

## 2016 CETL Innovation in Co-Curricular Education Award - Wilbur Lam

### Table of Contents

1. Table of Contents	1
2. Letter of Nomination from Dr. Ravi Bellamkonda	2
3. Description of the Co-Curricular Initiative	4
4. Description of how the initiative has been evaluated	5
5. Letters of Support from Students	7
a. Emma Mihevc	9
b. Pranaya Chilukiri	10
c. Durazi Savasir	11
d. Catherine Edwards	
6. Letters of Support from Colleagues	12
a. Christopher Harden	13
b. Kathy Murphy	



**Wallace H. Coulter Department of  
Biomedical Engineering**  
at Georgia Tech and Emory University



**EMORY**  
UNIVERSITY

January 28, 2016

Dear CETL Awards Committee:

I write this letter of support for Wilbur A. Lam, MD, PhD for the 2016 CETL Innovation in Co-Curricular Education Award with my absolute highest enthusiasm. Dr. Lam is a primary faculty member of the Wallace H. Coulter Department of Biomedical Engineering Department at Emory University and the Georgia Institute of Technology, of which I am currently chair. In the five years Dr. Lam has been at Georgia Tech, it has been a true pleasure to witness the meteoric rise of not only his laboratory's research program but also his innovative teaching program. As a successful bioengineer, inventor, and physician, Dr. Lam aptly applies his unique "trilingual" background to develop one of the most novel and inventive undergraduate courses I have ever seen. Specifically, Dr. Lam, with the assistance of one of his postdoctoral fellows, has developed a course called BME HealthReach, in which undergraduates in our BME department apply their design skills to develop manipulatives, physical tools for teaching, to help chronically ill children learn K-12 STEM topics. Academically, chronically ill children are an at risk group due to the nature of their disease and increased number of absences from school, and an extremely inventive attribute of Dr. Lam's program is that the undergraduates use the patients' own diseases as motivation and springboards for the patients to learn science and math. For example, for children with sickle cell anemia, our undergraduates have developed activities in which younger children learn arithmetic skills to calculate their own blood cell counts or for older children, the concept of gas exchange in the blood is taught; these are all topics that they patients have some familiarity with simply because of their disease. In essence, with the help of the undergraduates taking this course, these patients are finally able to use their diseases to their advantage.

As Dr. Lam still occasionally practices at Children's Healthcare of Atlanta, he is able to leverage his affiliations there to enable our undergraduates in his course to work directly with pediatric patients, one-on-one, in the hospital setting as well as in the clinics where they also interact with physicians, nurses, hospital teachers, child life specialists, and the patients' families. Although there are many stakeholders involved, Dr. Lam has constructed this program such that all parties involved benefit. Obviously, the patients benefit, and I have received ample positive feedback from the physicians and nurses who express gratitude for our undergraduates' efforts to improve quality of life of their patients while the hospital teachers and child life specialists have even integrated our undergraduates' activities as part of the hospital curriculum! Most importantly, however, are the abundant benefits this course offers our undergraduates, some of which are readily apparent and some not.

First of all, although this may not be immediately obvious, BME HealthReach is a bona fide engineering design course in which our students use problem-based learning and undergo every step of design and development of an educational tool. They are then able to present it to the end user (the patients), obtain real time feedback, and redesign. The undergraduates then cycle through multiple iterations until the device is deemed successful by the metrics they originally set. In most bioengineering design courses, students focus on the design of a complex medical device and as such, only have time to do one or two iterations within the duration of a single semester. Due to the relative simplicity of the devices they design for this course, the students are able to fit in multiple iterations during a single semester of BME HealthReach. Thanks to the collegiate nature of our department, our design-based teaching faculty also give various lectures throughout each semester to the BME HealthReach students, who are then asked to apply the same level of rigor and precision as in any design course and are graded accordingly.

In addition, as a significant portion of our undergraduates are on a pre-med or pre-health track, this program provides them with rich and in depth patient experiences that would not be available to them via other avenues. As such, the BME HealthReach undergraduates are able to spend much more time interacting with patients and in a much more meaningful manner than that of a typical hospital volunteer, which is the standard process that most undergraduate pre-health students experience. As the BME

HealthReach undergraduates are much more integrated with the hospital staff, they are also exposed to a more in depth view of how a healthcare facility operates and the various roles of different clinicians, allowing them to make much more informed choices about embarking on healthcare related career paths.

Interestingly, the undergraduates who have taken BME HealthReach have communicated to our faculty that this course vastly improves their communication skills and is extremely valuable to all BME undergraduates, regardless of whether they are on the pre-health track. As they are dealing with chronically ill children of all ages with drastically varying levels of cognitive abilities, they are forced to communicate scientific and mathematical concepts to an audience who may have had no prior knowledge of the topic. Over time, after several patient interactions, these undergraduates develop the capability to discuss any STEM topic at all levels of complexity, a skill that is valuable for any engineer on any career path!

Finally, this course enables our undergraduates to see how they can directly use the knowledge they have obtained during their time at Georgia Tech to give back to the community. In fact, many of our undergraduates who have taken BME HealthReach have told me that this course was one of the most rewarding experiences during their time at Georgia Tech!

Now in its 6<sup>th</sup> semester, Dr. Lam's BME HealthReach continues to be one of most popular undergraduate electives offered by our BME department and the undergraduates have now developed a large library of STEM activities geared towards patients of all diseases and grade levels spanning K-12. He and his team are now collaborating with the hospital cognitive psychologists to design a quantitative assessment to determine whether this unique program has improved the overall academic performance of their patients; the results of these studies will be published and will also be used to improve the program.

I should also clearly state that Dr. Lam teaches this course on his own time as supplemental teaching above and beyond what our Department asks of him because he strongly believes that the BME HealthReach program provides an unique educational experience for our undergraduates and at the same time benefits the greater community as well. Dr. Lam is still a practicing physician and has a very active and well-funded and renowned hematology bioengineering research program in his laboratory, and it is his dedication to our students that drives him to continue to improve his truly unique educational program.

In summary, Dr. Lam's BME HealthReach program is a truly unique course that offers our undergraduates a unique combination of 1) meaningful exposure to patients in the clinical setting for our those bound for pre-health careers, 2) practical and in depth experiences in design, 3) development of scientific communication skills, and 4) a novel mechanism for creating a positive impact in their community. Dr. Lam is a true innovator in every sense of the word and truly deserves this year's Innovation in Co-Curricular Education Award.

Sincerely,



Ravi Bellamkonda, Ph.D.  
Wallace H. Coulter Chair  
Biomedical Engineering

## **BME HealthReach: designing, developing, and deploying interactive STEM learning activities for chronically ill children**

**Principal Investigator: Wilbur Lam, MD, PhD**

**Co-investigator: Elaissa Hardy, PhD**

**Objective:** Give GT students hands-on experience in designing and implementing their own interactive educational STEM activities for chronically ill children onsite in which the patients' own diseases are used as motivation for learning

**Intended Audience:** Engineering undergraduate students who have taken design and/or problem-based learning courses interested in health-related careers

### **Targeted Learning Outcomes for Undergraduates:**

1. Using design and problem-based learning skills, students obtain experience in iteratively designing and implementing their own engineering solutions while working in conjunction with the end user
2. Students obtain teaching and communication skills with the capability to teach technical concepts to an uneducated audience
3. Students obtain meaningful one-on-one interactions with patients onsite in a hospital or clinic
4. Students gain experience in working in a healthcare setting with exposure to different types of health care professionals and their roles
5. Students will apply engineering skills as community service by improving the lives of chronically ill children in Georgia
6. Students will solidify their own fund of STEM knowledge when designing and implementing interactive activities to teach STEM topics

### **Description of the co-curricular initiative:**

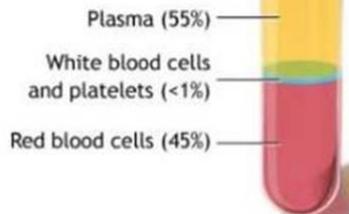
Wilbur A. Lam, MD, PhD, a faculty member in the Georgia Tech/Emory Wallace Coulter Department of Biomedical Engineering (BME) and a practicing pediatric hematologist/oncologist at Children's Healthcare of Atlanta (CHOA), has developed an educational program entitled BME HealthReach in collaboration with Georgia Tech and CHOA. Under the auspices of a graded elective course, BME undergraduates apply design and problem-based learning (PBL) skills to iteratively design, develop, and deploy interactive STEM learning activities according to Georgia K-12 education standards for chronically ill children, in which the patients' own diseases are used as springboards and motivation for learning STEM topics. For multiple reasons, chronically ill children are an academically underserved and disadvantaged population and accordingly, the STEM concepts our undergraduates teach are based on the patient's own disease and experience. Drawing inspiration from their own course work, the undergraduate teachers each design and create their own hands-on, interactive "gadgets" and activities emphasizing that medicine is interdisciplinary and involves biology, physics, chemistry, and math. Our undergraduates then implement their activities at the CHOA-affiliated hospitals and clinics and engage with patients of various disease types one-on-one in the outpatient and inpatient settings.

Throughout our course, BMED 4843, we have followed the PBL apprentice-to-master educational approach (observe, enact, and teach) in which the undergraduate students focus on the "teach" phase. Now in our 6<sup>th</sup> semester, in which our undergraduates have seen and worked with almost 600 patients, we have determined that our BME HealthReach course provides our BME undergraduates with a unique community servicing

learning opportunity that teaches and enables them to: (1) engage in a design-based engineering course in which implement multiple iterations of design and development with the end user, (2) introduce STEM concepts to children of different ages and cognitive levels for the greater good of the community, (3) effectively and succinctly communicate scientific topics to various audience levels, a critical skill for all engineers, (4) understand broad concepts while maintaining the integrity of scientific accuracy, (5) adapt teaching methods in real time when the initial approach is not reaching the patient, while maintaining professionalism and the patient's attention, and (6), importantly, for the undergraduates in the pre-health tracks, engage in novel and meaningful interactions with actual patients that are inaccessible to other pre-health undergrads. All these lessons can be applied beyond our course and our immediate goal is to now broaden our program to include other undergraduate majors at Georgia Tech.

#### A. What Is Blood Made Of -

Plasma: I am mostly water. I make up about half of your blood.  
Red Blood Cells: I am shaped like a round candy, dented in on both sides and there are more of me than any other blood cells.  
White Blood Cells: I am the biggest cell in your blood. I have a nucleus that is often split into 2 or 3 parts.  
Platelets: I am the tiniest part in your blood.



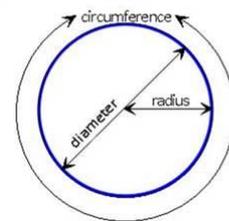
#### B. Make Your Own Blood –

Mason jar, corn syrup, and colored beads

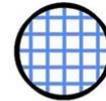


#### C. Circumference and Area -

- The circumference (C) of a **circle** is the distance around it.
- $C = \pi d = 2\pi r$



- The area (a) of a **circle** is the number of square units inside that **circle**.
- $a = \pi r^2$



- The **diameter** (d) is the distance across the **circle**, from one point passing through the center to another point on the **circle**.
- The **radius** (r) is exactly half the diameter.
- If you divide the circumference of any **circle** by its diameter, you will always get a value of approximately 3.14. This number is called pi ( $\pi$ ).
- $\pi$  is the ratio of a **circle's** circumference to its diameter.

**Figure 1** – Examples of activities created by the BME undergraduates that are currently being taught at CHOA. **(A)** What is blood made of activity discussing the percentages and composition of the blood. **(B)** The patient makes their own “jar” of blood out of a mason jar, corn syrup, and colored beads mimicking red and white blood cells and platelets. **(C)** Calculating the circumference and area of a circle, which can then be translated to determining the circumference and area of blood cells using known average diameter values.

### Description of how the initiative has been evaluated –

Evaluation of our program has occurred on multiple fronts:

1) From their feedback, the undergraduate students stated that this course was “extremely valuable” and has provided them in-depth knowledge about: (1) disease pathophysiology, diagnosis, and treatment, (2) various teaching and learning styles, and (3) the constraints of teaching in a hospital environment. Demographically, 50% of the BME undergrads are pre-meds and this course has enabled them to have meaningful interactions with pediatric patients in a one-on-one setting which has also bolstered and solidified their desire to become physicians, specifically pediatricians. Of the remaining 50%, 32% plan to attend graduate school and 18% plan to enter industry after graduation and all express interest in post-graduation goals with a pediatric focus. Therefore, our course has affected the career choices of many of our undergraduate alumni.

2) In collaboration with CHOA psychologists and teachers, we have just started implementing brief pre- and post-activity academic testing of the patients to determine the effectiveness of our activities. These results will

be used to as near instantaneous feedback for the redesign of the activities our undergraduates develop. In addition, these tests and conjunction with the patients' academic performance/testing at school will serve as our program's assessment of efficacy and also enable our program to apply for extramural funding as program that aims to improve the academic performance of chronically ill children.

3) In recognition of our program and its benefits for their patients, Georgia tech undergrads, and the community at large, the 1998 Society, one of CHOA's charitable foundations, has just awarded BME HealthReach a \$50K grant for supplies and establishing more clinical liaisons with different patient populations. Other accolades include the Georgia Tech Ideas 2 Serve Competition 2014 (Best Domestic Solution and People's Choice) and an NIH STTR phase 1 grant with Thrust Interactive 2015.

January 28, 2016

Dear CETL Awards Committee,

I am writing to express my support for Dr. Wilbur Lam and his post-doctoral fellow Dr. Elaissa Hardy for the 2016 CETL Innovation in Co-Curricular Education Award. Together they have created and supported BME HealthReach, which is an educational outreach program that teaches chronically ill patients about math and science in hopes of getting them excited to learn about their disease. What started as an exciting volunteer opportunity has turned into a Special Topics course in the Biomedical Engineering curriculum.

I have been with BME HealthReach from the beginning and it has been not only my favorite extracurricular I have participated in at Georgia Tech, but my favorite class as well. I thoroughly enjoyed going to this class because I got to be innovative for something I had a real passion for, impacting kids' lives. The class is structured like no other class at Tech. It has a small environment, it consists of all problem-based learning, and students get to design products then actually test them. In addition students get exposure to a hospital setting and invaluable patient interaction, which allows for BMED 4843 to provide a unique student experience.

After participating in the course as second year, I was able to continue on with the program volunteering at two different Children's Hospitals in Atlanta (CHOA). Three years later, I am still volunteering at CHOA and involved with BME HealthReach. When I go to CHOA I teach sickle cell patients about math and science in a hands-on, engaging manner. I use activities that I developed during class while also testing current student's newly designed activities. This is a very different experience from if I was just volunteering at CHOA because I am personally invested in everything I am doing.

Through this class I have learned more than just math, science, and typical engineering ideas that will be extremely applicable to my job working in industry. I have learned how to effectively communicate ideas. Think about trying to explain a complicated science idea, like blood, to a ten year old. I now can take a complex idea and explain it in an understandable way to a wide audience, which is essential in engineering. Another valuable lesson that this class has taught me is the importance of trial and error, which I was able to apply at my research internship this summer. When an idea does not work out the first time, you have to iterate and try again. Finally, this class trained me to be able to think on my feet. Patients never react in a way that you would expect them to and every patient is different. This has made it so I can be creative on the spot, which is also critical in my industry.

However, the reason that I value my experience in this class so much is it has kept my passion alive while I have been at Georgia Tech. Being able to have patient interaction and being in a hospital environment gives me the constant, and sometimes necessary, reminder of why I am a biomedical engineer. It consistently reminds me to strive to help other people and work to pursue a career in a public health field.

Truthfully, my Georgia Tech experience and my growth as a person would not have been the same without this class. Dr. Wilbur Lam and Dr. Elaiissa Hardy are incredibly deserving of this award and I hope that more students can have a classroom experience like BMED 4843.

Best,

A handwritten signature in black ink, appearing to read "Emma Mihevc". The signature is fluid and cursive, with a prominent initial "E" and a long, sweeping horizontal stroke at the end.

Emma Mihevc

BME Undergraduate, Class of 2016

January 29, 2016

Dear CETL Awards Committee:

I am honored to nominate Dr. Wilbur Lam and his post-doctoral fellow, Dr. Elaissa Hardy, for the 2016 CETL Innovation in Co-Curricular Education Award. They have dedicated themselves to developing BME HealthReach - an educational outreach enrichment program for chronically ill and hospitalized patients to serve multi-faceted goals: 1) establish a program for a K-12 science and math outreach for chronically-ill children; 2) employ the patients' specific diseases as the conduits for being educated about STEM fields; 3) integrate hospital-based supplies and equipment these children are use on a daily basis to experience hands-on science enrichment; and 4) enable Georgia Tech biomedical engineering undergraduate students to develop the "curricula" (following GA state educational standards) and implement this outreach program through the BMED 4843 course.

As a Biomedical Engineering student, I have participated in BMED 4843 for 6 semesters and I now serve as the teaching assistant for this lab-based course where biomedical engineering students create interactive math and science modules. Thus far, activities have focused on general physiology, and specifically Sickle Cell Disease, Cystic Fibrosis, and cardiovascular diseases. Seeing patients at the Children's Healthcare of Atlanta – Egleston and Hughes-Spalding campus at the grasp our teaching has been so rewarding and impactful. Solely volunteering at the hospitals could not have engendered this unique experience.

BME HealthReach has provided me the transformative opportunity to initiate interest in science among pediatric patients. By placing great effort into teaching and establishing warm connections with diverse groups of people, I have understood the importance of possessing stamina and creative energy in medicine. BME HealthReach has emphasized the value of spearheading new initiatives to accommodate patients and help them better understand physiology. It has also progressed my passion for pediatrics in general. I have been inspired to maintain personal strength from observing how patients display positivity and delight in their daily activities and interactions despite their debilitating conditions. Seeing the program develop from its early stages to the role it now plays in the lives of patients, families, and students has further stimulated my passion to pursue medicine. I will be starting medical school this fall and BME HealthReach has significantly impacted my decision to pave this path for my future.

I wholeheartedly endorse Dr. Lam for the nomination of the CETL Innovation in Co-Curricular Education Award. Dr. Lam and Dr. Hardy's efforts have incredibly impacted the lives of Georgia Tech Biomedical Engineering students and furthermore, patients at the hospitals, as they have developed a new scope of education through STEM and medicine.

Sincerely,



Pranaya Chilukuri, B.S. in Biomedical Engineering, Class of 2016

January 29, 2016

Dear CETL Awards Committee:

I am writing to nominate Dr. Wilbur Lam and his post-doctoral fellow Dr. Elaissa Hardy for the 2016 CETL Innovation in Co-Curricular Education Award for their work in creating BME HealthReach. HealthReach is an educational outreach enrichment program for chronically ill patients that aims to create a K-12 science and math outreach curricula that uses the patients' own specific diseases as motivation and springboards for learning science and math. HealthReach accomplishes this goal by using hospital and disease-based supplies and equipment that the patients are used to for hands-on science enrichment activities. I became engaged with HealthReach due to their initiative to have Georgia Tech biomedical engineering undergraduates develop the curricula and activities used at the hospital, all of which follow state of Georgia educational standards, and to have those same undergraduates implement those activities and curricula through the class BMED 4843.

I have been a part of BME HealthReach since spring of 2013, and have advanced from simply volunteering at the Hughes Spalding and Egleston Children's Healthcare of Atlanta locations to overseeing all of BMED 4843 with Dr. Lam and Dr. Hardy. HealthReach has given me the opportunity to develop many of the skills I will be using in the engineering world. Creating activities to be used in the hospitals let me practice my design skills, while teaching them let me develop my ability to communicate complex information to those who are less informed. Actually being a part of the operation of the program as a whole gives me the opportunity to develop as a leader and mentor to the younger members. This course has provided me with a unique experience that touched on all parts of professional life, and helped define my time spent at Georgia Tech unlike any other program I could have associated myself with.

I went into HealthReach as a pre-health student looking for a unique hospital experience, hoping to be medical school bound at the end of my undergraduate career. However, spending time at with patients at Children's Healthcare of Atlanta and our other partners made me realize that being a doctor was not the only path to making an impact on a patient's life. HealthReach made me realize that while medical school wasn't really what I wanted, I had ample opportunity to make a difference on the well-being of ill and injured individuals. While my experience with HealthReach was certainly unique compared to other teaching or hospital related programs, its impact on me was not all what I expected, but I would not have had it any other way.

All in all, HealthReach has made my time as an undergraduate student at Georgia Tech fulfilling and exciting. Without Dr. Lam and Dr. Hardy's initiative, I would have not had the same opportunities to develop my skills and positively impact the Georgia Tech and greater Atlanta communities in the same, personal, way. Having face to face time with patients and working closely with my peers would not have been made possible in the same way anywhere else at Georgia Tech, and for that I am eternally grateful to Dr. Lam and Dr. Hardy for the program they created, and would like to nominate them for the 2016 CETL Innovation in Co-Curricular Education Award.

Sincerely,

Durazi Savasir

A handwritten signature in black ink, appearing to read 'Durazi Savasir', with a long, sweeping underline that extends to the right.

January 29, 2016

Dear CETL Awards Committee:

I am writing to nominate Dr. Wilbur Lam and his post doctoral fellow Dr. Elaisaa Hardy for the 2016 CETL Innovation in Co-Curricular Education Award for their creation of the BME HealthReach program – an educational outreach enrichment program for chronically ill patients.

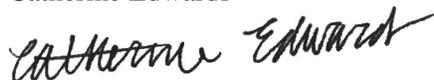
As a Biomedical Engineering student, I have participated in BMED 4843 and have had the opportunity to work in the hospital environment at Children’s Healthcare of Atlanta – Egleston and the Atlanta Ronald McDonald House. Through these experiences, I have directly taught patient and their family members about math and science using the activities that I and my peers created. There is something special about this course that is so much more than just volunteering at a hospital. I am able to get one-on-one patient time and I know the concepts that I spend time teaching the patients truly make a difference. The activities are unique too; each patient can directly relate to what he/she is learning. I love getting children excited about STEM fields, and through HealthReach, we are able to reach an audience of children whose STEM participation is even more limited than most other school-aged children. Chronically ill patients struggle to just keep up in all of their schoolwork, especially more challenging topics like math and science. Exposing patients to fun ways of doing the typically “less fun” school subjects and inspiring them to pursue their dreams is incredibly unique to this program.

One of my favorite memories from participating in this program is when I was with an eighteen-year-old patient. She had graduated high school and was hoping to start college in the fall. At first, I was wary of what we would be able to work on together, since our activities are more targeted to K-12 students. However, I started talking to her about what she was interested in, and we got to the topic of her heartbeat. We worked through an activity to calculate the number of times her heart has beat in her entire lifetime. By the end of the activity, the patient was so excited because she said, “I never got this stuff in high school!” To me, it was shocking that a high school graduate didn’t know how to do dimensional analysis. But I was thrilled to know that the thirty minutes that we spent together made her so excited to start school again in the fall.

Additionally, through the direct patient and hospital staff interactions I have had, the HealthReach program has significantly impacted my schooling and career goals. Because of my extended amounts of time at CHOA, I was able to choose a project for a design class that would modify the wagons that they use in the hospital. My connections at CHOA thanks to HHealthReach made this project not only a possibility, but a success. I also have recently been able to discuss career paths in a pediatric hospital setting with CHOA employees, and have decided that this is the path that I would like to follow upon graduation in a year and a half. I am so lucky to be able to participate in the HealthReach program and to have been a part of the 4843 course. It has made me more appreciative of my schooling, a better leader, a better communicator, a better problem solver, and ultimately given me a clear vision for my career goals. I am happy to endorse Dr. Lam for the nomination of the CETL Innovation Co-Curricular Education Award.

Sincerely,

Catherine Edwards



January 29, 2016

Christopher Harden, MA  
Hospital Teacher/Educational Advocate  
Family Services  
Children's Healthcare of Atlanta at Hughes Spalding

Dear CETL Innovations in Co-Curricular Education Award Committee:

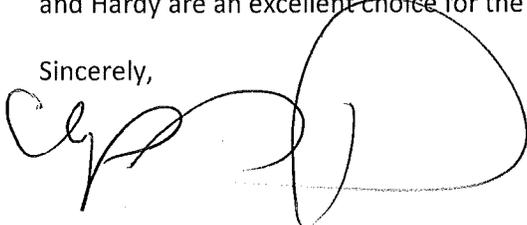
I write this letter to give my enthusiastic recommendation to Dr. Wilbur Lam and his post doctoral fellow Dr. Elaissa Hardy for the 2016 CETL Innovation in Co-Curricular Education Award. I have had the opportunity to work directly with Dr. Hardy and the BME HealthReach team (Georgia Tech undergraduates that have completed BMED 4843 and are now volunteer educators in the program) in the Aflac Cancer and Blood Disorders Center at Children's Healthcare of Atlanta at Hughes-Spalding working with Sickle Cell Disease patients starting in the Fall of 2014 and continuing to the present. I have seen a remarkable impact on the patients through this program, both with their educational milestones and overall attitude.

This semester, I am working directly with Drs. Lam and Hardy to increase the impact the BME HealthReach program has on patient education. Specifically, we are looking at Georgia State educational milestones and moving our patients from the Beginning Learners category to the Developing Learners category, an achievement level that is required by state law for students to be promoted to the next grade level. From our preliminary tracking, the BME HealthReach program has already provided (and will continue to provide) an extra level of educational support the patients need while they are in the hospital. It has been extremely impressive to me to see the dedication and support Drs. Lam and Hardy and the Georgia Tech undergraduate students have given to their educational program and to our patients. The BME HealthReach program is amazing and we at CHOA-Hughes-Spalding are truly thankful to have created this partnership.

I have observed Georgia Tech undergraduate students substantial skills first hand and have been astonished by their level of professionalism. They come to the hospital on time and ready to give their best to each child they work with. They give each child a smile and greet them with respect and care before starting to work. Moreover, they attempt to make sure children have the understanding of concept before leaving. Drs. Lam and Hardy continue to train their students well in working within the community at Childrens.

Working with Drs. Lam and Hardy and the BME HealthReach team has provide our patients with innovative ways to learn about math and science. The profound impact is found on the patient's face and continued desire to work with the Georgie Tech undergraduate students, as well as in their own classroom achievements. With the continued achievements of the BME HealthReach program, Drs. Lam and Hardy are an excellent choice for the 2016 CETL Innovation in Co-Curricular Education Award.

Sincerely,



January 29, 2016

Kathy Murphy, MSN, RN, PCNS-BC, PNP-BC  
Clinical Nurse Specialist/Pediatric Nurse Practitioner  
Children's Healthcare of Atlanta, Sibley Heart Center  
1405 Clifton Road  
Atlanta, GA 30322

Dear CETL Co-Curricular Education Award Committee:

I am writing to give my highest recommendation to Dr. Wilbur Lam and his post doctoral fellow Dr. Elaisa Hardy for the 2016 CETL Innovation in Co-Curricular Education Award. I have had the opportunity to work directly with Dr. Hardy and the BME HealthReach team (Georgia Tech undergraduates that have completed BMED 4843 and are now volunteer educators in the program) on the Cardiac Step down Unit (CSU) at Children's Healthcare of Atlanta-Egleston starting the Summer of 2015. Over the past three semesters I have been extremely impressed with the undergraduate's level of dedication, professionalism, and the impact they have made on the patients.

The Cardiac Service Line is constantly looking for new and interesting programing for our patients. They are hospitalized on CSU for long periods of time and missing out on childhood experiences. In particular, their education begins to suffer as a result of being away from school. The BME HealthReach program is exactly what we have been looking for as it provides additional educational programing for our patients and is truly amazing and has done wonders for our patients.

It has been extremely gratifying and truly impressive to see how the Georgia Tech undergraduate students have developed so many interactive hands-on science and math activities that my patients are completely enamored by. These activities have truly sparked an interest in STEM in a great number of our patients and their families. The creative way the Georgia Tech undergraduate students present complex topics allows the patients to visually understand and ask questions, providing the patients with new avenues for learning.

Additionally, through BME HealthReach undergraduate students are able to work directly with the patients, something that is not typical for traditional college hospital volunteers. The undergraduate students have thanked me personally for this opportunity, showing me that the BME HealthReach program has made a big impact on them as well.

Parents of hospitalized children marvel at the fascinating methods of teaching at the bedside. This often provides a well-deserved diversion in the monotony of hospitalization and offers the parent a chance to sit back and watch their child enjoy a morning of activities with Georgia Tech students. We even had a few Georgia Tech parent and grandparent alumni who were so excited and proud of students from their alma mater having a presence at Children's.

The innovative approach for teaching math and science, using the patient's own disease as the spring board for learning, is a highly unique program and has been one of the best learning experiences for our

patients. Therefore, the BME HealthReach program and Drs. Lam and Hardy are excellent educators and it is with my highest enthusiasm to recommend them for this award.

Sincerely,

A handwritten signature in cursive script that reads "Kathy Murphy". The signature is written in black ink and is positioned above the printed name.

Kathy Murphy