

UPCI SUMMER ACADEMY 2010 FINAL REPORT



EXECUTIVE SUMMARY

The second annual University of Pittsburgh Cancer Institute (UPCI) Summer Academy for Cancer Careers was successfully completed over the course of eight weeks, from June to August 2010. Building upon the experiences and curricula from our successful pilot program in 2009, we expanded this year's program to reach out to underrepresented local and national high school students (rising juniors and seniors) from minority and economically disadvantaged backgrounds that showed a unique aptitude and interest in cancer research careers. During the intensive eight week program, we provided twelve students with an exciting opportunity to participate in educational and research experiences focused on cancer and oncology research.

Students' interest and knowledge in cancer careers developed substantially throughout the summer, as they were exposed to

innovative and specific knowledge of cancer biology and clinical care. The Academy proposed the following goals to help prepare high school rising seniors to further their studies in science, technology, engineering, and mathematics (STEM) subjects and to consider careers in cancer care and research. Through immersion in our dedicated laboratories with qualified faculty mentors, students showed an increased knowledge of (1) STEM careers in cancer care and research, (2) education in cancer biology and therapeutic strategies, and (3) development of research and communication skills.

This year, we were fortunate to continue collaborations with local organizations such as the Pittsburgh Tissue Engineering Initiative and Bayer Material Sciences, as well as embark on new interactions with the Jack Kent Cooke Foundation and the University of Pittsburgh's Office of Diversity. Two participating students were recruited from the Jack Kent Cooke Foundation as part of the Foundation's Young Scholars Program that identifies underserved high school students who have potential in biology and chemistry and provides them with scholarships for intensive summer internships.

Funded in early 2010 by a P30 CURE Supplement from the National Cancer Institute, our program was able to provide students with a \$2,000 stipend and Robert Weinberg "Biology of Cancer" textbook for their participation. In addition, faculty mentors and laboratories received a \$500 supply stipend for their students' projects. With these resources, students were able to

spend daily time in their mentor's research laboratory, developing a project that they presented in a poster session and oral presentation at the end of the eight weeks. Students also experienced clinical shadowing opportunities, site visits to the operating room, journal club meetings, field trip to the National Cancer Institute, field trips to local poster sessions and scientific activities, and cameos by University of Pittsburgh faculty.



The students attended a series of didactic cancer biology lectures presented by program academic staff and mentors. They attended presentations from clinicians and researchers from across UPCI disciplines focusing on clinical care, career options, and career preparation.

Students were led on tours of a variety of clinical and research facilities at UPCI and UPMC Shadyside.

In order to measure behavioral outcomes, students were evaluated by their research mentors at the end of the program using a short survey form. Mentors then reported back to the program director and administrator feedback on students' enthusiasm, interest, punctuality, understanding of topics, attention to detail in conducting research, ability to follow instructions, compliance with safety standards, grasp of scientific content, and discipline in completing assigned readings. Students were also surveyed to assess their overall satisfaction with the program and to identify its strengths and weaknesses so that we may continue to improve upon program design for future years.

The students indicated on weekly feedback surveys administered by Dr. Buchser that they felt the program was well organized, well taught, and well designed with an interesting and appropriate combination of didactic and experiential learning. Students reported that their participation in an actual laboratory environment made them more knowledgeable about cancer biology and clinical care, and more likely to pursue medical careers in cancer care and research.

RECRUITMENT

Eleventh-grade students were recruited from the Pittsburgh Public Schools (PPS), the largest of 43 school districts in Allegheny County and the second largest in Pennsylvania. It has approximately 9,000 students enrolled in 11 high schools, approximately 61% of whom are African-American (37% white, 2% Asian, 1% Hispanic). Approximately 70% of the graduates go on to enroll in higher education. Over 51% of Pittsburgh Public School high school students are eligible for free or reduced price lunch. Targeting this urban school district immediately surrounding the University of Pittsburgh Cancer Institute Hillman Cancer Center provided the appropriate geographic, minority, and economic focus to our program. Ample public transportation throughout the city obviates our need to provide housing for student participants.

We also worked with the University of Pittsburgh's Office of Diversity, University Prep and the Learning and Research Development Center to identify and reach out to eligible students (based upon teacher and guidance counselor recommendations). Along with the Jack Kent Cooke Foundation, we created a unique collaboration in which we hosted two out-of-state students under their Young Scholars Program to spend the summer in Pittsburgh working in dedicated laboratories at the UPCI. We plan to expand the number of Jack Kent Cooke Foundation student participants next summer to five or more students.



PROGRAM LEADERSHIP AND MENTORSHIP

In addition, we recruited graduate, undergraduate and medical students to serve as teaching mentors who provided weekly mentoring and tutoring sessions to the students, so that all students had the opportunity to manage assigned coursework in an appropriate and timely manner. Offering a one-on-one experience with students led to overall better understanding of the material and more interactive didactic sessions and experiences in the laboratory. Staff mentors are listed below.

PERSONNEL

The program leadership team was comprised of:

- Dr. Michael Lotze, MD – a UPCI clinician/researcher. Program Director and Instructor.
- Ms. Megan Sylves, BA – Program Administrator. Recruited students and provided student support. Coordinated guest speakers, tours, application and recruitment development, advisory meetings, and program management.
- Dr. William Buchser – Postdoctoral Fellow. Academic Administrator. Developed curriculum, oversaw every didactic session, served as assessment consultant and instructor. Worked daily with students on developing research projects and laboratory experiments.

Led by Dr. Buchser, the following personnel served as program mentors and coordinated regular didactic and tutoring sessions with the students:

Philip Vernon, Graduate Student Researcher

Thomas Laskow, CMU Graduate

Neal Spada, Medical Student at Pitt

Siuwah Tang, Graduate Student Researcher

Philip Pavlik, Undergraduate at Pitt in Bioengineering Program

Jillian Bonaroti, Undergraduate at Pitt in Bioengineering Program

Annie Geller, University of Pennsylvania Undergraduate

One student from the 2009 pilot program returned this past summer to serve as a presentation coordinator and program facilitator. Ms. Ashley, who participated in our program as a rising junior in 2009, is beginning her freshman year at the University of Pittsburgh and majoring in Biology. She was enthusiastic to play a leadership role in our program this summer and served as a resource to the students when developing their final presentations and posters. Ms. Ashley also played a role in facilitating daily activities with the students and acting as an ad hoc advisor for mentoring sessions.

CURRICULUM

GOALS

The UPCI Summer Academy curriculum was designed to pursue the following goals:

Specific Aim #1: Awareness of Science, Technology, Engineering, and Mathematics (STEM) Careers in Cancer Care and Research. The primary aim was to motivate high school students to continue their study of STEM subjects by introducing them to the many STEM disciplines that are employed by professionals working in a Comprehensive Cancer Center. This was pursued through presentations by professionals recruited to represent the diversity of opportunities in the cancer field, focusing on the roles, skills, and educational backgrounds of members of the cancer team.

Specific Aim #2: Education in Cancer Biology and Therapeutic Strategies. Our secondary aim was to educate students in the biology of cancer and the strategies in use and under development for its prevention, diagnosis, and treatment. This was pursued through a variety of lectures, textbook readings, and guest presentations.

Specific Aim #3: Development of Research and Communication Skills. Our tertiary aim was to educate students in the process of scientific research. This was pursued through their participation in a project under the supervision of a cancer researcher and by preparing an oral/visual presentation to their peers and mentors describing their research goals, methods, and results.

Specific Aim #4: Participation of Underrepresented Groups. The Office of Diversity, Health Sciences (ODHS) and the School of Medicine's Office of Student Affairs/Diversity Programs

have played a major role over the past year in helping us to identify and reach out to local talented, disadvantaged youth. These programs and leaders are experienced in supporting students who come from economic, social or educational disadvantaged background, and those who are underrepresented in Medicine and Science. The directors of these programs (Paula Davis and Ryan Parker) have been instrumental in working with us during the application and recruitment process to create avenues by which students can be appropriately paired with a science and/or medicine internship. Additional collaborations with Brian Corr, Director of Pittsburgh Public Schools Science and Dr. Louis Gomez, Learning and Research Development Center have provided other avenues by which we have been able to recruit high-achieving, underrepresented high school students.

We plan to work closely with Brian Corr and Steven Pellathy from the Pittsburgh Public Schools Science Curricula Department to advertise our program to rising seniors in local high schools. Over the next academic year, we plan to visit various science classes within PPS high schools to talk about our program and identify eligible and high-achieving students for 2011.

SYLLABUS

Chap Topic

- 1 Biology Review 1 - Evolution
 - Lab overview, Scientific Method, Falsification, Interpreting Data
- 1 Biology Review 2 - The Body / Organ systems, Anatomy, Physiology, The Cell
 - Lab Safety and Notebook training, Mathematics of Science
- 1 Biology Review 3 - DNA, genes, proteins, transcription, cell cycle (1.0 - 1.10)

- 2 Pretest. Overview of Cancer (2.0 - 2.5)
- 2.6 Overview of Cancer and Cancer epidemiology (2.6, - 2.11) - Clinical/ Epidemiologic
- 3,4 Tumor Viruses (3), Transfection and Proto-oncogenes (4.0 - 4.7)

- 5 Growth factors, receptors / Kinases
- 6 Cytoplasmic Signaling, kinase cascades, phosphatases, EGFR and downstream

- 7 Tumor suppressor genes and genetic susceptibility to cancer (7.0 - 7.13)
- 9 Apoptosis, p53, autophagy
- 11 Tumor Progression, tumorigenesis

- 12 Genomic Integrity and effects of mutagens (12.0 -12.8, 12.9-12.13)
- 13 Chronic inflammation, Tumors resemble wound healing sites (13.3), Angiogenesis
- 14 Metastasis, biology and clinical implications (14)

- 15 Immunology Overview (15.0 - 15.8), Innate immunity
- 15.1 Adaptive Immunology, tumor Immunology (15.9 - 15.18)
- 15.19 Cancer Vaccines/Immunotherapies (15.19 -15.23)

- 16 Drug Development (16.0 - 16.5), Clinical Trials
- 16 Current and upcoming cancer chemotherapeutics (16.10 - 16.11, 16.13 - 16.16)

- Final Day – 10 minute presentations and a professional poster session

ACTIVITIES

The students participated in a wide variety of learning activities, including lectures, textbook readings, guest speaker presentations, tours of clinical and research facilities, laboratory research, lab meetings, research seminars, discussions, and their own presentations. The students found the majority of these categories of learning activities beneficial.

- Opening reception, orientation to labs, administrative orientation, Lotze Lecture
- Pathology and Genomics Facility Tour - Dr. Sheldon Bastacky
- Molecular and Cellular Biology Lecture - Dr. Richard Steinman
- Flow and Imaging Cytometry Tour (William Buchser and Michael Meyer)
- Debe Griffin - FDA Trials and Tour of Stem Cell Lab
- Joe Newsome - guest lecturer and tour of the animal facility
- Field trip to Bayer Material Sciences/Baywood Country Club
- Lyn Robertson - Community health education and screening
- Beth Dudley - Genetic counseling and familial centers
- Pittsburgh Tissue Engineering Initiative Presentations - Sheraton Hotel Station Square
- Bone marrow biopsy observation - Dr. Chris Lindberg
- Trip to the National Institute of Health, NCI
- Scrubbed-in Surgery Observation - Dr. Zeh
- Mike Becich - BioInformatics
- Nathan Bahary - Zebra fish facility tour

Specific Feedback on learning activities

3 Activities The in-class activities are fun, especially when there's demonstrations b/c the really help. // The diagnostic differential activity with Dr. Steinman was very interesting as well as the visit to the flow cytometry lab // Generally any in-class activities help me understand concepts and visualize them much better // Keep them up! // Good fun, helps me learn more when we use visual objects

3 Phage Hunting The phage hunting part was really cool and interesting! The journal club part was not though, because no one could read that article. // The information session was interesting but the journal article was difficult to understand and un-relatable. Traveling to and from the session was time consuming. // The idea of it was cool and the first day I learned a lot about bacteriophages but the second day was pointless. We just looked for a circle of missing bacteria on a plate. . . A picture would have worked just as well the first day instead of wasting time that could be spent in the lab. // Great opportunity, but the lecture was very rudimentary. Couldn't they just call us if they found something in our Petri dishes? Day 2 was a huge waste of time! // Boring

4 What did you think about hearing about other people's projects in class? Sometimes I didn't understand people's projects, but it was interesting to hear other people's presentations // It was a good learning experience. // I enjoy getting to hear about everyone's project // Very

interesting. I learned a lot // I liked hearing others comments and project. I learned a lot // Fascinating // It was interesting how levels of depth and understanding varied from project to project. Most people did very well. // Infesting but can get dull if too many people present // Good I love hearing what other ways there are to help cancer.

4 What did you think about presenting YOUR project in class? It was fun. // It was fun. // It was good. Helps me to see how much I really know. // Slightly nervous because the project is not done yet. // I felt that my presentation wasn't very clear. // I love presenting :) // I enjoyed presenting my project. Answering questions was beneficial to me in reaffirming my knowledge of my subject // Good practice for the future. Not too hard not to easy // It felt like I wasn't clear on what I'm doing. But I did my research and now I know.

6 What do you think about the review sessions at the end of each week? They are very helpful in solidifying the information covered during the week // They're very helpful // The review sessions are very helpful to go over possibly confusing topics and working on posters // I love them they make me understand the lectures so much better // If you can, would it be ok if you texted us if you were running late, thanks! // Maybe make them optional? Increase lab time.

Classroom, invited lecturers, tours feedback

Wk	Name	Comments – Lectures
1	Willie Lab Techniques, Evidence, Falsification	Falsification topic was phenomenal! (Megan) // Already knew most but that's to be expected.
1	Willie Sterile Technique, Lab Math	Lab Math was hard at first // Great to cover the basics, very helpful. Math could have been much more rigorous (Megan)
1	Willie DNA/RNA Protein	Great Foundation (Megan)
1	Tom Metabolism	Fantastic Intro! Thermodynamics concepts presented so clearly. One of my favorite lectures. (Megan)
1	Phil Cell Cycle	Again, great review of cell cycle. Easily understood lecture, a bit rushed (pressed for time) (Megan) // I'm lost, but only because I don't have as much science background as everyone else does (Shanita)
2	Annie/PJ/Jillian Cancer I	They were all patient and made sure we understood // Nice Introduction. A bit hard to follow at times. (Megan) // Too many teachers (Shanita)
2	Tom Epidemiology	Tom is a very good teacher. // Epidemiology great, could be more rigorous. More info could be included in this lecture. (Megan)
2	Phil Oncogenes	A bit hard to follow at times. (Megan)
2	Dr Bastacky Pathology	Some of the things were neat to see but it was too hard to understand // Way too much information at one time // Microscopy was great. Seeing tissues was exciting. Pm - a lot of walking for very little benefit. Way too rushed. (Megan)
3	Tom Growth Factors	Great Intro (Megan)
3	Richard Steinman	Great topics. Steinman gave an informative lecture with a unique, clinical perspective. Very valuable. (Megan) // Good: (Shanita)
3	Tom Signaling	LOVED this topic. (Megan)
3	Mike/Willie Flow/ Imaging	Fantastic! I really enjoyed hearing about this technology. (Megan)
3	PJ Tumor Suppressors	Loved the animations! The detailed outline was truly helpful. (Megan)
5	Review, Presentation Instructions	We'll be well prepared for our presentations
6	Phil Adaptive Immunity and Tumor Immunity	Great job - cool topic (Megan)
6	Lyn Robertson Public Health	Loved this and plan to follow up with her. Her willingness to discuss was great. Had another

		conver[sation] with her (Megan)
6	Beth Dudley Genetic Counseling	Went a little long still rather interesting (Megan)
6	Neal Immunotherapy	Enjoyable lecture (Megan)
7	Siuwah Drug development, trials	Fascinating! Loved it. (Megan)
7	Lindberg Bone Marrow Biopsy	This was great (Megan)
7	Trip to NIH	I had fun and learned there are other jobs in science besides working in labs // Can we take a train next time? // Loved it! I plan on applying for a lot of their programs (Shanita)
7	Neal Cancer Chemotherapy	Neal is a great lecturer. Love the case studies. (Megan) // Missed it! Argh! (Shanita)

ASSESSMENT

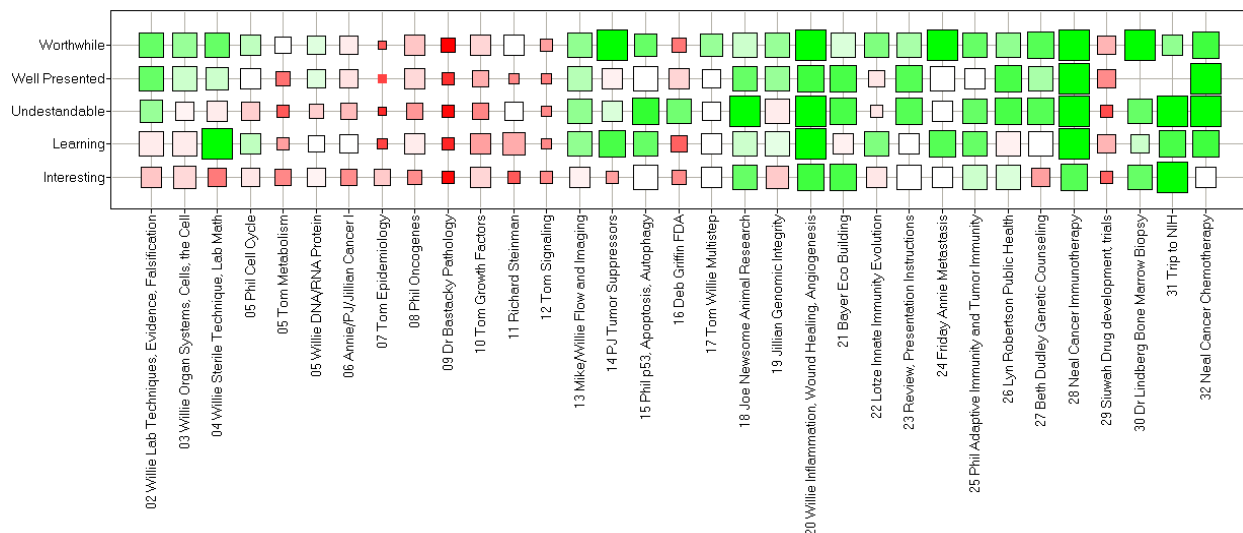
Assessment of program performance was conducted using two methodologies: feedback surveys (weekly and cumulative surveys) and a pre-/post test.

Follow-Up Evaluation

Both students and faculty mentors who participated in the 2010 UPCI Summer Academy have also been asked to provide feedback via an electronic survey to determine their overall satisfaction and learning experience from the program. These surveys have been designed to gauge the increased knowledge of the students, their increased interest in cancer careers, the faculty's perception of the students' success, and ways in which we can further improve and build upon our program. In addition, students will be mailed a survey near the end of their senior year asking for feedback on their college plans and intended majors.

STUDENT FEEDBACK

Students ranked each didactic lecture and activity by 5 parameters. Below, each square represents the students response where green is positive (i.e. valuable, clear, understandable, a lot of learning, and exciting) and red is negative (useless, confusing, too difficult, no learning, boring). Large squares indicated agreement among the 12 students where smaller squares mean that there were some negative responses and others positive. Each lecture/activity is listed on the abscissa.



Analysis of these results makes it evident that particular lectures need to be optimized and specific teaching styles need to be honed. This feedback allows us to quickly adapt to the program for even better success in the future.

IMPACT

Students, their families, their research mentors, and other professionals witnessing these students’ presentation all had significant praise for the quality of the students’ research and their articulation of it to audiences.

Below are just some of the testimonials provided by this year’s students:

The UPCI Summer Academy was a wonderful experience that I found both academically enriching and very fun! My family and I are very proud of what I've been able to learn and accomplish, thanks to the great mentors I had the pleasure of working with. I would recommend this program to any diligent student! – Fayten El-Dehaibi

The UPCI Summer Academy was a great opportunity to get hands on experience in science. Having done other scientific programs before this, this program gave me true laboratory experience which will be very useful in helping to decide my goals for the future. – Katherine Walrath

The UPCI Summer Academy has been the most rewarding program that I have participated in during my high school career. To say I learned a lot would be an understatement. I thoroughly enjoyed every aspect of this program. My favorite, however, has been the hands on lab experience that I was able to gain. Because of this, I am now seriously considering a career in the lab. Without the UPCI Summer Academy, I would have never been exposed to all of the great opportunities that I had this summer. – Jaela Wesley

UPCI Summer Academy is an enriching high school program. With the help from mentors, volunteers, staff, and even the students, I learned about the nature of cancer and the importance of Cancer Research. Not only did I learn a lot through the program but I also made great friends and made many memories this summer. I would recommend this program to any student interested or even considering entering the medical field. It's a blast! – Andrew Muse