

UPCI SUMMER ACADEMY 2009 FINAL REPORT

EXECUTIVE SUMMARY: A SUCCESSFUL PILOT PROJECT

The inaugural *University of Pittsburgh Cancer Institute (UPCI) Summer Academy for Cancer Careers*, conducted over eight weeks in June-August 2009, succeeded in its goals of encouraging students' interest in cancer careers, instilling knowledge of cancer biology and clinical care, and developing research and communications skills. Within six weeks of receiving seed funding from philanthropic and UPCI sources, the program was launched with five talented and motivated students: four rising high school seniors recruited from among Governor School applicants and one recent high school graduate.

The students attended a series of cancer biology lectures presented by a UPCI clinician/researcher, a biology professor, and a University of Pittsburgh medical student. They also 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. Most of each student's day was spent conducting laboratory research in a UPCI lab. Students gave well-received oral presentations of their research progress at a Pittsburgh

Tissue Engineering Initiative Research Symposium, and gave oral and poster presentations at a culminating seminar/reception at UPCI to rave reviews from the assembled families and UPCI researchers.

The students indicated on feedback surveys that they felt the *Summer Academy* was well organized, well presented, and well designed with a suitable mixture of worthwhile learning activities. They reported that their participation made them more knowledgeable about cancer biology and clinical care, and more likely to pursue medical careers in cancer care and research. The experience of the project management team in administering this inaugural *Summer Academy*, as well as the student feedback and assessment results obtained, will provide significant information to use in seeking ongoing funding and in implement a much-anticipated, improved second *Summer Academy*.

We gratefully acknowledge funding to support our program from the Bayer Foundation, the University of Pittsburgh Cancer Institute, the Varischetti family, and the Pfefferle family.

How likely are you to recommend this program to your teachers and fellow students?

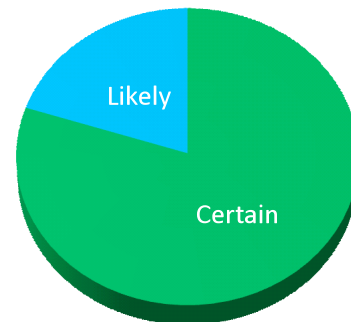


Figure 1. Survey results: *Summer Academy* participants are eager to recommend the program.

PERSONNEL

The project leadership team was comprised of:

- Dr. Michael Lotze – a UPCI clinician/researcher. Project Director and Instructor.
- Ms. Megan Sylves – Dr. Lotze’s administrative assistant. Project Manager. Recruited students and provided student support. Coordinated guest speakers and tours.
- Dr. Richard Hershberger – a former biology professor. Curriculum and Assessment Consultant and Instructor.
- Ms. Kristen Livesey – a University of Pittsburgh medical student and researcher. Instructor. Coordinated guest speakers and tours.

CURRICULUM

GOALS

The *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. Our original intention was to focus the program on underrepresented and disadvantaged students by working closely with the Pittsburgh Public School to target appropriate students. Despite the concerted efforts of Brian Corr, Science Coordinator of the Pittsburgh Public Schools, and contacts to which he provided access, no students who were available to participate were identified in the few weeks between funding and program launch. Thus this specific aim was abandoned for this year as it was

deemed important to launch the program and gain experience without a year's delay. *Summer Academy* students were identified from among applicants to the cancelled Governor's School, regardless of disadvantaged or underrepresented status.

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. (Figure 2.)

The table in Appendix A lists the learning activities (excluding laboratory research) in which the students participated and their overall rating of each individual activity using a 5-point scale (1 = strongly negative; 3 = neutral; 5 = strongly positive) on the final Student Feedback Survey. Of 46 activities that students rated, only three received a negative average rating (< 3.0) and 43% of the activities earned a rating of 4.0 or greater.

What portion of your learning came from each of these categories of activity?

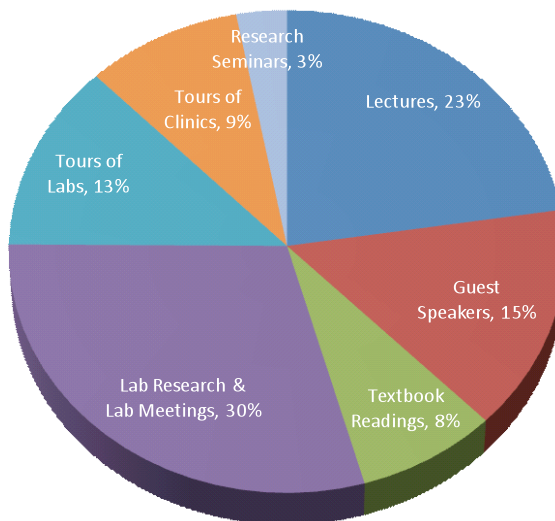


Figure 2. Survey results: The curriculum provided a balanced variety of worthwhile learning activities.

Owing both to the late start of the program and to the summer professional and personal travel schedules of clinicians and researchers, we were not able to attain the degree of coordination between lecture subjects and guest speakers as we had hoped. It is expected that this will be better achieved in future summers with greater amounts of planning and scheduling time before the program launch.

The textbook chosen for the students to read in conjunction with the lectures was the advanced undergraduate/graduate-level *The Biology of Cancer* by Dr. Robert A. Weinberg. Reading this text proved challenging for the students. They rated it among the least valuable learning activities in the program (Figure 2) and the students rated its suitability as 3.4 on a 5-point scale. If this textbook is used in future years, it is advised that each textbook reading assignment be accompanied with a worksheet that guides the students' reading so that they successfully identify the key concepts and achieve the desired learning outcomes.

ASSESSMENT

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

STUDENT FEEDBACK SURVEYS

Feedback surveys asked students to respond to questions using a five-point scale (1 = strongly negative or strongly disagree, 3 = neutral, 5 = strongly positive or strongly agree). Results of the weekly feedback ratings of individual learning activities are presented in Appendix A. The activities deemed least valuable to the students were the UPCI research seminars featuring visiting scientists, as these were considered by the students too difficult to understand.

Figure 3 presents the consistently positive ratings the students gave the *Summer Academy* for its design, organization, and presentation.

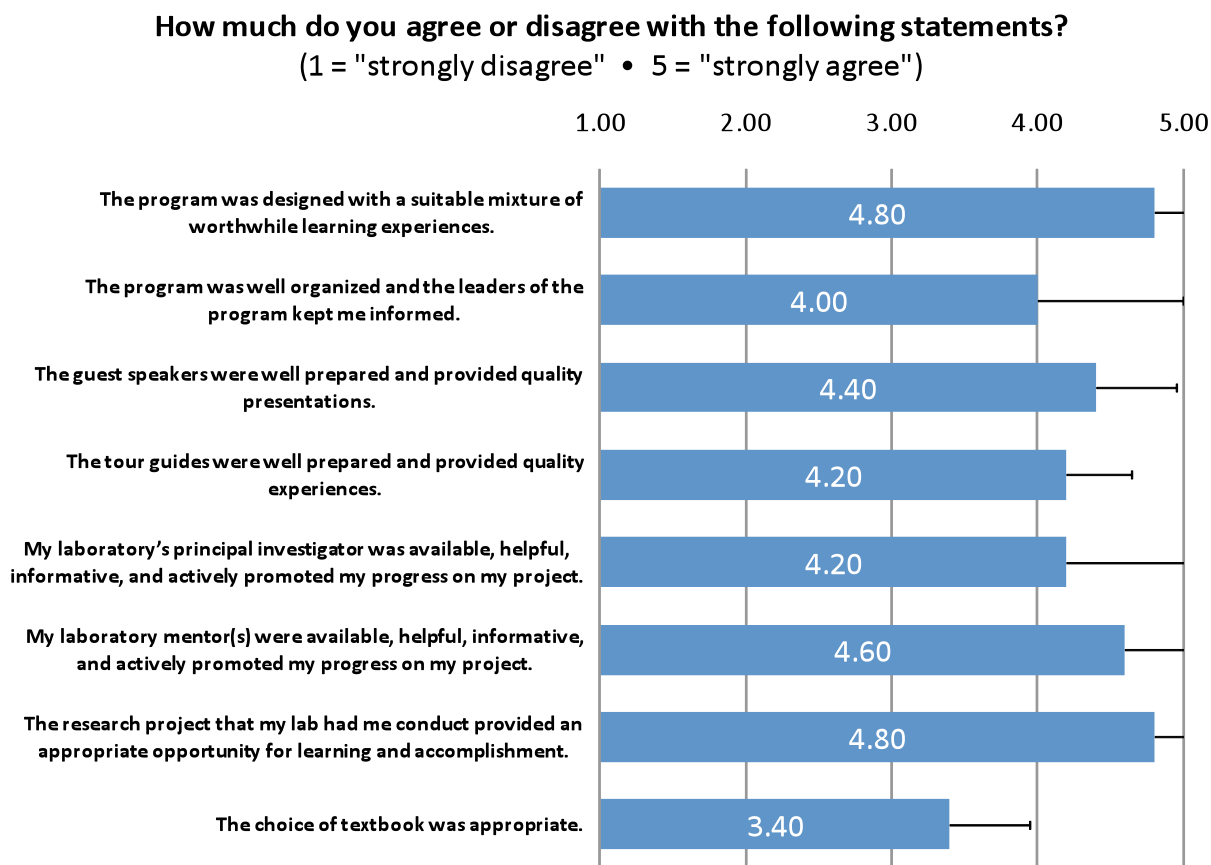


Figure 3. Survey results: The *Summer Academy* was deemed well designed and well implemented.

Students indicated that the *Summer Academy* made them more knowledgeable about cancer clinical care, and *much* more knowledgeable about cancer biology, biomedical research, and biomedical careers. (Figure 5) This provides strong evidence that our key curricular learning goals were met.

The students also indicated their increased likelihood of pursuing undergraduate biology training, a medical career, and work in the cancer field. (Figures 5 and 6) They were also consistently pleased with the quality of instruction presented. (Figures 7, 8, and 9)

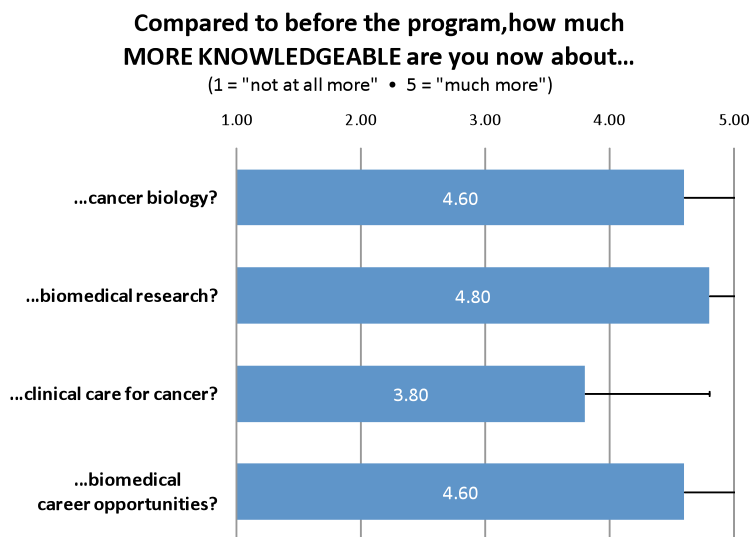


Figure 4. Survey results: Students acquired knowledge about cancer biology, research, clinical care, and careers.

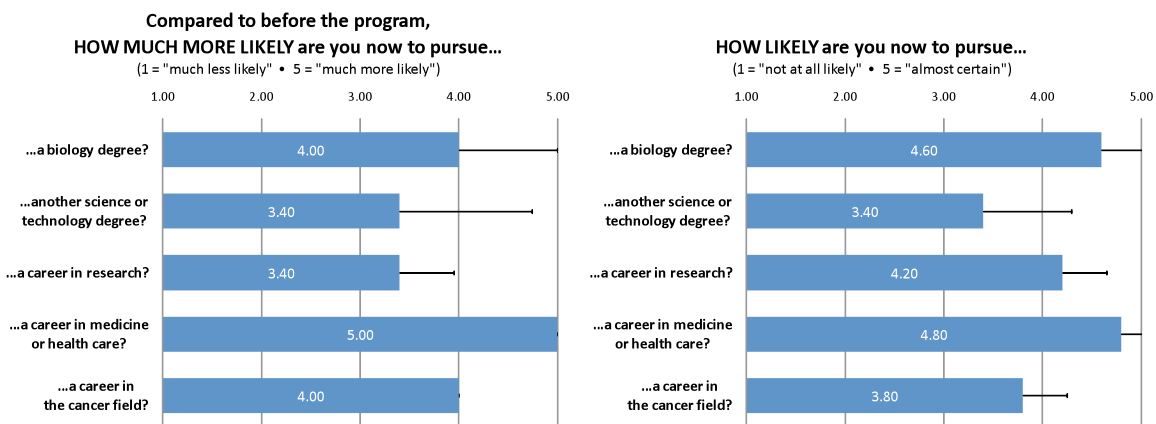
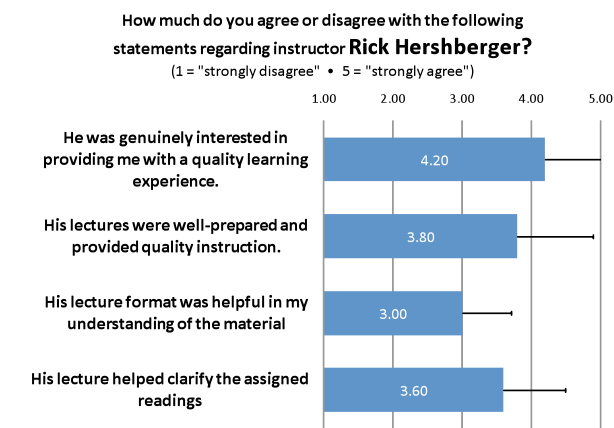
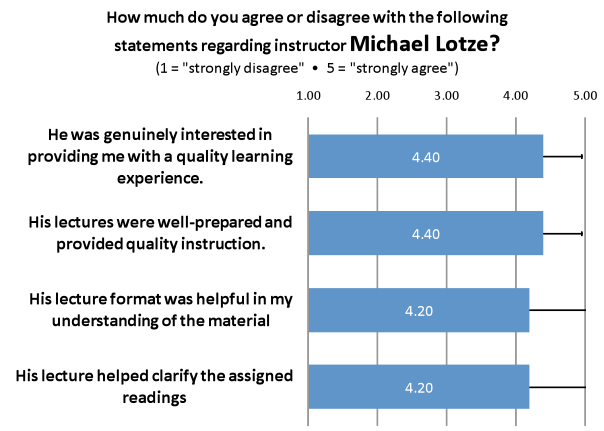
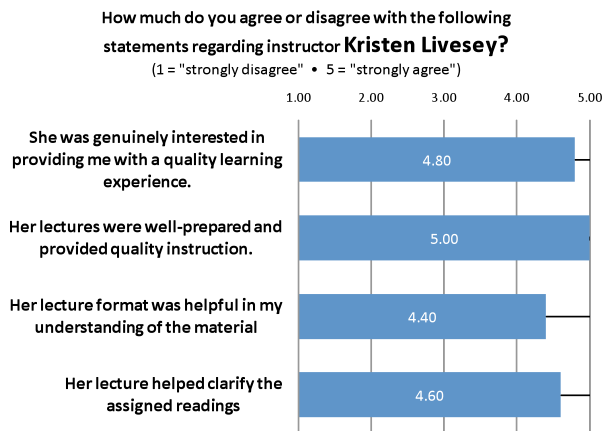


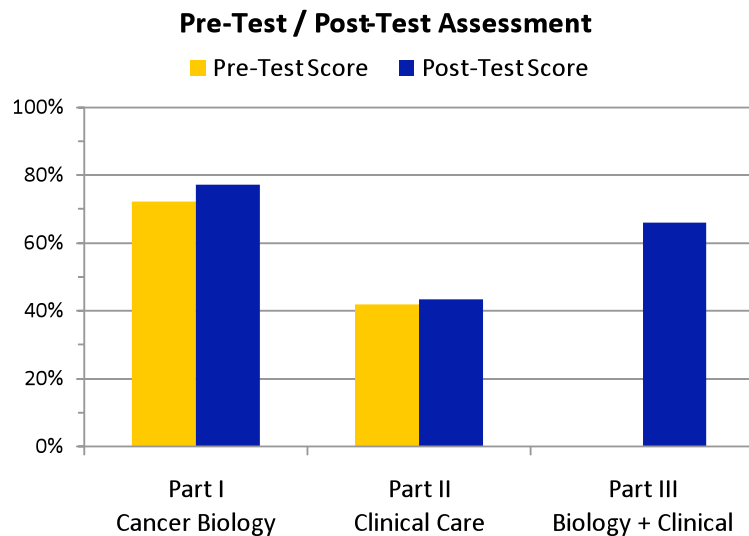
Figure 5 and 6. Survey results: Students are more likely to pursue a biomedical career.



Figures 9, 9, and 9. Survey results: The quality of instruction was high.

PRE-TEST & POST-TEST

Students were given a two-part pre-test and a three-part post-test, each comprised of multiple choice questions. The pre-test included a section focused on cancer biology (Part I) and a section focused on clinical care (Part II). These sections were written before the curriculum was delivered. Part III was written after all program instruction was completed and encompassed material specifically presented in lectures, guest presentations, and tours. We believe the lack of an observable learning effect in Part I (Figure 10) is due to those questions being somewhat easy to the students, since they scored greater than 70%



Figures 10. Pre-test and Post-test results.

on them on the pre-test. It is also possible that Part I and II questions were not well aligned to the content eventually addressed specifically in the learning activities, particularly with regard to the coverage of clinical care subjects. Since the Part III questions were written specifically from the content *actually* delivered, in contrast to Part I and II which were written based on *anticipated* content, it is expected that the Part III questions will be a better pre-test for future *Summer Academy* sessions.

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. An attendee at the PTEI Research Symposium remarked of the *UPCI Summer Academy* students:

The symposium attendees at my table were laughing in disbelief because your students were just that impressive - one after the next!!! I can't believe that your students were able to stand up and say some of those words, let alone understand what they mean. It is clear that they learned a ton this summer and I'm sure what we saw only begins to scratch the surface! Congrats to you and your team!

One parent used the adjective "dumbfounded" to describe his reaction to the quality of the students' presentations, saying "they presented the research in a manner that would do credit to a university graduate student" and comparing the research posters to those presented by students in his department.

A student e-mailed her thanks, saying "This summer really helped me to realize that I want to go to medical school. I also had a great experience in the research lab" and "It was a once in a lifetime experience." A parent wrote: "It may have been a life-changing experience for my daughter."

APPENDIX A: CURRICULUM ACTIVITIES AND STUDENT FEEDBACK RATINGS

The following table lists the learning activities in which the students participated and their overall rating of each activity on a 5-point scale (1 = strongly negative; 3 = neutral; 5 = strongly positive).

Week	Activity	Type	Presenter	Rating (5-pt scale)
1	Chemical Safety	Training	Pitt Env Hlth Sci Dept	3.00
	Lab Math	Lecture	Hershberger	3.93
	Scientific Method	Lecture	Hershberger	3.70
	Lab Notebook	Lecture	Hershberger	4.00
	Molecular and Cell Biology and Cancer Treatment	Speaker	Steinman	
2	Biology of Cancer	Lecture	Hershberger	3.50
	Chapter 2: Nature of Cancer	Textbook		3.65
	Chapter 4: Transformation & Oncogenes	Textbook		3.40

	Tour: Hillman Cancer Center	Tour		3.60
	Tour: Flow Cytometry & Array Scan	Tour	Meyer & Buchser	4.10
3	Immunology	Lecture	Lotze	4.00
	Antibodies	Lecture	Hershberger	3.80
	Tour: Radiology	Tour	Coyne	4.00
	Tour: Radiation Therapy	Tour	Dodd	4.00
	Epidemiology & Dietary Effects	Lecture	Livesey	4.20
	Tour: Pathology	Tour	Strock, Knizner	4.48
	Tour: Blood Lab	Tour	Kaib	4.04
	Tour: Microarray Lab	Tour	Lyons-Weiler	3.60
	Mutagens	Lecture	Livesey	4.12
	Chapter 12: Genomic Integrity	Textbook		3.12
4	Student Project Updates	Discussion	Lotze/Hershberger	3.90
	Tour: Cardiology	Tour		3.70
	Tour: Stem Cell Transplants	Tour		4.00
	Genetics Review	Lecture	Hershberger	3.90
	Speaker: Radiology	Speaker	Branstetter	4.40
	Seminar: Renal Cancer	Seminar	Atkins	2.20
5	Tumor Suppressors	Lecture	Hershberger	3.30
	Chapter 7: Tumor Suppressors	Textbook		2.90
	Bayer Sustainability Camp	Tour	Bayer	3.80
	Drug Development & Clinical Trials	Lecture	Lotze	3.90
	Chapter 16: Treatment of Cancer	Textbook		3.10
	Student Project Presentations	Discussion	Lotze/Hershberger	3.90
	Cancer Therapeutics	Lecture	Lotze	3.80
	Seminar: Melanoma	Seminar	Hwu	3.40
6	Immunology	Lecture	Livesey	4.60
	Tissue Engineering	Speaker	Washburn	
	Chapter 15: Tumor Immunology	Textbook		3.40
	Tour: Stem Cell Clinic	Tour		3.40
	Genetic Counseling	Speaker	Dudley	4.60
	FDA & Quality Assurance	Speaker	Griffin	4.20
	Tour: Stem Cell Lab	Tour	Griffin	4.60
	Seminar: PTEI Research Symposium	Seminar	Lu	3.40
7	Tumor Immunology	Lecture	Livesey	4.30
	Bone Marrow Biopsy Observation	Tour	Lindberg	4.70
	Technology Transfer	Speaker	Booden	3.50
	College Admissions	Speaker	Vaina	4.80
	Operating Room Observation	Tour	Zeh	4.20
	Cancer Vaccines & Immunotherapy	Lecture	Lotze	4.20
8	Practice Session for Presentations	Discussion	Lotze/Hershberger	
	Biomedical Informatics	Speaker	Becich	
	Hematology/Oncology & Bone Marrow Transplantation	Speaker	Mapara	
	Reception and Research Presentations			