Purdue University

NOMINATION FORM FOR

HELPING STUDENTS LEARN AWARD

Michael R. Melloch

Name of Nominee

Professor of Electrical & Computer Engineering

Title

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Department	*Phone Number and email address*
West Lafayette	Electrical Engineering (BHEE)
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Title of Innovation

Keys to Learning: Unlocking the Brain's Potential

Nominations must be sent electronically to cie@purdue.edu. Nominations must be received no later than 5 pm, Monday, January 27, 2025.

I joined the faculty as an Assistant Professor of Electrical Engineering at Purdue University in 1984. I was always a good teacher, as evidenced by my teaching evaluations and comments from students. But at a large public research university my major emphasis was on research. That changed with two events. The first was my daughter becoming a student at Purdue University in 2006. The second was when I became Associate Head for Education for my department in 2007, a position I held for 13 years. Both these events gave me an increased sense of responsibility to the education mission, especially the undergraduate education mission, of the university.

The position of Associate Head for Education came with release from teaching. However, I was inspired to continue to teach. My inspiration was Henry Yang who used to be Dean of Engineering at Purdue. For a brief time in 1990, I served as an assistant dean for Henry before he took the position of Chancellor at UCSB. Henry was unlike any other administrator, especially at such a high administrative level. Henry continued to do research, supervise graduate students, and teach undergraduate classes! When I was at UCSB for a meeting, I dropped by the Chancellor's office in the off-chance Henry was available to say hello. He was and after a brief conversation he suggested we could continue talking for a few minutes if I would walk with him to the class he was teaching! What other university president or chancellor has such dedication to undergraduate education?

This increased responsibility to undergraduate teaching led me on a quest to improve my teaching. I started to read books and papers on the learning process. I realized that we are still learning how people learn, and how to optimize the brain for learning, but there are things that have been discovered, and known, about the learning process since at least 1885. I was surprised to learn the roles that nutrition, exercise, sleep, mindset, meditation, and relationships play in learning. I was never taught any of these things and from talking with students I have learned few have. I started to present seminars at the undergraduate and graduate level for the students in my department summarizing the things I had found out about learning. I received very positive feedback from the students that confirmed students are not being told about the learning process and how your way of

life effects your ability to learn. Students were asking me if there was a book where they could learn more. They would have to read a dozen books and many research papers to explore what I was presenting in these seminars. I saw a need for a book and decided to write, *The Keys to Learning: Unlocking Your Brain's Potential* (ISBN 979-8988829218), which was published in July 2023. **The book has been well received with 73 ratings (71 are five star) and 68 reviews on Amazon. On Goodreads there are 35 five-star and 1 four-star rating.**

As I was writing the book, I realized I had the makings for a very useful course; the outline is below. I taught this course for the first time, ENGR 10301 Keys to Learning, the Fall 2023 semester to 127 mainly First Year Engineering (FYE) students. I again offered a section of the course the Spring 2024 semester to 67 students. This time the students were of all levels and there were even 10 students from outside of engineering. (The course is a general audience course. ENGR is just a vehicle for offering it.) **For the 2024 - 2025 Academic Year, the enrollment has grown to 429!**

Week		Topic
1		The Human Brain and Neuroplasticity
2		What is Learning? Mental Models, Creativity and Solving Complex Problems
3		Memory and Spaced Studying
4		Study Environment and Interleaving
5		Incubation
6		Testing and Active Recall
7		Exam 1
8		Purposeful Practice
9		Engage all your senses
10		Sleep
11		Mindset, Self-Control and Grit
12		Exercise
13		Meditation & Breathing; Relationships
14		Exam 2
15		Nutrition

To gauge the students' reaction to the course, there is a weekly reflection exercise on Brightspace. The students must make a comment about the past week's class. I ask them to keep them brief, no more than a few sentences, as I read and respond to all of them each week. The comments can be anything such as did they find something discussed surprising, interesting, useful; something they have encountered before; questions they have; etc. I was a little apprehensive how the course would be received the first time I offered it. Every week as I started to look at the reflections with trepidation, I was always pleasantly surprised. The students were finding the material interesting, often surprising, and very useful. There were even comments from a few students that they now looked forward to Mondays, the day of the class, to see what surprising thing would be discussed!

The following table lists the results for the course-instructor evaluations for the three completed offerings. Even though the scores were excellent the first semester the course was offered, the Fall 2023 semester, there was significant improvement with the second offering in Spring 2023. It would be difficult, to impossible, to obtain a better course-instructor evaluation than the one for Spring 2023. But the course is continuing to be improved as I am always learning more about what is important for learning, how best to present it, and incorporating feedback from the student reflections.

Class	Average of 3 course questions	Average of 6 instructor questions
Fall 2023 (2 sections)	4.62	4.73
Spring 2023 (1 section)	4.95	4.90
Spring 2024 (3 sections)	4.78	4.89

Sampling of student comments

This class has been truly eye-opening. I believe that all ECE students—and perhaps students in other majors—should take this class during their college journey. As a senior, I've realized that there's so much I wish I had approached differently, but I didn't fully understand the value of many things we've learned until now. (student reflection Fall 2024)

"Professor, thank you so much for everything I have learned in this class. I only need one hand to count the number of teachers that have really stood out to me because of how good they are at teaching and how well they know the subject. It is a great pleasure to learn from someone who knows what they are talking about, likes to talk about it, and is great at teaching and conveying information. You seemed to really enjoy talking about the subjects in class, and that made this class special to me. In addition to that, I came out of high school after getting by with barely ever studying. I got to Purdue in desperate need of real study habits, and this class was perfect for me as you taught us tons of different methods while I worked on building my methods of studying from the information you provided. Your class has been a great help in my learning how to study properly and refining those methods throughout the semester." (student reflection Fall 2024)

"This is my favorite class I have ever taken. I find myself captivated during lecture! Never before have I seen someone get an ovation after the last lecture, but Professor Melloch did in this course. The content covered is interesting and more importantly, applies to anyone who takes the course." (course evaluation Spring 2024 semester)

"Professor Melloch is amazing, this class shows you how to be successful, this class is absolutely amazing and honestly this should be a required class." (course evaluation Spring 2024)

"I have learned so much from this class, and it has really inspired me to change my mindset, as well as my behavior surrounding my habits. I think the examples, studies, experiments, and anecdotes you provided throughout the class helped to convince me that there are so many aspects of my life that I can improve. Some of the main things, I'm trying to change are sleep, nutrition, testing, studying, and mindset habits. Thank you for teaching this class, it was definitely a great hour of my week!" (from course evaluation Spring 2024 semester)

I had the privilege of taking a class with Professor Melloch based on the contents of this book. Being able to learn from him and his approach to learning was truly amazing to experience. All of the topics we cover in class are expanded upon within the book, which gives readers a deeper dive into

why each of these practices work and how people can use them to their advantage. Everybody has something to learn by reading this incredible book. And, I highly recommend that anybody at Purdue University take this amazing course!" (book review on Goodreads 12/7/2023)

"I was in your ENGR 103 course last semester. I just wanted to reach out and thank you for the effort you put into creating a great learning experience this past semester. As a junior in ECE, I'm constantly being thrown many complex concepts and difficult academic situations (as you may know as an ECE professor), but I truly believe that your class helped me drastically improve my ECE performance by changing my bad habits into good ones. Not only did I have better grades, but my confidence in diving into hard-to-grasp concepts grew. I will definitely be carrying on what I learned in your course throughout the rest of my academic life, and I wish you the best of luck in continuing this course into the future!" (email from a student in the course Fall 2023 semester)

To summarize:

1. The course and book facilitate learning by providing students with information about the learning process that most students and instructors do not know.
2. The innovation is novel in that it brings all aspects important for learning—neuroplasticity, study methods, psychological aspects, and brain optimization techniques—into one course and book.
3. The broad impacts are that students learn how to be successful lifetime learners. **The first AY, 2023-2024, the course was offered there were 201 students, which has increased to 429 for the 2024-2025 AY**. I will be giving the Keynote talk on ENGR 10301 Keys to Learning at the College of Engineering Student Services Retreat 2/3/2025 and I envision one day all FYE students, and many more from outside Engineering, taking Keys to Learning.
4. The evidence that this course and book work is feedback from students. Through weekly reflections, course-instructor evaluation comments, and book reviews on Amazon and Goodreads there is much evidence of students being helped.