



AN EDUCATIONAL ENRICHMENT PROGRAM IN COLLABORATION WITH
GEORGIA TECH, EMORY UNIVERSITY, AND CHILDREN'S HEALTHCARE OF ATLANTA

Creating Social Value in an Undergraduate Human-Centered Design Course through STEM Education for Chronically Ill Children

Elaissa Hardy, PhD^{1, 2, 3}, Joseph LeDoux, PhD¹, and Wilbur Lam, MD, PhD^{1, 2, 3}

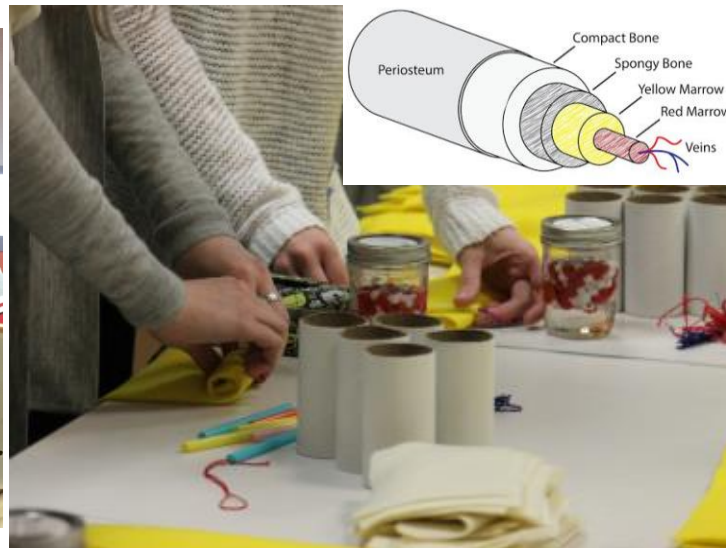
¹Wallace H. Coulter Department of Biomedical Engineering, Georgia Institute of Technology
and Emory University

²Department of Pediatrics, Division of Pediatric Hematology/Oncology, Emory University
School of Medicine

³Children's Healthcare of Atlanta

About us

- Interactive science and math educational enrichment outreach program focused on chronically ill hospitalized children
- Child's own disease is used as the springboard and hook for learning
- Goal of motivating and sparking an interest in science and math.
- Designed to augment classroom teaching and provide educational experiences with interactive hands-on activities



BME Undergraduate Student-Teachers

- BMED 4843
- Create the activities and are the volunteer teachers

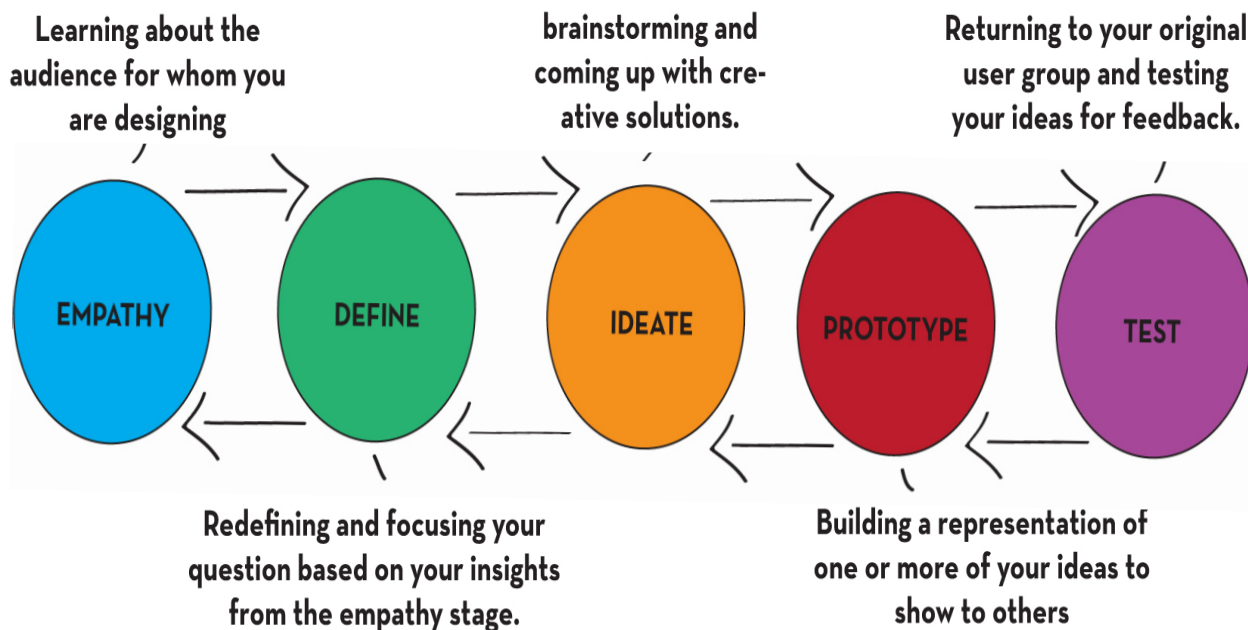


- Human-centered design cycle
- Iteratively develop and implement interactive learning activities
- Emphasizing that medicine is interdisciplinary and involves biology, physics, chemistry, and math.
- Created social value with meaningful patient and community interactions



Special Topics Course

- 1-50min lecture, 2-90min lab sections
- Required community event participation
- Follow:
 - Problem-based learning skills
 - Georgia Standards of Excellence
 - Medical school pedagogy, “see one, do one, teach one” ¹



	Location	Department	Time (weeks)	# of Patients Encounters
Fall 2013	Hospital	Hematology	8	35
Spring 2014	Hospital	Hematology	12	36
	Hospital	Hematology	10	30
Summer 2014	Sickle Cell Disease Camp		1 day	100
September 2014	Sickle Cell Education Day		3 hours	50
Fall 2014	Hospital	Hematology	12	36
	Hospital	Hematology		30
Spring 2015	Hospital			12
Summer 2015	Hospital			3
	Sickle Cell			100
September 2015			4	15
			3 hours	50
Spring 2016		Cardiac Step Down Unit	12	40
		Hematology	10	30
	Ronald McDonald House		6	25
Summer 2016	Hospital	Cardiac Step Down Unit	12	40
	Hospital	Hematology	10	30
	Ronald McDonald House		6	25
September 2016	Hospital	Cardiac Step Down Unit	8	20
	Sickle Cell Disease Camp		2 hours	40
	Ronald McDonald House		6	25
September 2016	Sickle Cell Education Day		3 hours	50
Fall 2016, Spring 2017, Fall 2017, Spring 2018, Fall 2018	Hospital	Cardiac Step Down Unit	12	40
	Hospital	Hematology	14	65
	Ronald McDonald Houses		7 (2x a week)	40

Over 1600 patient encounters!
150 Undergrad participants!



~2450 k-12 student interactions!

	Location	Age Group	Time (weeks)	# of student participants
2015-16 school year	Woodland Elementary The Amana Academy	5 th graders	12	75
		7 th graders	12	70
2016-17 school year	Woodland Elementary The Amana Academy	5 th graders	12	125
		7 th graders	12	70
2017-18 school year	Woodland Elementary The Amana Academy	5 th graders	12	125
		7 th graders	12	70
2018-19 school year	Woodland Elementary The Amana Academy	5 th graders	12	125
		6 th and 7 th graders	12	40
Spring 2017	Atlanta Science Festival	k-12 th and parents	1 day	800
Fall 2017	Cobb Foster meeting	k-12 th grade	2 hrs	50
Spring 2018	Atlanta Science Festival GT STEM day	k-12 th and parents	1 day	700
		5 th grade	1 day	80
Fall 2018	GT STEM day Cobb Foster meeting	7 th and 8 th grade	1 day	70
		k-12 th grade	2hs	50



Calendar for Tuesdays tours

Amana Academy
Fulton County Public Charter School

Imported From Firefox

#1 K-8 STEM Certified School in Fulton County
Cafeteria • Home Access • Attendance • Newsletter • Calendar

Home About Academics Parents Staff Activities Supporting Us Admissions

News and Announcements

Amana Academy Wins Award for STEM Outreach
Amana Academy won the STEM Certified School Outreach category at the 2017 STEM Education Awards sponsored by the Technology Association of Georgia and TAG Education Collaborative.

Amana Academy Charter School in Alpharetta recently won the Technology Association of Georgia's STEM (Science, Technology, Engineering and Math) Education Award for Certified STEM School Outreach. This category recognizes the crucial role that STEM Certified schools play in mentoring other innovative schools that are working towards school certification. Nominees for this award are evaluated based on their outreach efforts supporting other schools and programs. Amana is the first K-8 school in the state of Georgia to achieve STEM Certification, a designation awarded by the state's Department of Education. There are currently fewer than 60 schools across the state that are STEM Certified, with another 1000 in the application process.

Last year, Amana introduced STEM/Venture Days, a series of events designed to showcase their unique Expeditionary STEM program to both educators and industry innovators. According to a recent study, 56% of young people surveyed said knowing how STEM skills relate to the real world—beyond math and science—would make STEM classes more interesting. In the face of an ongoing STEM talent shortage, many schools are seeking STEM Certification through the Georgia Department of Education in order to give students those real-world STEM experiences, but often need help with navigating the rigorous certification process.

As teachers from Rome City Schools circled up with other participants to debrief the most recent STEM/Venture Day at Amana, their big 'noticing' was the large number of purposeful partnerships with businesses, non-profits and expert visitors that are working directly with students on semester-long Learning Expeditions, where students attempt to find solutions to real-world



Make Your Own Blood Jar

What Is Blood Made Of -

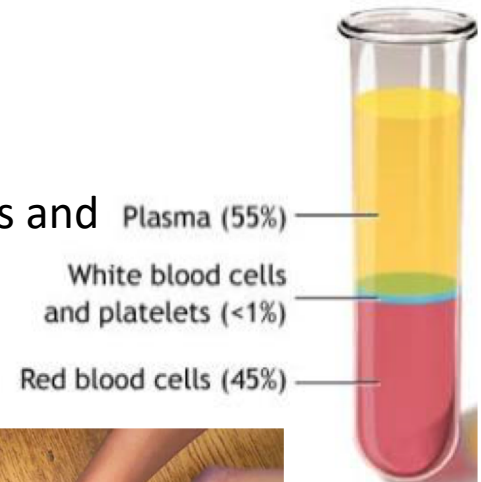
Plasma: I am mostly water. I make up about half of your blood.

Red Blood Cells: I am shaped like a donut, 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.

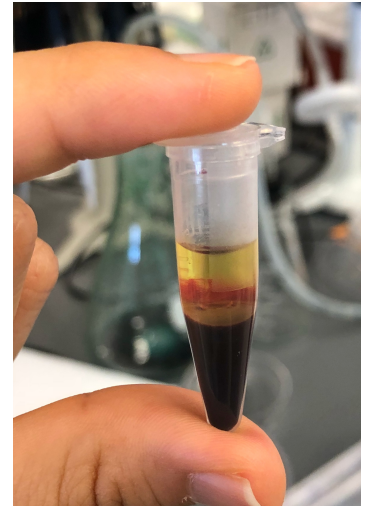
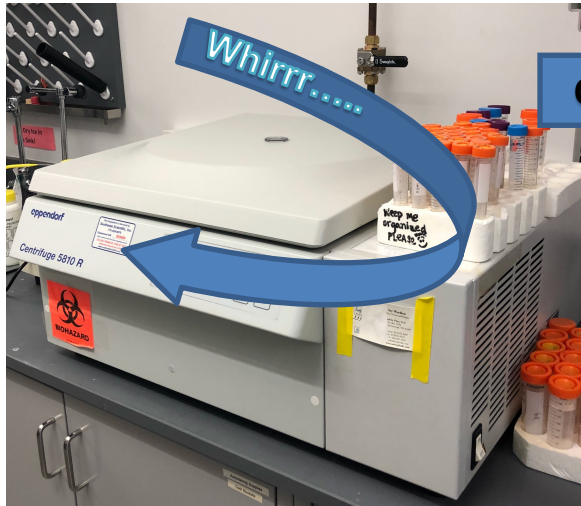
I have a nucleus that is often split into 2 or 3 parts.

Platelets: I am the tiniest part in your blood.



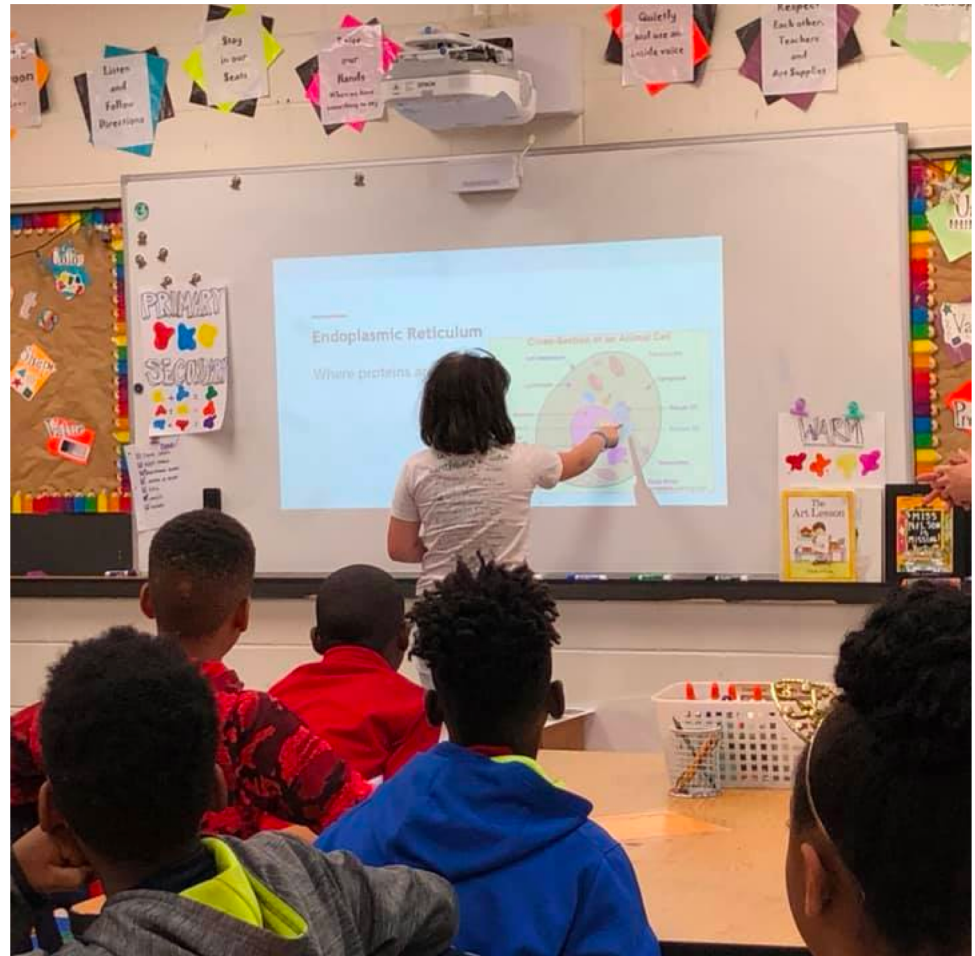
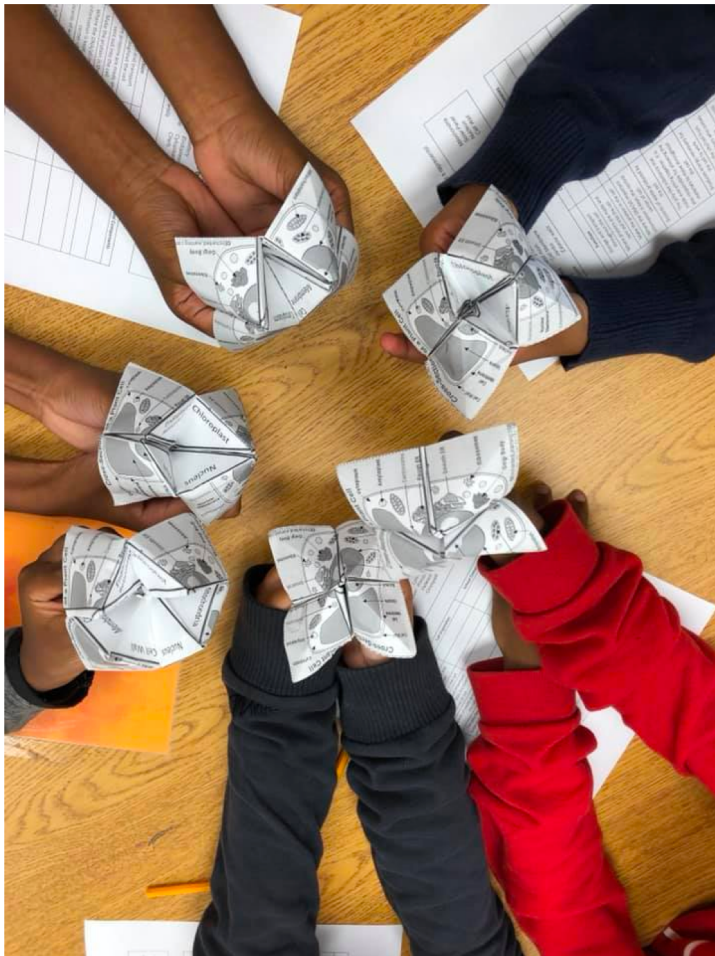
Fidget Spinner Science

- Centrifuges utilize centripetal force to separate the different density components



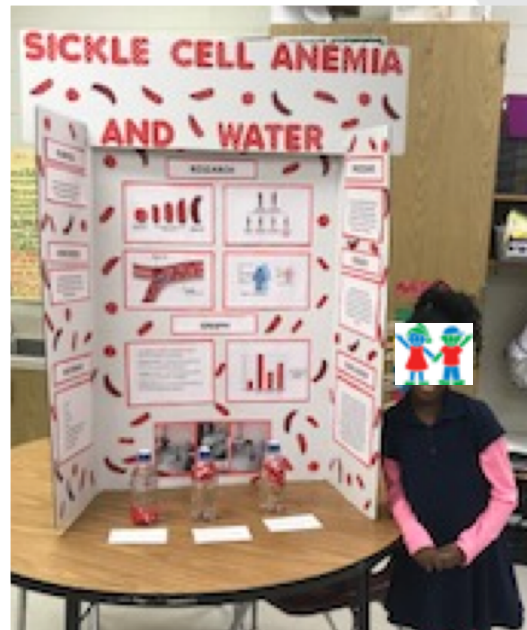
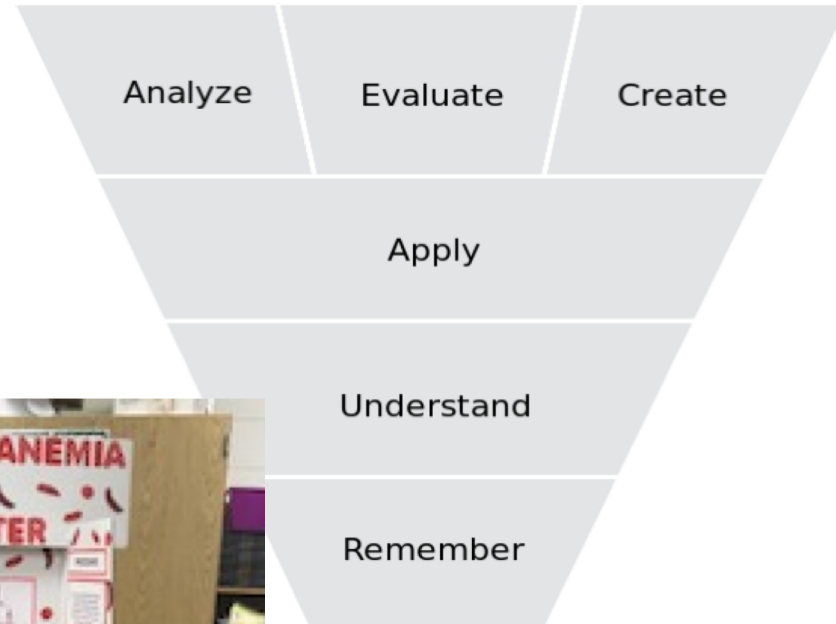
Cell Fortune Tellers

- Learn to identify the structure and function of the cell organelles.
- Compare and contrast the differences and similarities between the organelles of a cell and things found in a school.



What We Teach Undergraduates

- Bloom's Taxonomy - move past Remember
- VARK – design activities around **all learning styles**
- Complex Topics/Analogies – how to explain a complex topic in a simple manner



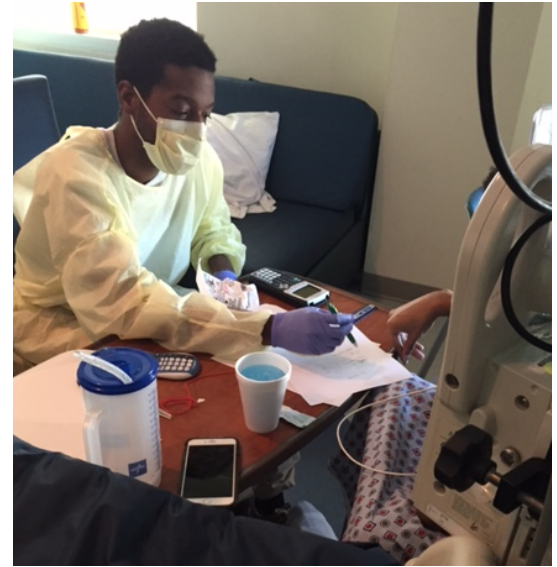
Undergraduate Assessment

- **46%** are Pre-med
 - Enabled them to have a more **meaningful interaction with the patients** in a one-on-one setting
 - Bolstered and solidified their desire to become physicians
- **35%** plan to enter industry after graduation
- **22%** plan to attend graduate school
- **After taking this course 100%** express interest in post-graduation goals with a **pediatric** focus.



Undergraduate Assessment cont.

- How to **effectively and succinctly communicate** to various age levels
- **Volunteer experience** – social value
- Disease pathophysiology, diagnosis, and treatment
- Various teaching and learning styles
- Constraints of teaching environments
- **Adapt teaching methods** in-real time
- Development as a **student, educator, teammate, and future employee**



Undergraduate Feedback

- Learned about **other** non-physician healthcare related career paths
- Thinking outside of the box about the disease and STEM
- How to work effectively in a team
- **Communication and presentation skills**



“I have learned when teaching a new topic with a student, it makes sense to understand the underlying topics, understand the basics from the beginning. I have also found that this skill applies to my own course work.”

Conclusion

- Human centered design course
- Creation of:
 - Interactive teaching modules for school aged patients
 - Disease and human physiology as the springboard for learning
- Learned how to :
 - Introduce STEM concepts simply
 - Effectively and succinctly communicate
 - Understand broad concepts
 - Apply quick thinking skills
 - Adapt teaching modules in-real time
- Created social value with meaningful patient and community interactions

Contact Information

- NSF CAREER grant # 1150235
- CHOA Family Services – Hospital Teachers
- Georgia Tech BME Department

Elaissa.hardy@emory.edu

Wilbur.lam@emory.edu

bmehealthreach@gmail.com

bmehealthreach.gatech.edu

twitter.com/BMEHealthReach

www.instagram.com/bmehealthreach



KEEN Talk:Reimagining STEM education for chronically ill children

www.youtube.com/watch?v=Vm33Sp05IzY

"I truly cannot thank you enough for giving me the opportunity to take this course. After my time at Georgia Tech, I can say that HealthReach has been the most unique course I have taken. Unlike most courses at Georgia Tech, HealthReach is the perfect opportunity for us as students to give back to our community and see the impact we are having directly. And with the mission to promote education and happiness in the community, HealthReach is a major reason our school is so unique and has the #1 BME program in the nation. Thank you again and I will forever cherish my memories as a member of this wonderful organization."

– Graduated May 2017, currently a Contract Engineer at Spinal Elements

