such as the NSF PRISM program.

We have obtained supporting letters from two outstanding individuals. Dr. Diane Ebert-May is a Professor of Plant Biology at Michigan State University. She is a recognized national leader in promoting professional development, evaluation, and improvement of faculty, post-doctoral teaching fellows, and graduate students who actively participate not only in their discipline-specific research, but also in creative research about teaching and learning. Dr. Marshall Darley is an emeritus Professor here at the University of Georgia; Dr. Darley is a winner of the Josiah Meigs award, UGA's highest honor for those who make outstanding contributions to instruction.

It is important to the state of Georgia as a whole to improve the scientific literacy of our population. Citizens who are not scientists need to be able to make informed decisions about a range of scientific issues. As examples, individuals need information to make personal medical decisions, to understand the effects of biotechnology and ecological global climate change so they can vote appropriately on public policy. Dr. Brickman's scholarship of teaching efforts directly addresses the need to improve our science education and thus her work also addresses a critical need in our state.

I strongly recommend Dr. Brickman for the Regents' Scholarship of Teaching and Learning Award and urge you to recognize her accomplishments in this area.

Sincerely,

Russell L. Malmberg
Professor and Department Head

2007 Regents Scholarship of Teaching and Learning- Peggy Brickman

Statement of Teaching Philosophy

After teaching at the college level for the past decade, I am just now becoming an effective instructor. This is a humbling statement, and it should be. Admitting failings and striving to improve are the essence of what makes a good teacher. It takes decades of trial and error, of justifying why students should spend their time learning what you have to teach, and of critically questioning your effectiveness before it is possible to become a good teacher. I believe that teachers can only succeed if teaching is viewed as a collaborative effort: we must stop struggling down this road in isolation. We need to share our failures and successes to be able to improve. My primary contribution to the scholarship of teaching has been to implement novel methods to coax students into wanting to learn biology in the unnatural environment of large introductory courses. In addition, I have created new learning activities and methods for measuring student's motivation. I have disseminated this knowledge to K-12 instructors, college professors, and most importantly to graduate student instructors.

For over twenty semesters I have taught sections of introductory biology for non-science majors, with more than 300 students in each section. This is the first (and often only) biology class taken by undergraduates and is major challenge for anyone to teach effectively. Survey courses are often described as a 'mile wide and an inch deep' - students generally consider it a waste of time to begin with, and are further dissuaded when they encounter the impersonal stadium-style setting. But, unlike graduate students or most faculty members who lack the time or impetus to make needed changes, my primary responsibility is to address the challenges posed by this form of teaching. Along this path I have ventured into all-new areas of teaching and, and as judged by empirical learning statistics and any number of subjective assessments, have been successful. Through my activities, I have successfully proven to colleagues and administrators the benefit of hiring tenure-track university teaching faculty.

My Primary Teaching Goal: My immediate teaching goal has always been simple: to get my students some basic Biology know-how. I don't mean esoteric facts, I mean real skills they must have to make informed decisions in their own lives. Most of these skills involve basic Biology concepts that pre-class surveys show my students just don't know. For example, treatment for diabetes, the fifth deadliest disease in the U.S., requires limiting carbohydrate consumption, but I have found less than 10% of my students know that tomatoes contain carbohydrate or can distinguish a simple from a complex carbohydrate. I see few students that can distinguish a virus from a bacterium, let alone understand why antibiotics won't work to cure viral infections. Less than a third of my students could tell me the most likely time during the menstrual cycle a woman could get pregnant or how to go about discovering this information. Most students cannot define a gene let alone understand the results of a genetic test. And, most students don't know that plants take up carbon from the air rather than the soil, even though this is often used as the major reason for pushing the use of biofuels to combat global warming. College students can learn a lot of facts from searching the internet; my major teaching goal is to make sure students have mastered enough basic Biology knowledge and concepts to be able to actually understand and use what they find in these searches.

Investigating and Documenting the Impact of Teaching Practice on Student Learning

Determining what your students don't know is the critical first step in teaching, but the next step is much harder: Determining what methods work to remedy this lack of knowledge. Through trial and error, and constant observation and questioning, I have documented three areas where substantial improvements to student learning can be affected through teaching practice. First, my research suggests that teaching using 'cases' - stories that allow students to see how they can actually use science to solve real life problems - is particularly effective. Second, I have created an interactive learning environment that can be used in even the largest lecture classrooms to promote student engagement and improve achievement using these cases. And third, I've shown that modifying the laboratory experience so that students have an opportunity to more fully examine the impact of Biology on real-world problems and then communicate what they have learned through writing and presentations leads to greater scientific literacy.

Area 1: How can we tell what motivates students to want to learn?

Students in general education courses often feel like prisoners being led on a forced march, through topics not of their choosing, that are not interesting, and for which they have no use. Instructors can only remedy this problem if they determine what students are interested in – what motivates students to make the effort to learn. My colleagues Shawn Glynn and Gita Taasoobhirazi (UGA, Educational Psychology) and Thomas Koballa (UGA, Science Education) and I examined the contemporary motivation literature and identified several areas where we could question students to learn more about their motivations. Using an instrument developed by Glynn and Koballa, we surveyed 350 non-science majors from 2005 to 2006 to better understand their individual characteristics, career goals, and motivation to learn science. As suspected, we found that students were motivated to learn science for extrinsic reasons (a means to an end, such as getting a good grade) rather than intrinsic (simply learning for its own sake). The factor most commonly given by students for low motivation to learn science was the perception that science had little relevance to their careers. This is not surprising since studies have identified professional success as the primary reason students are pursuing a college degree (Humphries and Davenport 2005), and students who have concluded that a course is irrelevant to their future careers exhibit low motivation (Smith, Gould and Jones, 2004). On the positive side, though, the small level of intrinsic motivation we observed could be traced to student's desire to attain a better understanding of issues related to health and disease (Glynn, Taasoobshirazi, and Brickman, 2007). We concluded from these findings that if we want to motivate our students we need to make connections between science and real-life health issues as well as make the effort to connect biology concepts to students' future careers.

As a result of these studies, I have begun developing, testing, and publishing case studies - biological mystery stories that inspire students to learn (Brickman, 2005; 2007). Some cases were designed to appeal to the students' intrinsic motivation to improve their own health by better understanding science. One such case highlights the biological cause of flatulence – undigested carbohydrates that are consumed by bacteria in our colons - as a way of motivating students to understand what foods contain carbohydrates and how they are normally digested in our bodies. I have presented workshops related to teaching these cases and am currently serving along with 15 other instructors nationwide on an NSF-funded project to determine the efficacy of cases in very large introductory Biology courses. As part of that project I have written cases that highlight human health. One case motivates students to understand the process of meiosis – where genes are allocated to sperm and eggs - to figure out the chances that one of their parents or a sibling could donate an organ for them.

In addition, I have begun developing cases that demonstrate the relevance of biology in a multitude of careers other than science. One business case describes Lee Scott, CEO of Walmart, who admits to learning about biology and global warming to make business decisions like whether to support carbon trading or buy vehicles that use biofuels or electricity. I have received funding from the NSF-sponsored Reform in Science and Math Education (PRISM) program to develop a book of these case studies connecting biological knowledge and success in non-science careers. My colleagues Shawn Glynn and graduate student Geoffrey Graybeal and I are in the process of submitting this book to the National Science Teachers Association for publication, and I am currently classroom testing these cases to determine whether student's attitude and motivation are improved by their use.

Area 2: How can we tell why students aren't learning?

When a seal fails to learn a trick, we don't blame the seal; we blame the trainer. When I first started teaching I blamed the seals. I was sure that because I had given a good clear lecture, it was my student's fault that they did not understand what I had told them. I didn't understand that it was my job to know when students are confused and to slow down or modify my approach before moving on. I am not the first to realize this, nor am I the first to discover the difficulties inherent in implementing this type of 'interactive assessment' in large lecture settings (DeCaprarliis, 1997; McConnell, et al., 2003, Greer and Heaney, 2004). Known difficulties include: the infeasibility of providing even minimal feedback on written responses for assignments from hundreds of students; the improbability that students will admit confusions or respond at all to oral questions in front of hundreds of peers; and most damaging, the lack of accountability students feel for their own learning in this anonymous setting.

I have attempted to remedy these problems by asking students to form small groups during class to discuss specified topics – a form of cooperative learning. Educators have reasoned that students learn better, are more likely to admit they are confused, and generally learn more effectively when they talk amongst themselves (a visit to any coffee shop with chatting tables of students will confirm that students know this too) (Webb, 1995). Meta-analysis of hundreds of studies on cooperative learning has documented a positive effect on student achievement, skills, and tasks in this type of environment (Johnson et al. 1998; Singer et al. 1999). Lord (1994) noted that students are much more likely to speak out in small groups. I took this a step further and I reasoned that if they communicated their answers to me, I could monitor confusion and modify my lectures accordingly. Beginning in 2002, I started organizing permanent groups of 6-8 students in the first week of class. These groups then work cooperatively throughout the semester on in-class questions. Students discuss questions and then present a communal answer using remote answer pads, called "clickers." Others have shown significant improvements in student learning using this model (e.g. Mazur, 1997).

My colleagues Norris Armstrong, Shumei Chang, and I conducted a study in 2004-2005 to determine what if any positive outcome resulted from these activities. We found that students in the cooperative learning classes performed significantly better than students in the traditional lecture sections. We also found that student attendance was greater in cooperative-learning sections. Further, students in grouped sections overwhelmingly (92%) indicated that they would like to see cooperative learning used in other classes (Armstrong, Chang, and Brickman, 2007). Over the past 5 years, we estimate that over 10,000 students have benefited from this type of instruction in our classes alone.

Many of the cooperative-learning activities I devised have been published as case studies or web-based interactive exercises (as MediaLabs in David Krogh's *Biology: A Guide to the Natural World*; 1st, 2nd and 3rd Editions, Prentice Hall). I also described my interactive exercises in the Instructors Manual that accompanies the Krogh textbook, and was co-developer of a CD-ROM that uses interactive animations to demonstrate concepts in the classroom.

Area 3: How can we tell what students have really learned?

As mentioned above, my research has encouraged me to radically adjust my teaching style to replace simple lecturing with more interactive cooperative learning and case-based instruction. However, I still felt handicapped by the fact that multiple-choice questions provided the only practical method for measuring learning in a large course. I just didn't feel confident that multiple choice questions could adequately measure student's ability to apply, interpret, and analyze the complex science processing skills I was hoping they would acquire as my primary teaching goal.

In an effort to remedy this weakness, I turned to our laboratory courses that are taught by graduate teaching assistants. I received funding from the National Science Foundation to co-author an entirely new laboratory manual for BIOL1103L emphasizing teaching biology using the inquiry method. Inquiry lab exercises ask students to plan their own investigations, gather and interpret data, propose explanations, and make predictions based on their data. This contrasts with the "cookbook style" laboratory exercises where students follow a series of instructions to arrive at a predetermined result – a type of learning that bears no relationship to how scientists actually solve problems. For example, our former cookbook genetics lab provided students with a summary of how their instructor set up a mating between two different flies and then provided the students with the frozen offspring (affectionately called flycicles). The students would then be asked to make observations, interpret data from counting the flycicles and propose an explanation about the type of inheritance observed. Students performing such an exercise were not exposed to 'process' skills like planning an investigation, proposing answers or predictions, and communicating their results. In addition, students showed little motivation for uncovering the results of an experiment for which the answer was predetermined. In the inquiry labs I have authored, students are presented with an interesting problem, such as a genetic mystery or a scientific article on antibiotic-resistant bacteria from *Consumer Reports*, and then challenged to solve the problem by devising a study and communicating their results.

I have presented one lab and published another in *Tested Studies for Laboratory Teaching*, the Proceedings of the Workshop/Conference of the Association of Biology Laboratory Education. I am currently completing a two-semester analysis of the learning outcomes of students in the inquiry labs compared to students taught using traditional curriculum. Preliminary results reveal that students in the inquiry labs make significant improvements in science literacy skills such as interpreting media reports of scientific advances as well as research skills such as explaining and assessing data, conceptualizing and planning investigations, and interpreting and drawing conclusions from data. The study will be completed in one month and the data prepared for publication over the summer.

Area 4: How can we make sure that other teachers benefit from this knowledge?

Knowing that the success of a new lab curriculum relies as much on graduate student instructors as the labs themselves (Russell and French, 2002), I developed an inquiry-training protocol to use with our graduate-student instructors. It consists of a one-day pre-class workshop that provides an orientation to inquiry-based science instruction, followed by several opportunities aimed at maximizing reflection and assessment of teaching practice. These included weekly 2-hour meetings to practice and discuss strategies for implementing inquiry including a discussion of problems encountered, peer and instructor observations of classroom activities (with an observation protocol I developed), discussion throughout the semester using an electronic listserve to discuss problems and solutions; and finally an end-of-semester meeting to discuss modifications of the teaching materials for the next semester. These materials were organized into an ongoing training manual for novice TAs and my collaborator and laboratory coordinator, Kris Miller, and I will be completing a study of their effectiveness next fall.

Continuing Challenges:

As I explained in the opening paragraphs, I believe that teachers only improve through critically evaluating their efforts and sharing both their successes and their failures with other teachers. I've highlighted many of my teaching successes, but it is the failures that truly underscore the importance of scholarship activities. My first intensive research project involved developing an electronic laboratory manual with dynamic animations, tutorials, and photographs. I performed an intense study of the effectiveness of the electronic materials using interviews, surveys, and careful analysis of student achievement on assignments. To my disappointment, I discovered that although students benefited from the reduced cost of electronic delivery, students who received their materials electronically did not perform as well in the course as students who received traditional paper-based materials, regardless of their computer skills. The reason: students with an electronic manual weren't using it (Brickman, Teare-Ketter, and Pereira, 2005.) I had to abandon a method that I had invested a great deal of time and energy in developing. I doubt I would have been willing to let it drop without the convincing evidence of the research data. I mention it here in closing because it strengthened my resolve to engage more fully in the scholarship of teaching. Unless we force ourselves to critically evaluate methods and abandon much-loved methods that just aren't working, we will not improve as teachers. I hope to continue sharing my successes and failures, as I hope to involve more teachers in this process.

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2007 Regents Scholarship of Teaching and Learning- Peggy Brickman

CURRICULUM VITAE

EDUCATION

1993	Ph.D.	University of California, Berkeley (Genetics)
1987	B.A.	Columbia College (Biology)

POSITIONS

2001-present	Assistant Professor, Plant Biology Department, University of Georgia
1998-2001	Lecturer, Division of Biology, University of Georgia
1996-1998	Instructor, Division of Biology, University of Georgia
1996	Instructor, Department of Biology, Agnes Scott College
1995	Post-doctoral Research Associate, Department of Cellular Biology, University of Georgia
1993-1994	Post-doctoral Research Associate, Reproductive Endocrinology Center, University of California, San Francisco
1991-1993	Research Assistant, University of California, Berkeley
1989-1991	Graduate Student Instructor, University of California, Berkeley
1986	Macy Undergraduate Research Fellow, Columbia College

HONORS AND COMPETITIVE FELLOWSHIPS

2006	Richard B. Russell Undergraduate Teaching Award	University of Georgia
2005	Disability Resources Center Outstanding Faculty Member	University of Georgia
2004	National Academies Education Fellow in the Life Sciences	National Academy of Sciences
2002	Instructional Learning Technology Grant	University of Georgia
2002	Who's Who Among America's Teachers	University of Georgia
2000	Who's Who Among America's Teachers	University of Georgia
2000	Special Sandy Beaver Award for Excellence in Undergraduate Teaching	Franklin College University of Georgia
1989	Outstanding Graduate Student Instructor	U. C. Berkeley
1986	Macy Undergraduate Research Fellowship	Columbia College
1983	John Jay Scholar	Columbia College

REFEREED RESEARCH PUBLICATIONS

Norris Armstrong, Shu Mei Chang, and Peggy Brickman: Cooperative Learning in Industrial Sized Biology Classes. *CBE-Life Sciences Education* (*in press*)

Shawn M. Glynn, Gita Taasoobshirazi, and Peggy Brickman. Nonscience Majors Learning Science: A Theoretical Model of Motivation. *Journal of Research in Science Teaching (in press)*

Brickman, Peggy. 2006. The Case of the Druid Dracula – A Directed "Clicker" Case Study on DNA Fingerprinting. *Journal of College Science Teaching*. *XXXVI* (2), 48-53.

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PUBLICATIONS OF PEER-REVIEWED EDUCATIONAL MATERIALS

Brickman, Peggy. 2007. The Case of the Druid Dracula – A Directed "Clicker" Case Study on DNA Fingerprinting. In Clyde Freeman Herreid (Ed.), Start with a Story: The Case Study Method of Teaching College Science. Arlington, VA: NSTA Press.

Brickman, Peggy and Cara Gormally. 2006. The Creature from Beneath: An Inquiry Genetics Exercise for Introductory Non-science Majors. *Tested Studies for Laboratory Teaching*. Proceedings of the 28th Workshop/Conference of the Association for Biology Laboratory Education (ABLE).

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David Krogh. *A Guide to the Natural World.* Third Edition. Prentice Hall. 2004. Medialab author and editor.

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David Krogh. *A Guide to the Natural World*. Second Edition. Prentice Hall. 2001. Medialab author and editor.

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PUBLICATIONS OF EDUCATIONAL MATERIALS

Brickman, Peggy. *Instructor's Guide to the Natural World: Print and Media Resources*. Third Edition Prentice Hall, 2004.

Brickman, Peggy. eLabs Conversion: Convert Your Old Paper Lab Manual into a CD-ROM. Tested Studies for Laboratory Teaching. Proceedings of the 25th Workshop/Conference of the Association for Biology Laboratory Education, 2003

Brickman, Peggy. PowerPoint Presentations for Instructors to accompany David Krogh's. *A Guide to the Natural World*. Second Edition. Prentice Hall. 2002

Brickman, Peggy and Anu Singh-Cundy. *Instructor's Guide to the Natural World: Print and Media Resources*. Second Edition Prentice Hall, 2001.

Brickman, Peggy and Isobel Heathcote. *Additional Medialabs and Web Investigations*. Prentice Hall, 2001.

Brickman, Peggy and Anu Singh-Cundy. *Instructor's Guide to the Natural World: Print and Media Resources.* Prentice Hall, 2000.

EXTRAMURAL SUPPORT FOR RESEARCH

"Improving Pre-Service Teachers' Learning of Biology: A Case-based Strategy for Practical Inquiry" NE GA PRISM 2006-2007 CoPIs Shawn Glynn and Peggy Brickman: 1 year $10,000

"Promoting Inquiry and Scientific Literacy in Non-Science Major Undergraduate Biology" 2005-2007 Norris Armstrong, PI, Marguerite Brickman, CoPI.: 2 years $99,285

"Making Ginger Ale: A Practical Application of Enzymes and Respiration for Non-Majors Biology" ABLE Laboratory Teaching Initiative Grant, 2002, $528.95

"Biology e-Labs Conversion" Learning Technology Grant, Office of Instructional Support and Development, University of Georgia 2002-2003, $15,090.80

COURSES TAUGHT

Concepts in Biology I: Introductory Biology for Non-majors
Principles of Biology I: Introductory Biology for Majors
Mentoring Undergraduates: A Seminar Course for Graduate Students
Special Teaching Projects: Research Opportunity for Graduate Students
Teaching Internship Program: Individual Projects to Improve Graduate Student Teaching

INVITED PRESENTATIONS:

The Creature from Beneath: An Inquiry Genetics Exercise for Introductory Non-science Majors. Major Workshop Presenter. 28th Annual Workshop/Conference of the Association of Biology Laboratory Education (ABLE) Purdue University, June 2006

Using Case Studies in Large Enrollment Classes. Workshop Presenter. 6th Annual Conference on Case Study Teaching in Science. Sponsored by the National Center for Case Study Teaching in Science at the University at Buffalo, State University of New York October 7 and 8, 2005

Enhancing Teaching with Technology. Department of Integrative Biology. Brigham Young University, July 18, 2005

Trial and Error: What can we do to Improve large introductory biology classes? Institute for Cross-College Biology Education, University of Wisconsin, Madison, August 16 2004

Teaching Biology. Bioforum Workshop Series (Textbook Presentations, sponsored by Prentice Hall Publishers), Southwest Texas State University, San Marcos, TX, 2/25/2000, Frederick Community College, Frederick MD, 3/24/2000, Association of Southeastern Biologist Meeting, Boone, NC. 4/9/2002, National Association of Biology Teachers Annual Meeting. Cincinnati Ohio. 10/31/2002. North Carolina State University, 4/16/2004.

Tenure Track Teaching Positions at the University of Georgia. College of Computing, Georgia Institute of Technology, Atlanta, GA, June 17, 2002

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21 March 2007

Dr. Dorothy Zinsmeister
Assistant Vice Chancellor for Academic Affairs
University System of Georgia
270 Washington Street, SW
Atlanta, GA 30334-1450

Dr. Zinsmeister (Dorothy!):

I am honored to support Dr. Marguerite (Peggy) Brickman's nomination for the FY 2007 Regent's Scholarship of Teaching and Learning Award. I met and subsequently collaborated with Dr. Brickman through the National Academies Summer Institute (SI), an ongoing faculty professional development program funded by the Howard Hughes Medical Institute. The overall goal of the Summer Institute is to reform undergraduate life science education based on the principles of scientific teaching that involves "active learning strategies to engage students in the process of science and teaching methods that have been systematically tested and shown to reach diverse students" (Handelsman et al 2004). Peggy is member of the University of Georgia team that participated in the Summer Institute in 2004, and is also a participant in an NFS-funded research project on faculty change in teaching and learning for which I am the PI.

Dr. Brickman's primary responsibility (80%) is teaching introductory biology to over 650 students each semester, and conducting research in biology pedagogy (20%). In science departments around the country, the number of faculty with similar types of appointment is increasing in response the call by National Academy reports, AAAS, and others for reform in undergraduate science education. Hence, the role of many institutes has expanded to reward teaching and research on science teaching and learning that is based on theories and practice in the social sciences.

Dr. Brickman's impact on student learning in her courses is second to none. The large enrollment courses Peggy teaches are a major challenge for anyone, yet alone an early career faculty member, but she excels in this learning environment. Foremost, Peggy integrates the scholarship of discovery with the scholarship of teaching thereby demonstrating interdisciplinary thinking in the fields of biology and cognitive psychology. Her research addresses how people learn through the development and testing of curricular materials. Specifically, Dr. Brickman examined the effect of inquiry-based learning on students' confidence in understanding and using biology in their own lives. Funded by the NSF, she developed curricular materials for laboratories designed to enable students to learn biology through inquiry and subsequently increase their comprehensive scientific literacy. Peggy presented the data on student learning of one of these labs at the annual ABLE Conference in June.

In a noteworthy study recently published, Dr. Brickman investigated the effectiveness of a CD-ROM versus paper delivered lab manual and determined that the instructional delivery method significantly students' laboratory grades. Students who used a traditional paper-based lab manual performed better than students using the same materials that were electronicbased. Hence, the conclusion that CDs did not provide equivalent replacement for text-based instruction for non-science majors' introductory classes may guide faculty's future decisions about instructional materials. Science education needs more studies like this because technological advances are influencing classroom instruction in large undergraduate science courses. We need to know what works to increase student learning gains and why. This study provides an example research design for faculty to consider repeating or modifying with questions derived from their own courses.

The MediaLabs Dr. Brickman developed are based on the principle that students can gather information from the Internet and move from data collection to critical analysis, just as is done with databases in science. I believe Peggy is forward looking in this endeavor. A recent workshop at the National Research Council entitled *Reconsidering the Textbook* advocated this type of approach to learning with traditional textbooks assuming a secondary role in courses.

Without question, Dr. Brickman's nomination for the Regent's Award says it all. She has a remarkable gift for motivating non-science majors to become scientifically literate in their everyday lives. The comments written by students about her course were simply a joy to read and revealed the core of Peggy's expertise in and passion for teaching. I predict that her teaching excellence is not only limited to non-majors, that indeed, her influence on the learning by biology majors would be equally impressive.

Dr. Brickman's impact radiates beyond undergraduates. A critical population involved in her teaching and research is the graduate students, our future faculty. Not only do they learn about teaching from an expert model, but also as they think about how students learn science, they become better scientists themselves. Peggy is investigating the correlation between student achievement and graduate student instructor attitudes and will present the results at the annual NABT meeting this fall. I encouraged Peggy to present her work at scientific conferences and contribute to the associated journals as well. Now many professional societies in biology have active education sections that include members who are interested in and want to enhance undergraduate learning in biology.

Dr. Brickman is nationally recognized as a bright star in biology education. As we expand our efforts to improve undergraduate biology education at Michigan State University, we seek individuals like Peggy as faculty; the University of Georgia community is fortunate. With confidence, I predict Dr. Brinkman will emerge as the top candidate for this award.

Sincerely,

Diane Ebert-May, PhD
Professor

The University of Georgia

College of Arts and Sciences
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March 20, 2007

Dr. Russell L. Malmberg, Head
Department of Plant Biology
The University of Georgia

Dear Russell,

I am so pleased to have this opportunity to support Dr. Peggy Brickman's nomination for a Regents' Scholarship of Teaching and Learning Award. As one of the teaching faculty in the Division of Biological Sciences until my retirement in June 2006, I interacted with Peggy on many levels and know her very well. Since my retirement I have continued to work with Peggy in our PRISM learning community and look forward to working with her in the future. Peggy is in a special situation in that she holds one of the few tenure-track faculty positions whose promotion is based excellence in teaching in addition to scholarship in teaching and learning. Peggy has taken full advantage of this opportunity to combine her teaching skills, her love of teaching, her dedication to her students, her creative classroom innovations and scholarship to excel in all of the criteria established for this award.

Peggy is a leading participant in the PRISM (Partnership for Reform in Science and Mathematics) learning community (Implementing Inquiry-based Strategies) that I co-chair. PRISM is a five-year, $35 million NSF grant to the Georgia Board of Regents to improve teaching and learning in K-16 science and mathematics classes. At the college level, a major PRISM goal is to expose future science and math teachers, most of whom do not decide to enter the teaching profession until late in their undergraduate years, to improved teaching and learning methods, especially those using inquiry-based approaches. Peggy is at the forefront of this nationwide initiative. She is interacting at the national level with leaders in the field and is being recognized at the national level for her contributions (e.g. National Academies Education Fellow in Life Sciences, member of the Teacher Preparation Committee of the National Association of Biology Teachers, CoPI on a large NSF grant to promote inquiry and scientific literacy in non-major undergraduate biology).

I watched with a knowing eye the enthusiasm, occasional frustration, and exciting synergism that developed as she worked with Norris Armstrong and Cara Gormally to write, test and then implement the lab manual for the BIOL 1103L laboratory course. Similarly, I have worked with collaborators to write the organismal biology lab manual for science majors and it has been one of the most personally exciting and rewarding experiences in my career. Peggy is ahead of us in taking that all-important next step in teaching and learning scholarship to assess the effectiveness of their lab manual. I will be looking to her for advice as we assess our organismal lab manual next year.

Peggy's creativity and initiative have been very evident in our PRISM learning community. During our brainstorming sessions, her ideas and comments are those that do the most to further the discussion and are most likely to be part of the end product. She was a leader in organizing one of our most successful activities, a "Sharing Teaching Tips" luncheon attended by faculty from across the campus. In our PRISM learning community programs and discussions, we learned that the success of inquiry labs depends in large part on advanced training for the graduate laboratory assistants (GLAs) who actually teach the labs. You see in Area 4 of her statement that Peggy has developed an protocol to train GLAs in inquiry-based lab instruction. We plan to adopt her program for training GLAs in our inquiry-based organismal biology labs. Thus, Peggy is not only using her considerable scholarship and talents to improve the science experience for literally thousands of biology students, she will also be contributing very significantly to training graduate students who will become the next generation of biology teachers.

As part of our peer teaching review process, I attended three of Peggy's BIOL 1103 lectures fall semester, 2003. It was a pleasure to watch an exceptional teacher practice her craft in front of 300 students. Her lectures are characterized by relevancy and boundless enthusiasm. She creates a "need to know" by asking questions relevant to students' lives. She engages students during the lecture with questions and by dynamically and energetically making her points. No one sleeps in Peggy's classes. Peggy cares that students learn; the fact that she communicates that concern very effectively helps motivate her students to learn.

In sum, Peggy Brickman has demonstrated excellence and scholarship in teaching and learning. She is an inspiration and role model for faculty at UGA and at other schools across the nation. Even after 37 years of teaching experience including several teaching awards, I realize how much more I can and hope to learn from her. She has my strongest and unqualified support for this award.

Sincerely,

W. Marshall Darley

W. Marshall Darley
Associate Professor of Biology, Emeritus

2007 Regents Scholarship of Teaching and Learning- Peggy Brickman

SCHOLARSHIP OF TEACHING AND LEARNING PUBLICATIONS

Armstrong, Norris, Shu Mei Chang, and Peggy Brickman: Cooperative Learning in Industrial Sized Biology Classes. *CBE-Life Sciences Education* (*in press*)

Shawn M. Glynn, Gita Taasoobshirazi, and Peggy Brickman. Nonscience Majors Learning Science: A Theoretical Model of Motivation. *Journal of Research in Science Teaching (in press)*

Brickman, Peggy. 2007. The Case of the Druid Dracula – A Directed "Clicker" Case Study on DNA Fingerprinting. In Clyde Freeman Herreid (Ed.), Start with a Story: The Case Study Method of Teaching College Science. Arlington, VA: NSTA Press.

Armstrong, Norris, Peggy Brickman, and Cara Gormally. 2006. *A Laboratory Manual for Concepts in Biology I: Biology 1103L.*

Brickman, Peggy and Cara Gormally. 2006. The Creature from Beneath: An Inquiry Genetics Exercise for Introductory Non-science Majors. *Tested Studies for Laboratory Teaching*. Proceedings of the 28th Workshop/Conference of the Association for Biology Laboratory Education (ABLE).

Glynn, Shawn, Tom Koballa, Dava Coleman, and Peggy Brickman. 2006. Professional Development Cases. *Journal of College Science Teaching*. *XXXVI* (1), 10-12.

Brickman, Peggy. 2005. Sweet Indigestion: A Directed Case Study on Carbohydrates. The National Center for Case Study Teaching in Science website: http://ublib.buffalo.edu/libraries/projects/cases/ubcase.htm

Brickman, Peggy, Catherine A. Teare Ketter, and Monica Pereira. 2005. Effectiveness of an Electronic-Delivered Lab Manual. *Journal of College Science Teaching*. *XXXV*(3), 28-30.

David Krogh. *A Guide to the Natural World.* First, Second, and Third Edition. Prentice Hall. 2004. Medialab author and editor.

Brickman, Peggy. *Instructor's Guide to the Natural World: Print and Media Resources*. Third Edition Prentice Hall, 2004.

Michael Guidry (Sr.), Peggy Brickman, Michael Guidry (Jr.), Wayne Kincaid, Eric Lingerfelt, Erin McMahon, Yang Sun, Ann Tarrant, Ping Zheng. Developers, student CD-ROM to accompany David Krogh, "Biology: A Guide to the Natural World." Second Edition. Prentice Hall, 2001.

SCHOLARSHIP OF TEACHING AND LEARNING PRESENTATIONS:

Using Case Studies in Large Enrollment Classes. Workshop Presenter. 6th Annual Conference on Case Study Teaching in Science. Sponsored by the National Center for Case Study Teaching in Science at the University at Buffalo, State University of New York October 7 and 8, 2005

Facilitator and Science Content Coordinator: 2005 One week NSF-PRISM (Partnership for Reform In Science and Math Education Sponsored Clarke County Math and Science Summer Summit for middle and high school Biology teachers.

Enhancing Teaching with Technology. Department of Integrative Biology. Brigham Young University, July 18, 2005

Trial and Error: What can we do to Improve large introductory biology classes? Institute for Cross-College Biology Education, University of Wisconsin, Madison, August 16, 2004.