

## ***The City of Roses—Pasadena City College and the Chemistry Research Laboratories***

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**Abstract:** As a background for these student responses, I would first like to describe the distinguished program they are a part of at Pasadena City College (PCC). The Early Career Undergraduate Research Experience (eCURE) is a program at PCC that provides students with an undergraduate research experience in the natural or physical sciences at the onset of their scientific careers. This unique experience inspires enthusiasm for scientific research by introducing students to research projects with broader impact in terms of sustainability, energy, the environment and emerging scientific technologies. In this particular eCURE research group led by Dr. Jillian L. Blatti, students have devised methods of synthesizing sustainable paints and testing their resultant properties; they have transposed their tested methods into lesson plans to engage local high schools in scientific outreach efforts, inspiring the next generation of scientists and science educators in sustainability education. As part of this outreach effort, students collaborated with Penn State University's Nanotechnology Applications and Career Knowledge (NACK) Network in their Remotely Accessible Instruments for Nanotechnology (RAIN) program to bring hands-on experience with advanced analytical equipment to high school students via the Internet, including a scanning electron microscope and atomic force microscope, which they used to analyze sustainable paints they crafted in the classroom. In these highly interdisciplinary and collaborative projects, PCC students are learning to integrate concepts from their science courses into a research-based setting, generating novel questions, designing experiments, analyzing the results, and communicating their science to a broad audience. This innovative community college research program has inspired our students at PCC to continue scientific research in sustainability that they have become passionate about as they transfer to four-year institutions. What follows is accounts of chemical research in sustainability in the chemistry research laboratories at Pasadena City College, the eCURE students' 'sense of place', and how it impacted their views on sustainability research and education.

**Keywords:** sustainability education, sustainable paints, renewable resources, community colleges, community college research, outreach and education, green chemistry, algae biofuels, chemistry, sustainability, undergraduate research

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*Jillian L. Blatti is a chemistry professor at Pasadena City College (PCC), where she teaches Introductory Chemistry, General Chemistry, and Organic Chemistry. She leads a research group at PCC through their Early Career Undergraduate Research Program (eCURE). Through eCURE, students are inspired to pursue interdisciplinary research focused on global issues, such as energy, the environment, and sustainability. She says, "In the lab, we have a lot of fun doing scientific research, and as such, we have fostered a sense of community and acceptance, freedom of thought, creativity, and application of scientific principles. It has been remarkable to watch my students grow as creative scientists and independent thinkers who are passionate about the environment. As we believe that creativity is inherent in the scientific method, we engage in artistic endeavors in addition to our laboratory research, such as painting and playing music." When she is not teaching chemistry and conducting scientific research, she is likely playing classical guitar, hiking, watching soccer, surfing, and/or spending time with her husband, Jeff and cat, Luka.*

*Anthony F. Cuccinello is currently an undergraduate student at PCC where he is studying chemical engineering in order to pursue a career path in the field of energy. He is eager to solve the energy crisis and find sustainable sources of energy that will*

*ultimately benefit society as a whole. He says, “I am a very driven and passionate individual that thrives and appreciates my studies. The English expression, ‘when the going gets tough, the tough get going,’ is a great representation of who I am. I am someone who will never quit or turn away from a challenge, but instead embrace it, and determine a way to work through it. I am a strong believer that if you put your mind to something you can accomplish anything with hard work. I am also very passionate about helping others. Some highlights from my time at PCC are moments when I was able to share the knowledge I have gained as a result of my proactive efforts in my courses and research with other students to help them realize their dreams.” Aside from his studies, he really enjoys playing baseball, hiking, downhill mountain biking, and social gatherings.*

*Betsy Juarez recently transferred to the University of California, Irvine (UCI) from PCC to pursue a B.S., majoring in Biological Sciences. She says, “The eCURE internship inspired me to also pursue a minor in Global Sustainability because I am passionate about introducing sustainability in education. I participated in the Summer Institute for Sustainable Leadership (SISL) at UCI, which has made me actively involved in sustainability and green initiatives on and off campus.” Having been accepted into the Minority Biomedical Research Support (MBRS) program within the UCI Ayala School of Biological Sciences, she plans to continue to pursue research in a biomedical laboratory. Her career goals are to achieve a Ph.D. in an area of Biomedical Sciences and work in a nationally recognized lab to be able to collaborate with research scientists on a global level. In her free time, she enjoys spending time exploring nature, catching a good game of soccer, and playing music on her guitar.*

*Jianyi (Ken) Lu is an International student from Japan. He recently transferred from PCC to Wesleyan University. His major is Molecular Biology and Biochemistry, and he is working on obtaining a bioinformatics certification; he also conducts scientific research in Professor Rich Olson's X-ray crystallography protein structure lab. He plans to go to medical school and work with Doctors Without Borders.*

*William Liang began his academic career at Pasadena City College, taking STEM classes and conducting research with the eCURE program. He recently transferred to the California Institute of Technology, where he is majoring in Biochemistry and conducting scientific research in this field (and continuing to help out the eCURE research group at PCC). Through his studies, he aspires to contribute to advancements in the medical field and to protect the environment. When he is not in the lab, he can be found in a practice room with his cello or on the soccer field!*

*Carina Sepulveda-Torres is a bioengineering major with hopes of transferring to the University of California, Irvine, the University of California, Los Angeles or Cal Poly San Luis Obispo. Her passion lies within learning new things in the science field and seeing how they can be applied to the world to make it better for future generations. She says, “As a bioengineer, my goal is to unlock and decode the science of human genetics and use it to create new treatments to cure disease.” Whenever she is not studying for school, she loves playing soccer and watching all of the latest match-ups for the upcoming EuroCup and Copa America 2016.*

*Anakany Ramirez began her journey at Pasadena City College during the Fall of 2012. As the first Latina female in her family to attend college, she believes it has been an honor to have the opportunity to pursue higher education. With the help of her parents who came to the United States of America to allow for her and her sister to have access to a better future, the encouragement and support she received from peers, mentors, and professors fostered her ambition and made her strive towards pursuing a higher degree. She says, “I value the work I have done as a STEM major at PCC. As I wait for the month of April to come, my hopes are set on hearing a positive response from UCLA, UC Irvine, Cal State LA or Cal Poly Pomona. My goal is to obtain a B.S. in Cell Biology/Immunology and Genetics and a minor in Child Psychology with the aim of applying to the David Geffen School of Medicine at UCLA. In terms of my career aspirations, my goal is to become a Trauma Surgeon and conduct research in type II diabetes and arthritis. The opportunity to engage in scientific research at PCC through the eCURE internship has been life changing. Our work focused on green chemistry, sustainability, critical thinking skills, and creative approaches to work on ‘real world’ science and its applications. Dr. Blatti has gone far and beyond to create an exciting, free thinking academic environment. It is opportunities like these that really motivate students to learn and take part into the ever growing and changing world of science.”*

*Jennifer Portillo is currently attending PCC and about to transfer and pursue a major in Biochemistry. She feels very fortunate to have attended PCC and joined the eCURE. She says, “I learned about green chemistry and sustainability through hands-on experience. Now that I am about to transfer, I take with me more care and an awareness that I did not have prior to this research. My overall goal is to obtain a Ph.D. in Neuroscience and do research in neurodegenerative diseases. I have a long road ahead, but I am excited to be on this journey. I have learned persistence and dedication, and most importantly, I know that I have great support from family and friends.”*

*Elliot Pourmand is a student at PCC working towards becoming a software engineer with the hopes of intertwining computers with the hard physical sciences, chemistry and physics, and developing platforms that allow humans to observe and understand the vast unknowns in our world. He says that, “eCURE really curated my interest in science and enlightened me to a feeling I am not often exposed to in my STEM classes—creativity. Furthermore, the peer group that I was introduced to by being part of the program had a powerful impact on me as a student. They were very motivational to me as a new student and the insights they provided in science and chemistry caused my interests in science to grow and develop. The equipment that we had access to,*

*Pasadena, the City of Roses, Pasadena City College, and the Chemistry Research Laboratories*

*particularly the SEM (scanning electron microscope) also had a huge impact on me as a student. It was instantly the coolest thing I had ever seen, ever. The SEM greatly sparked my interest in software engineering and the scientific application of software in lab."*

*Vanessa Sanchez is currently attending Pasadena City College and studying Biology. She intends to pursue a career in Medicine. Her goal is to go to medical school to become a doctor and specialize in Gastroenterology. She says, "My passion and desire to help others has brought me to where I am today. This undergraduate research program has allowed me to better learn and understand the language of organic chemistry. My participation in this research group and the environment that was established has allowed me to strengthen the confidence that I have in achieving anything; as long as I do my best and have the drive to follow through." In her spare time, she enjoys running, hiking, and snowboarding.*

*Nikolai Massine recently transferred to UC Berkeley from PCC and started an intern job at the Berkeley Civic Center as a data programmer. According to Nikolai, "The eCURE research experience helped me think collectively with other people. It made me realize that when you work on a project together in a progressive way, you can get a lot of work done! The reality of a scientist consists of so many patterns that one must wade and dwell through one way or another to discover the truth of nature." He is fluent in many languages in addition to the language of science. He loves art and nature, and enjoys listening to electronic music, in particular intelligent dance music, and reading scientific articles.*



One morning, I went for a run at the Hahamongna Watershed Park. I was intrigued by the algae in a pond that I passed by and retrieved samples of it. That afternoon, I brought the samples into the Pasadena City College Chemistry laboratory, and my research partners and I produced biofuel and made soap with them! The Hahamongna Watershed Park is meant to serve as drainage, as water flows from the San Gabriel Mountains, through Pasadena, and into the L.A. River. The once beautiful park, now dry and covered in trash, is a warning of the urgency with which we need to protect our environment. Pasadena City College offers me the unprecedented opportunity to respond to that warning. The laboratory offers me an open space to develop ideas and collaborate with peers and mentors who share my passion for protecting the environment.

-William

PCC has changed my life for the better. Through attending PCC, I was able to find myself and realize exactly what I wanted to do with my life. Because of my research mentor and other professors at PCC, I was exposed to many different fields and routes I could go as science major. Also, because of the programs offered at PCC, I was able to experience hands-on what it's like to work in a research lab environment. From the research opportunities offered through PCC (eCURE), I now possess the skills and techniques that are required to work efficiently in a high impact laboratory. Personally, when I think of "sense of place," I think of home. It is where I can go and feel like I belong. It's a place where I feel comfortable to share my ideas openly without judgment and feel a sense of motivation because of the presence of others that share the same interests as me. PCC has provided this "sense of place" to me in many ways. Through my experiences working in the lab, reading research articles, designing and conducting my own

experiments, and setting up outreach activities to spread awareness and knowledge of sustainability, I realized that all of this effort didn't feel like work. I always found everything so intriguing and enjoyable, even if a test had to be run for the fifth or sixth time. I was always looking forward to the times my group would be meeting at PCC. Attending our meetings didn't feel like work at all. We all enjoyed what we were working on, and it turned into a social hour as well! I gained some good friends who I can be myself around and know that I will not be judged when I express an idea or thought, and because of these good friends and professors that I have been acquainted with these past couple of years at PCC, I feel like I can excel far beyond what I thought I ever could as a science major and as a person. I will forever feel that PCC represents this "sense of place" (home) to me because it is where my realization of my career officially started and ultimately changed my life. Furthermore, this is where I discovered the importance of sustainability. The ideas that my group and I have been working on in the laboratory and through outreach can lead to changing the world by spreading awareness of sustainability through education. Teaching fun, engaging, and interactive lessons about sustainability represents one of the many ways we can foster sustainability in this world. Eventually, if the younger generations pick up on this idea of sustainable education, I believe it will lead to finding alternative and more efficient solutions to a cleaner, greener, less toxic world.

-Anthony



Pasadena City College turned out to be the place where I ended up finding myself. There are a lot of decisions that are expected to be made when you come out of high school that can be very overwhelming at times. I never thought that I would end up finding my own place in Pasadena, mainly because I never found a place where I could really connect with people who had the same

mindset as I did. When I finally decided to major in the STEM field, I found a group of people that had the same ideas, goals, and interests as I did. I identified with these people so much that I no longer felt like a stranger in a foreign land. To me, that is exactly what "sense of place" means. It's the group of people that never fail to help you out on a homework assignment even if they have problems of their own to figure out. It's the place you can go to and take a nap after a stressful exam that gave you nightmares months after you (barely) passed the class. It's the place that allows you to grow personally, professionally, and as a human being. The chemistry research laboratories at PCC are where I felt supported by my friends and professors, which empowered me to believe that I could pursue science as a career.

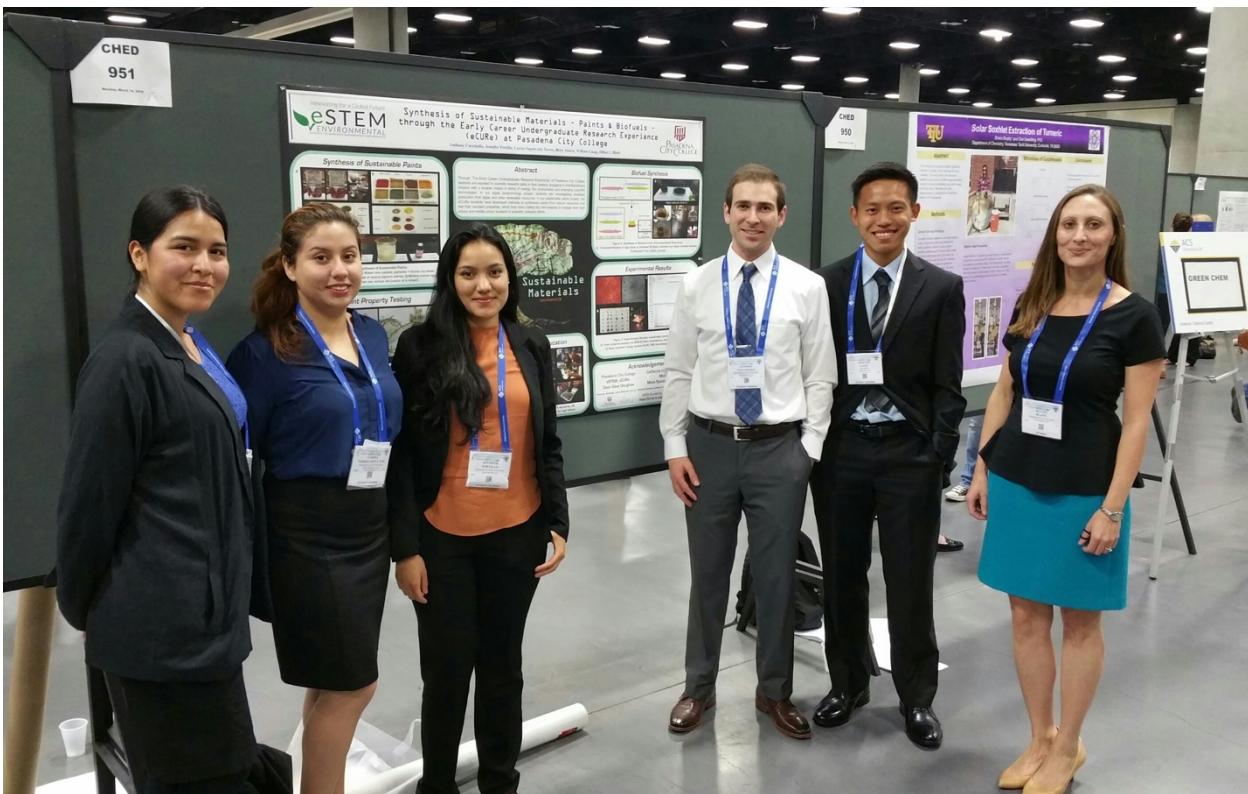
- Carina

Coming to Pasadena City College has offered me a series of opportunities, and I knew from the beginning that I was at the right college. Introduction to the type of courses that the Science Village had to offer was also comforting, seeing this as a place where I would be able to interact with other students who had an interest in the natural sciences as well. The opportunity to work in a lab not involving classroom assignments provided a sense of real life application of techniques. Dr. Blatti allowed us to explore ideas and experiments in areas of interest outside of our previous learning experiences, such as organic chemistry. My favorite sustainability experiment that Dr. Blatti allowed us to take part in was the use of coffee grinds to make bio diesel fuel. 'Sense of Place' has to do with being able to feel comfortable and free in exploring and learning. It has to do with having fun while learning new and proper techniques and research skills. 'Sense of Place' means being able to interact with new individuals and getting to know the professional faculty who, in this sense of place, have served as mentors. The experience that this 'Sense of Place' has offered is one that I am hoping to repeat again. The majority of the experiments we did focused on sustainability. Previously in my education, the idea of sustainability and its importance was not made evident, and the space that Dr. Blatti provided for us brought awareness of this concept. Her idea to connect our research to outreach about sustainability further shows the dedication she applied not just to our group, but to expand our awareness beyond the classroom experience to others. The eCURE program at PCC has provided tremendous experience for our research group in sustainability and education.

-Anakany

I really feel that eCURE at PCC was a life changing experience because I got to meet and be close to a lot of beautiful forces that I haven't really experienced in the past. I was mostly a loner at Pasadena City College before I came to the research group. But when I was in the lab with everyone, it all seemed to be correlational and I will always cherish those moments.

-Nikolai



Pasadena City College is my second home; if anything, it is more like my actual home. Similar to how I find comfort at my house, I find comfort at PCC. This makes my long drives worth my time. Specifically, where I am comforted and fueled to become a better individual is at the Pasadena City College Chemistry labs. When I first started doing research at PCC, I had no idea what to expect. I had little knowledge about the scientific field. Gradually, I began to gain exposure to different scientific fields and projects that I could work on. I was very intrigued by how my own thought processes could develop into a new idea. Most of the time our ideas are left in limbo because we feel we do not possess adequate skills to develop them. I began to think better than that and believe in my own ideas. I was taught to cultivate my ideas and explore methods to pursue them. Subsequently, I started to see science everywhere. I became more passionate about science, especially about creating a change. Our group has worked diligently on improving paints through sustainability. Through research, we became increasingly more exposed to the toxicity of many paints, and we took it upon ourselves to better the environment by coming up with ways to make paints with less toxic by-products. It is our responsibility as scientists to work for Nature and care for our environment. Still, we did not stop with our research results. We took it to the next level and developed our ideas into lessons to outreach to high schools so that we could increase their knowledge in green chemistry and sustainability. We are now planting trees, so that the future generations can enjoy the shade.

-Jennifer

During the spring semester of 2015, I was invited by Dr. Blatti to be a part of her research group. I had no idea that this invitation, this experience, would go on to shape my thought process, values, and interest in science forever. Working on laboratory research allowed me to think

freely as a student. It curated my interest in science and enlightened in me a feeling I do not experience often in my STEM classes—creativity. Creativity coupled with critical thinking and conceptual understanding is essential in science. I had never experienced an environment like this before on such a level, and I loved it. It was an open playing field with any influential idea we could generate. The chemistry lab provided a platform for us as STEM students to hypothesize, experiment, and observe without the restrictions of a strict class or set curriculum. Furthermore, the peer group that I was introduced to by being part of the program had a powerful impact on me as a student. The group motivated me as soon as I entered the lab, and the insights they provided me in science and chemistry have pushed my interests in science to grow and develop. The equipment that we had access to, particularly the SEM (scanning electron microscope) had a huge impact on me as a student and as a person. It was instantly the coolest thing I had ever seen, ever. I was in complete awe the first time Dr. Blatti showed us the SEM and explained how it worked. I just couldn't believe something so powerful and advanced was available to us as students, purely for the sake of discovery and observation, purely for the sake of science. The SEM sparked my interest in software engineering and the scientific application of software in lab settings. I am now working towards becoming a software engineer with the aim of intertwining computers with the hard physical sciences, chemistry and physics, and developing platforms that allow us to observe and understand the vast unknowns in our world. I really think the research group changed me as a person, changing my life. I know that if I had not been given this opportunity as a student I would be on a different path. I've never really known what I wanted to do with my life, and oftentimes in school it becomes difficult to perceive a clear future and path. It often feels distant and unattainable. Working in this research group, surrounded by such powerful peers, exposed to critical thinking, tinkering, student-generated experimentation, and experiencing unbelievable equipment such as the SEM, all helped carve the mental pathways I needed as a student to find my direction towards success and develop powerful hunger for knowledge. I thank Dr. Blatti for giving me an unreal opportunity last spring. It will positively impact me for the rest of my future.

-Elliot

Pasadena City College was a place that made me realize my passion for learning. Comparing PCC with the liberal-arts college to which I transferred, there were many more age and social class diversities at PCC. At PCC, I met friends who were really enthusiastic for seeking their careers and sought to find work of their life's calling. There were many students who came back to the college to study. In many cases, listening to all of these unique people's stories or reasons for coming back to school surprised me and reminded me of the importance of education. They seemed to figure out the core values of their life according to their social experiences or life's struggles. Their commitments or resolutions for learning always motivated me. Everyone was kind and helpful. I had wonderful mentors and friends at Pasadena City College. Even though I transferred to an East Coast liberal arts college recently, I am proud of my three years of experiences at Pasadena City College, and will take it with me wherever I will go. In addition, California has the nicest weather! We made biofuels and paints, and I even got to lead a 'Sustainability and Green Chemistry Day', where I taught others how to make (and burn) algae biofuels. The experiences I got through eCURE with Dr. Blatti taught me a lot of things. Especially, it kept reminding me of the importance of the scientific problem seeking and solving process. You always start from finding interesting chemistry facts or problems that do not have clear answers. Then, you must inductively reason the matter to an understandable

general or organic chemistry concept and research the matter. In addition, we enjoyed working in the lab every time! Research is difficult, and it takes a long time to get the results in most cases. However, Dr. Blatti reminded me that I should enjoy what I do since that is what I want to do with my life. Dr. Blatti added flexibility and a sense of fun to my science perspective. Of course, outreach was also a good experience for me. I have never done this kind of community contributing activity before I came to the U.S. I really appreciate eCURE and Dr. Blatti for giving me those opportunities. Furthermore, I met a lot of friends in our research group. They are all passionate towards studying science. When I was in Japan, there were a lot of friends who were really smart on tests in science. They studied science because they knew they could do well and it made it easier to get job later. However, people who I met in our group at PCC were all motivated and sought after their genuine goals. I am actually motivated from them a lot. This is my best experience in my life.

-Ken



An ideal ‘sense of place’ is known to exist when one closes their eyes and powerful memories emerge of an environment that has left a favorable impression that will never be forgotten. The environment is greatly influenced by the mentor and the energy that he or she conveys towards the students. I am grateful to say that I was given the opportunity to participate in Pasadena City College’s eCURE program, which involved the synthesis of sustainable paints. During the program, the passion and dedication that Dr. Blatti channeled to her students was truly inspiring. An ideal ‘sense of place’ may cease to exist if there is no motivation or enthusiasm that is being evoked from the surroundings. Fortunately, that was never the case in our chemistry lab. The lab had an abundance of creativity and enthusiasm. Before being presented with this opportunity, I was uneasy about attending my general chemistry lab because I was constantly afraid of making errors in the lab and not achieving the results that were expected. Working in the lab with Dr. Blatti was a unique experience because it granted me the ability to see that every day was a learning experience. The fact that we were able to develop our own procedures allowed me to progress my observation skills and enabled me to become more detail-oriented. I never felt rushed or as if I was being watched, due to the likelihood that I would make mistakes. I respected the fact that we were treated like capable scientists doing research. I am proud to say that my ‘sense of place’ emerges when I enter my organic chemistry lab and I am no longer nervous or afraid of making mistakes. Instead, I am excited and ready to work because I know

that making mistakes is part of the learning experience and also a great part of being a scientist.

-Vanessa

I believe a 'sense of place' comes from having the realization of where one belongs. Pasadena City College is a school of about 26,000 students. As with most community colleges, it is a very diverse campus with students ranging in age and work experience. Among this large and diverse student population, it can be quite easy to miss out on finding a 'sense of place'. As I entered PCC majoring in biology, I was suddenly whisked into the system, trying so hard to get through the English and math course requirements. I did not have a 'sense of place' during this time because everything was almost mechanical. Then, I was able to take my science classes--which, due to the construction of a new science building, were temporarily relocated to a corner lot of the campus with dispersed bungalows for classrooms and laboratories called the Science Village. At first, I believe the students and most of the faculty disliked the idea. However, as I began taking classes in the Science Village and became involved with internships, outreach events, and our chemistry club, all of these thoughts faded. I no longer viewed the Science Village as an inconvenient place to have our classes, but I saw it as a place where learning about science inspired students to take action against the many environmental and societal issues our planet is struggling with. This is where I found my 'sense of place' in my undergraduate career, specifically with eCURE. Through eCURE, students are exposed to laboratory-based chemical research, led by chemistry professors such as Dr. Jillian Blatti. Through eCURE, we worked together to solve scientific problems in the chemistry laboratory. It was from this laboratory platform that I understood the importance of science, research, and teaching. We were taught by Dr. Blatti to use the knowledge we gathered during our research and teach those around us what we learned in the lab. Through our research regarding sustainable paints and nanotechnology, we addressed the topic of sustainability and better understood its importance, not just for our world today, but for the future. eCURE was actually the first place where I was exposed to the concept of sustainability, and I even had the opportunity to teach others about it, as our group designed lessons to make sustainable paints and engaged local high schools in chemistry-based research. Once I learned what sustainability was and its high importance, I knew that education in sustainability was necessary for all students to receive. The world that younger generations will inherit is facing some tough challenges. Therefore, sustainable practices are essential and should be taught to all students. Instead of inheriting a world filled with problems, we should do our best to instruct students on solutions. Creating a place where students may be encouraged to direct their thoughts and ideas towards sustainable solutions is of utmost importance.

-Betsy

I am inspired by my fantastic research students at PCC. We are a diverse group of individuals who worked together in the chemistry lab over the past year and a half on a common goal – to better the environment and the world through sustainability. I looked forward enthusiastically to our Friday meetings, which often surpassed the time required by the program. We had so much fun figuring out methods to make paints in a sustainable, non-toxic way. We synthesized biodiesel from algae and other unconventional sources. We came up with a homemade pyrolysis device with which we could decompose plastic bags into smaller chemical building blocks. We collaborated with an aquaponics group at PCC to utilize their algae for renewable energy research. My students brought in their own clever concepts and ideas and developed

them in the laboratory through creativity and the scientific method. We painted, laughed, and grew together. I watched as my research students blossomed into scientists, collaborated with one another productively, developed their own unique ideas, and designed experiments (and built makeshift apparatuses) to test them. I watched my students help one another and become environmentally conscious thinkers. I observed as they created their first ever lesson plans, a truly unique experience for a science major at a community college, and teach an A.P. biology class in Hollywood, California, about sustainability, nanotechnology, and how to make their paints – lessons based on methods they had designed in the lab. My eCURE students taught the high school students about electron microscopy as we remotely accessed our SEM at PCC to analyze the sustainable paints they had just made. Through this experience, my research students have grown as scientists, sustainability educators, and as compassionate human beings, and I am forever grateful for this ‘sense of place,’ the chemistry research laboratories at Pasadena City College.

**Inspired by Nature,**

*Jillian L. Blatti, Ph.D., and her research group  
at Pasadena City College, Pasadena, CA*