

University Senate Chair Award Nominee Information

Dr. Mary Caldorera-Moore
Program Chair and Associate Professor
Biomedical Engineering Department
College of Engineering and Science

1. List of Courses Taught and Overall Teacher Evaluation

	Winter		Spring		Fall	
	Course	Rating	Course	Rating	Course	Rating
2022	HNRS 121: Honors ENGR Problem Solving II	3.8				
2021	HNRS 121: Honors ENGR Problem Solving II	3.9	BIEN 202: Biomedical Engineering Principles	3.9	HNRS 120: Honors ENGR Problem Solving I	3.6
			ENGR 121: ENGR Problem Solving II	2.7		
2020	BIEN 450C: Biomedical Materials	-	BIEN 202: Biomedical Engineering Principles	4	HNRS 120: Honors ENGR Problem Solving I	4
	BIEN 530: Biomedical Materials	4				
2019	HNRS 121: Honors ENGR Problem Solving II	3.9	BIEN 202: Biomedical Engineering Principles	3.8	HNRS 120: Honors ENGR Problem Solving I	4
2018	HNRS 121: Honors ENGR Problem Solving II	3.9	BIEN 202: Biomedical Engineering Principles	3.7	HNRS 120: Honors ENGR Problem Solving I	3.6
2017	HNRS 121: Honors ENGR Problem Solving II	3.6	BIEN 202: Biomedical Engineering Principles	3.5	MSNT 657: Nanomedicine	4
					BIEN 523: Nanomedicine	4
					BIEN 450C: Nanomedicine	4
2016	HNRS 121: Honors ENGR Problem Solving II	3.8	BIEN 202: Biomedical Engineering Principles	3.5	BIEN 450C: Biomedical Materials	4
	ENGR 389C: Biomaterial Research	-	ENGR 489C: Biomaterial Research	-	BIEN 530: Biomedical Materials	3.7
					ENGR 489C: Biomaterial Research	-
2015	BIEN 325-001: Bioinstrumentation	3.6	MSE 405-001: Nanotechnology Principles	4	BIEN 202: Biomedical Engineering Principles	3.6
	BIEN 325-002: Bioinstrumentation	3.5	MSE 505-001: Nanotechnology Principles	3.5	BIEN 523: Nanomedicine	3.8
			MSNT 505-001: Nanotechnology Principles	3.1	ENGR 389C: Biomaterial Research	-
2014	BIEN 325-001: Bioinstrumentation	2.5	MSE 405-001: Nanotechnology Principles	3.3	BIEN 530: Biomedical Materials	3.8
	BIEN 325-002: Bioinstrumentation	3	MSE 505-001: Nanotechnology Principles	3		
			MSNT 505-001: Nanotechnology Principles	3.5		
2013					BIEN 557: Nanomedicine	3.8
	Average	3.591	Average	3.5	Average	3.838

Shading Indicates New Class Prep.

Total Course Rating Average 3.65
Non-New Class Prep. Average 3.78

2. Statement of Beliefs Concerning the Importance of Teaching, Research, and Community/ University Service to the Overall Mission of the University

Increasing science, technology, engineering, and mathematics (STEM) literacy in my home state and at my alma mater is a career goal of mine. Henceforth, all of my efforts as a faculty member have centered around this goal. Educational studies have shown that after two weeks we tend to remember only 10% of what we read, 20% of what we hear, 30% of what we see, and 50% of what we see and hear. In contrast, we remember 70% of what we say through participating in a discussion or giving a talk, and 90% of what we say and do through doing a dramatic presentation, simulating the real experience or doing the real thing – i.e. active learning (from Edgar Dale Audio-Visual Methods in Teaching, Holt, Rinehart, and Winston). For this reason, my teaching approach has been to incorporate as many active learning components as possible into my courses.

In all of the courses I have taught, I have added innovative hands-on activities to better engage students and foster learning of complex topics. As part of my teaching responsibilities, I have designed 2 separate graduate courses (also cross-listed as undergraduate courses) on nanomedicine and advanced biomaterials to enhance the diversity of courses in our program. The goal of these courses is to better prepare students for research and development in those areas. I have also been active in the development and submission of state level educational enhancement grants for the purchase of equipment to strengthen core undergraduate curriculum for the entire college. Now, as the Program Chair of the Biomedical Engineering Department I am working enhance our core curriculum with more hands-on projects and updating lab infrastructure to better train tomorrow's engineers. Together, these efforts improve student retention and learning of complex engineering concepts which in turn strengthens the quality of students graduating from Louisiana Tech University.

My engineering education efforts led me to be nominated to apply and subsequently accepted to the National Academy of Engineering (NAE) 2014 Early Career Engineering Faculty Fellowship program. As a fellow, I attended the NAE's Frontiers in Engineering Education (FOEE) Symposium. At the symposium I attended workshops on implementation of innovation education practices, worked with engineering education experts to strengthen my proposed curriculum enhancement.

As a research active faculty member, I see my research products as not only the experimental results produced but also the students (high school, undergraduate, and graduate) I educate and train to be the next generation of engineers and educators. Throughout my academic career, I've been exceedingly active and dedicated to mentoring students in biomaterials research including several underrepresented minority graduate and undergraduate engineering students. I serve as research advisor to a multidisciplinary group of Ph.D., master's, and undergraduate students in biomedical engineering, chemical engineering, mechanical engineering, microsystems engineering, chemistry, biology, and molecular science and nanotechnology (MSNT) programs. In addition to mentoring undergraduate and graduate students, I have to-date, 3 female students from the local public high school (Ruston High School) have participated in research under my direction.

I take a very hands-on approach in the lab with all of my students. I meet with my entire lab weekly either in the form of a full lab meeting or individual project meetings. In these meetings all of my students have the opportunity to give research project updates in a power point presentation format. This gives them invaluable experience with giving research presentations. In addition, I encourage and financially support my students to present on their research at the local, state, and national level. Since joining LA Tech, students in my lab have given over 50 research presentations in the form of poster or oral presentations. Fourteen of these presentations have received top presentation awards.

I have also been very active in mentoring and sponsoring undergraduate students in my lab to obtain fellowships through state EPSCoR programs and Louisiana Space Grant Consortium (LaSPACE, federal flow-through). Nine undergraduates have successfully received funding through the BoR Supervised Research Experience for Undergraduates (SURE) and LaSPACE Undergraduate Research Assistantship (LURA) programs, (**Table 1**). In addition, 2 of my graduate students have been awarded LaSPACE Graduate Research Assistantships (GSRA) and 1 graduate has received a Sigma Xi scientific research society grant that is sponsored in part by the National Academy of Science (**Table 1**). Writing these successful research assistantship proposals is an empowering experience for the students that can be pivotal to retaining them in a STEM research career field. In addition, I push my students to aspire

Table 1: Assistantship Awarded to students working in the Caldorera-Moore Lab

Grant Type	Student	# of Assistantships Award
LaSPACE LURA	Sofia Urbina	1
	Reagan Edwards, BME/Bio '23	3
	Terrance Lymon, BME '21	1
	Alisha Brown, BME '20	1
	Luke Villermin, MEEN '17	3
	Rachel Hegab, BME '19	4
	Madison Padgett, BME '19	2
BoR SURE	Alisha Brown, BME '20	1
	Carlie Whitfield, MEEN '19	1
LaSPACE GSRA	Anna Whitehead, MS '17 MSNT	1
	Haley Barnett, Ph.D. '20 MSNT	3
Sigma Xi	Nehal Patel, MS '16	1

to gain as much research experience as they can through REUs and internships. Given their research background, experience, and strong presentation skills my undergraduate students are all strong applicants for these programs and they have been selected to participate in highly competitive REU programs like at Penn State University, Cornell University, and The University of Texas at Austin, and internships at GE Healthcare, Medtronic, and Alcon.

My efforts go beyond the lecture podium and the lab bench and extend to the entire University and the surrounding communities. I've developed innovative approaches to foster informal STEM learning by building upon Tech's strengths in multi- and interdisciplinary partnerships. Lack of diversity in STEM fields continues to be a significant problem nationally and at Louisiana Tech University. To address this problem, new, transformative pathways of recruitment and retention of minorities need to be created. In the efforts to accomplish this, I have been instrumental on a number of fronts to create novel routes for increasing exposure of females and minorities to STEM fields. Initiatives include the development of a science experiment booth at the weekly local farmers' market, growth of University-wide, interdisciplinary, seminar series, and creation of University program called Visual Integration of Science Through Art (VISTA).

Along with Dr. Jamie Newman in Biological Science, I co-direct the year-long interdisciplinary New Frontiers in Biomedical Research Seminar Series. For nine years now, the New Frontiers Series has brought world-renowned researchers in biomedical research to Louisiana Tech University for seminars. Even during the pandemic, the series continued virtually. In addition to discussing their research, some of our guests give a separate lecture intended for a general audience. These special lectures are designed to involve and educate the community on research that is relevant to them and what progress is being made to improve diagnostic and treatment options for patients.

I am also one of the founding directors of the Visual Integration of Science Through Art (VISTA) program for the creation of an interdisciplinary undergraduate curriculum concentration in medical illustration. The VISTA program is creating a new and unique avenue to attract and retain undergraduate students to Louisiana Tech University. Even in its infancy, this collaboration between art and science has significantly impacted the students and faculty involved and Louisiana Tech University. This collaborative, uses digital art to enable the students to create scientific illustrations, representing what President Guice called an "unparalleled educational experience."

At the community level, to increase early exposure of children in the local community to STEM fields, in partnership with Dr. Katie Evans (former OWISE director), Dr. Lindsey Keith-Vincent, Louisiana Tech's Science and Technology Education Center (SciTEC) director, and Ms. Amanda Sutherland, community members and senior director at Murphy USA, I have worked to develop a science experiment booth at the weekly local farmers' market. Before the pandemic, the booth provided weekly hands-on science experiments directly to children in the Ruston community. During the first seasons of the booth, 11 different science experiments were conducted, 65 undergraduate students from COES and the UTeachTech program worked the booth, and over 250 area kids participated in the booth – 70% of which were female. While the impacts of these efforts on increasing recruitment of underrepresented minority groups are not easily measured within a 3-year period because the target demographics of the booth are children ages 4-12; these numbers are merely a confirmation that we are moving in a positive direction.

3. Selected List of Recent or Relevant Publications, Papers, Grants, and/or Presentations

A. Invited Plenary Presentations

M. Caldorera-Moore, Responsive Biomaterials for Regenerative Medicine Applications. Alliance for Diversity in Science and Engineering (ADSE), New Orleans, LA, 03/2018.

M. Padgett*, R. Hegab*, H. Barnett, A. Heimbeck, and **M.E. Caldorera-Moore**. Hydrogel Tissue Scaffolding for Wound Healing & Cardiovascular Health. LaSPACE Fall 2017 Council Meeting, Baton Rouge, LA, USA; 11/2017.

* Undergraduate Student

H.H. Barnett and **M.E. Caldorera-Moore**. Investigating Cell-Biomaterial Interactions to Create Cardiac Tissue Patch on Tailorable PEGDMA Hydrogel Scaffolds. LaSPACE Fall 2017 Council Meeting, Baton Rouge, LA, USA; 11/2017.

M.E. Caldorera-Moore, A. Moore, and R. Hegab *. From Undergraduate Researchers to Tenure-track Faculty: Our Story of the Continued Impact of Past, Present, and Future NASA Space Grant Support in Louisiana. National Space Grant Directors Meeting, Arlington, VA, USA; 03/2017.

M.E. Caldorera-Moore. Nanotheranostics for Cancer Applications. ACS 247th National Meeting 2014 Spring Meeting, Dallas, TX, USA; 03/2014. **Invited plenary speaker**

B. Selected Peer Reviewed Publications

H.H. Barnett, M. Shevchuk, N.A. Peppas, and **M.E. Caldorera-Moore**. Influence of Extracellular Cues of Hydrogel Biomaterials on Stem Cell Fate. *Journal of Biomaterials Science, Polymer Edition*. 2022, 1-24. (Impact Factor: 3.517, 2020).

T.R. Priddy-Arrington, M.S. Ward*, R.E. Edwards*, **M.E. Caldorera-Moore**. Proactive Biomaterials for Chronic Wound Management and Treatment. *Current Opinion in Biomedical Engineering*. 2021; Vol. 20, 100327. (Impact Factor: 3.227, 2022).

H.H. Barnett, I.A. Pursell*, L. Lee*, N. Perez*, **M.E. Caldorera-Moore**, and J.J. Newman. Combination of Soluble Factors and Biomaterial Scaffolds Enhance Human Adipose-Derived Stem/Stromal Cell Myogenesis. *Biochemical and Biophysical Research Communications*, 2020, 529 (4), 1180-1185. (Impact Factor: 3.575, 2020).

M. Wechsler and **M. E. Caldorera-Moore**. Intelligent/Responsive Polymers as Biomaterials. *Journal of Applied Polymer Science*, 2020, 137 (25), 49249. (Impact Factor: 3.125, 2020).

R.H. Hegab*, S. Pardue, X. Shen, C. Kevil, N.A. Peppas, and **M.E. Caldorera-Moore**. Effect of Network Mesh Size and Swelling to the Drug Delivery for pH Responsive Hydrogels. *Journal of Applied Polymer Science*, 2020; Vol. 137 (25), 48767. (Impact Factor: 3.125, 2020).

H.H. Barnett; A.M. Heimbeck, I. Pursell, R.A. Hegab*, B.J. Sawyer*, J.J. Newman, **M.E. Caldorera-Moore**. Poly (Ethylene Glycol) Hydrogel Scaffolds with Multiscale Porosity for Culture of Human Adipose Derived Stem Cells. *Journal of Biomaterials Science, Polymer Edition*, 2019, Vol. 30 (11), 895-918. (Impact Factor: 3.517 2020).

A.M. Heimbeck, T.R. Priddy-Arrington, M.L. Padgett, C.B. Llamas, H.H. Barnett, B.A. Bunnell, and **M.E. Caldorera-Moore**. Development of Responsive Chitosan-Genipin Hydrogel for the Treatment of Wounds. *ACS Applied Bio Materials*, 2019, Vol. 2 (7), 2879-2888. (Impact Factor: 3.25, 2021).

A.M. Heimbeck, T.R. Priddy-Arrington, B.J. Sawyer*, and **M.E. Caldorera-Moore**. Effects of Post-Processing Methods on Chitosan-Genipin Hydrogel Properties. *Material Science & Engineering C*, 2019, Vol. 98, 612-618. (Impact Factor: 7.328, 2020).

A.K. Whitehead, H. Barnett, **M.E. Caldorera-Moore**, and J.J. Newman. Poly (Ethylene Glycol) Hydrogel Elasticity Influences Human Mesenchymal Stem Cell Behavior. *Regenerative Biomaterials*, 2018, 5 (3), 167-175. (Impact Factor: 5.16, 2020).

J.J. Newman, **M.E. Caldorera-Moore**, and N. Bustamante. Digital Painting and an Introduction to Medical Illustration. *Proceedings of the Louisiana Academy of Sciences*, 2016.

* Undergraduate Student

N. Patel, A.K. Whitehead*, J.J. Newman, and **M.E. Caldorera-Moore**. Poly (Ethylene Glycol) Hydrogels with Tailorable Surface and Mechanical Properties for Tissue Engineering Applications. *ACS Biomaterials Science & Engineering*, 2016; Vol. 3 (8), 1494-1498. (Impact Factor: 4.749, 2020)

J.J. Newman and **M.E. Caldorera-Moore**. Interdisciplinary Seminar Series: Increasing Awareness for Research, Recognition of the University, and Professional Development Opportunities. *American Society for Engineering Education Conference Proceedings*, 2016; DOI: 10.18260/p.25442.

M.E. Caldorera-Moore, K. Maass*, R. Hegab*, G. Fletcher*, and N.A. Peppas. Hybrid Responsive Hydrogel Carriers for Oral Delivery of Hydrophobic, Low Molecular Weight Therapeutics. *Journal of Drug Delivery Science and Technology*. 2015; Vol. 30 Part B: 352-359. (Impact Factor: 3.981, 2022)

4. Selected List of Relevant Community and/or University Service Activities

A. Service to University and College

Program Chair, Biomedical Engineering (Sept. 2021-present).

LaSPACE affiliate institutional coordinators for Louisiana Tech University (Feb. 2018-present).

Co-Director of Louisiana Tech University New Frontier in Biomedical Research Seminar Series (2014-present).

Regional Science Fair committee member (Dec. 2016).

Louisiana Tech University Work-life Balance committee member (Sept. 2016-2020).

Faculty counselor for Louisiana Tech University's Society of Women Engineers (2015-16).

Founder of Louisiana Tech Community Women Influencing Science, Technology, Engineering, and Math (WiSTEM) outreach organization (May 2015-present).

Tenure track faculty candidate searches (Chemistry 2014-15, Chemical Engineering 2015-16, Biomedical Engineering 2017-18, 2018-19, 2021-present).

Helped with summer advising during freshman orientation (~4 hours, 2015).

College of Engineering and Science (COES) Leadership Team Associate (Sept.-Dec. 2014, Sept.- Dec. 2020)

B. Service to Community

Research and Engineering Apprenticeship Program (AEOP) funded by the Army Educational Outreach Program (AEOP) Mentor (Summer 2021).

Louisiana STEM (LaSTEM) Girls Collaborative Project Leadership Team Member (Aug 2015-pres).

Co-founder, organizer and volunteer for the WiSTEM: Sensational STEM Booth at the Ruston Farmers Market (2015-pres).

Organizer and volunteer for South Arkansas Community College GLAMS-Girls Learning About Math and Science event (May 2015, 2016).

Mentored local school teacher – Ms. Danni Stuckey, Dubach Elementary, Dubach LA, through the Sigma Xi: SciTEC partners program. Part of mentoring involved doing demos in Ms. Stuckey's English/writing class and then lead a technical writing assignment.

Organizer and volunteered for Louisiana Tech University's The Society of Women Engineers (SWE) introduce and girl to engineering and science: Girls Scout Day.