

**HUTCHLAB:
STUDENTS WORKING AS SCIENTISTS
An Educational Review**

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HutchLab

The HutchLab summer program in Seattle, Washington, provides a unique learning experience in biomedical research for high school juniors and seniors. Based at the world-renowned Fred Hutchinson Cancer Research Center, the program consists of two one-week sessions with twenty students in each session. The sessions begin on Sunday afternoon with an orientation, and then run Monday through Friday for five eight-hour days. Students in the program spend the week exploring current trends in the research and future treatment of sickle cell anemia through lab work, lectures, readings, group discussions, journal writing and more. In addition to creating a hands-on learning environment for students, HutchLab also affords those who work with the students—the full-time staff, as well as the summer staff of teachers and research scientists—with professionally and personally enriching opportunities.

HutchLab stands out to us as an especially engaging program for students. We have prepared this review in order to provide feedback to the staff, and so that those interested in science education can learn about the program's design as well as the flavor of the students' experiences working as scientists.

This Review

We, the two authors of this review, spent four days in August of 2000 observing portions of that summer's HutchLab sessions.¹ Whenever possible, we spoke with students and staff, both one-on-one and in informal focus groups. We observed small groups of students and teachers working on various labs as well as large group sessions. We read literature generated by the program; for example, program brochures, applications, lab protocols, student evaluation forms, and the HutchLab website. We also looked through texts and materials that informed the design of the program.

This review is based on our observations of the program and contains descriptions as well as our judgments about the quality and import of what we saw and heard. Our review is

¹ HutchLab also offers one-day sessions throughout the school year. This review focuses on only the one-week summer sessions.

thus more a critique than an exhaustive evaluation, and is more descriptive than data-driven. In what follows we illuminate what we believe are HutchLab's essential elements. We also include vignettes to evoke the feeling of the program as well as exemplify the ways in which the various aspects of HutchLab are thoughtfully and purposely woven together.

Our views are informed by our 30 years of combined experience, which includes designing, implementing, directing and evaluating arts, science, after school and mentoring programs for youth. We have worked in both formal and informal settings and are knowledgeable and passionate about the intricacies, the particulars, the frustrations and the joys of coordinating meaningful and successful youth programs. Based on our experiences, we have come to value thoughtfully-designed programs that offer young people possibilities for growth and transformation through relationships with adults, engagement with challenging content, and participation in substantive activities. We have also come to also recognize programs that are truly committed to diversity, the importance of strong programmatic leadership, and the significance of the connection between youth programs and the larger institution in which they are housed.

Although HutchLab is a relatively new program, we recognized that the program has been carefully designed and thoughtfully implemented. Over the time we were there, we became increasingly aware of the profound quality and potential of the program.

The Essential Elements of HutchLab

Place

HutchLab takes place within the prominent Fred Hutchinson Cancer Research Center, "the Hutch," in Seattle. The Hutch's Robert Day campus overlooks Seattle's Lake Union and consists of several large, modern brick and glass buildings filled with offices and research labs. In the lobby of the main building is the Double Helix Café and an espresso bar which is busy at all hours of the day. Conversations around the espresso bar range from details of the progress of someone's research to weekend activities. Also on the first floor of the Hutch is a library, a teaching lab, an auditorium and a display of glass artwork. There is an upbeat and friendly atmosphere at the Hutch that complements the serious nature of the research that is being done there.

The Hutch has a long history of being a teaching facility. It offers postdoctoral and graduate research opportunities as well as internships for undergraduate students. In addition, the Hutch has provided professional development for teachers over the last ten years through their Science Education Partnership (SEP) program.

Being housed within a world-renowned institution affords HutchLab credibility and prestige. At the same time, we know from our experience that a youth program's affiliation doesn't necessarily guarantee that the program will be integrated into the parent institution or even have access to that institution's resources. In fact, youth programs

housed within larger non-youth-oriented institutions commonly feel marginalized. In the case of HutchLab, however, we were impressed with the ways in which it has been carefully integrated into the Hutch.

One way this integration is manifested is in HutchLab's access to material resources. During the week-long session, staff and students have the opportunity to work in a real research lab (which the Hutch temporarily sets aside for HutchLab) using equipment such as electrophoresis gel boxes, micropipettes, microscopes, centrifuges and thermal cyclers. In addition, HutchLab staff and students have access to the Hutch's library and are able to use lab coats, journals, books, computers, scanners and digital cameras. Hutch scientists and researchers also serve as resources to the program through formal and informal interactions with the staff and students. The summer staff and students we spoke with expressed gratitude for the quality of these resources—equipment and expertise—which they typically don't have access to at their schools.

Finally, being housed within the Hutch offers the program authenticity. HutchLab students and staff are immersed in an environment where “real world” scientific research is going on, which adds credibility and seriousness to the science and research the students engage in. In turn, the presence of high school students in an institution like the Hutch adds a youth perspective that is valuable to the professional development of the those who work there. Ideally, the relationship between HutchLab and the Hutch will continue to deepen over time and to grow in ways that are mutually beneficial to both.

Sunday Afternoon: Gearing Up for Research

The Sunday afternoon orientation and kick-off day for HutchLab students and their guests (mostly parents and, in a few cases, siblings) has the feeling of an open house at school. The parents display a mixture of pride and discomfort, looking somewhat out-of-place in their children's high school science class, perhaps wondering how much biology they remember and probably for some, hoping they aren't asked.



Nancy Hutchison, Director of HutchLab and the Science Education Partnership (SEP), and HutchLab staff know that this first day may be a little anxiety-provoking for both students and their parents. The staff has even done research into ways to reduce people's anxiety in new situations. Everything from the physical set-up of the room to the order and type of activities for the afternoon have been planned with purpose. There are eight tables, with seven chairs at each, fanned out from a central point at the front of the room. HutchLab staff members are attending to different stations around the room—one welcoming people at the door, another taking digital photos of each student, and another fitting students for the lab coats they will wear for the remainder of the week. The schedule for the afternoon is visible on a screen as the staff gently directs the students through each station. Then, with their newly acquired HutchLab binder in hand, the students join their parents at a table where they sit and chat with other students and parents. There is anticipation in the air as Hutchison welcomes everyone to the Fred Hutchinson Cancer Research Center, or "The Hutch" to those who work there. Hutchison and the staff then take turns outlining the context, scope and expectations for the program.

There is a high level of engagement over the next few briskly choreographed hours, as the staff lead students and their families in discussions about DNA and hands-on activities such as using micropipettes and DNA spooling. The formal part of the afternoon ends with an informative talk by pediatric oncologist Eric Siever on genetic diseases of the blood, which sets the stage for the science content that will fill the week to come. The afternoon ends with students, family members and staff enthusiastically chatting over snacks and soft drinks.

Evolution

“We wouldn't consider doing anything without teachers.”

– Nancy Hutchison, Director of SEP and HutchLab

One of the most important things about HutchLab is how it grew organically from the Science Education Partnership (SEP), the Hutch's professional development program for teachers. In 1998, the Hutch's SEP staff held a meeting with 50 “stakeholders”—teachers, program leaders, professional development providers and funders—to revisit the program's goals. For years prior to the meeting, a growing number of high school students had been requesting some type of internship at the Hutch. At the same time, teachers in SEP had been lobbying for lab opportunities for their students. Based on these requests, SEP director Nancy Hutchison began looking at programs such as CityLab in Boston, Cold Spring Harbor DNA Learning Center, and the High School Human Genome Project, each of which provided different models for working with high school students.

The consensus at the stakeholder meeting was that the Hutch would institute a program for high school students, in addition to the work they were already doing with teachers through SEP. The professional development in leadership and science content that SEP provided for teachers would become the foundation for the HutchLab program. This program would offer investigative science experiences for high school students, and also provide opportunities for research scientists to become more effective communicators by working with both high school students and teachers. A by-product of HutchLab would be the creation of science kits and innovative teaching strategies to be used by secondary school teachers.

The evolution of HutchLab from SEP has produced a natural synergy between the two programs. For example, the HutchLab teaching staff and teacher-in-residence are all alumni of SEP. In addition, the HutchLab director, program manager and postdoctoral research fellow—all research scientists by training—also work with the teachers in SEP. Throughout the two sessions we observed this summer, the complementary staff and goals of HutchLab and the SEP programs helped make the students' hands-on science research experiences as authentic and current as they were grounded in the collective wisdom and best practices of exemplary high school teachers.

Monday Morning: Introducing Sickle Cell Anemia

On Monday morning the students are given a “case.” Using notes written by a doctor in 1904 that describe the symptoms of a patient, the students try to “diagnose” what the patient may be suffering from. While considering the patient’s symptoms, the students rotate through four or five stations set up around the room. At one station they look at cells under a microscope. At another, they manipulate 3-D models that show how the shape of sickling cells affect blood flow, and at another they analyze a family tree and consider how certain diseases are hereditary. In a large group discussion, the students begin to consider that the patient may have sickle cell anemia. The group agrees, however, that before they would diagnose this patient with any certainty they would want to look in more detail at a sample of the patient’s blood.



After lunch, pairs of students are given a plastic bin filled with a variety of equipment. Dressed in their lab coats and using micropipettes and electrophoresis gel boxes, the teams first practice and then place four small protein samples into the “lanes” of the gel box. The four samples represent a sickle cell patient, a “normal” patient, a heterozygous patient and a presenting patient. One adult is working with each of the five tables of four students. The adults offer help when asked and guidance if a team seems particularly lost. Otherwise, the student pairs move along at their own pace until all the groups are done. Dave Masterman, the teacher-in-residence, then goes over the results, pointing out what the protein patterns of a sickle cell patient looks like on the gel run. It is with the results from the gel run that the students finally “diagnose” the patient with sickle cell anemia.² Later that afternoon, after watching a short video about the life of a woman who was diagnosed with sickle cell anemia when she was sixteen years old, Nancy Hutchison stands before the students and tells them that she “has a confession to make.” She reminds the group that although a lot is known about sickle cell anemia, there still is no cure for it. She then states that when applying for funding, she told the National Institute of Health that HutchLab students would be looking at the likely directions the treatment of sickle cell anemia would be taking over the next ten to fifteen years. “I told the NIH that I would ask you to prepare materials for someone your age about current research and future treatment options for sickle cell anemia,” she says, revealing the goal for the final presentations at the end of the week.

Interwoven Program Design and Pedagogy

When Nancy Hutchison was laying the groundwork for the design of the program, she consulted advisors that included scientists, educators and funders. She also surveyed teachers and staff in exemplary programs and identified issues running the gamut from the true nature of scientific inquiry, to national and regional science standards, to transportation, lunch and orientation. This work resulted in the thoughtfully combined and interwoven design features and pedagogical tools that give HutchLab its character.

➤ *Orientation*

Orientations are crucial in setting the tone for the program that follows it. High school students are keen, quick synthesizers of new experiences and are adept at making their own meanings of situations from first impressions. HutchLab's well-organized, immersive orientation session explicitly communicates the seriousness of the program's content and conveys clear expectations of the students. At the same time, the playful spirit of the staff creates a non-threatening atmosphere. It is an impressive example of a thorough induction into the culture of an institution and a program.

➤ *Team Work: Strand Groups and Home Groups*

Many HutchLab activities are done in teams or small groups. Informal education programs such as HutchLab and those in science museums often derive their strength from their ability to offer these kinds of collaborative experiences.

As Dave Masterman states, working in teams provides students with a variety of challenges and, in turn, a variety of ways in which to contribute, learn and grow. "Each student is going to take away a different amount and different levels of achievement, but there is going to be growth. And it is not all just science and equipment. We hope most of it is attitude, the ability to work together as a group. Schools don't often foster teamwork as a priority and we want people to realize that you get so much further ahead if people work cooperatively and synergistically. And that the sum result of working together is much better than anyone can do individually."

Early in the week, the students are randomly assigned to one of four "strand groups" with five students in each. Each strand focuses their work on one theme or potential treatment option for sickle cell anemia; the four are Gene Therapy, Bone Marrow Transplant Success, Host-Donor Matching, and Molecular Diagnostics. One of the four teaching staff is assigned to each of the strands. The postdoctoral fellow floats among all four strands.

Each student is also placed in one of five "home groups" that include four students, each representing a different strand. Within these home groups, students report out daily on the results of the work they are doing in their strand. The four teaching staff as well as the postdoctoral fellow are each assigned to one of the home groups.

² Donald DeRosa and B. Leslie Wolfe, *Mystery of the Crooked Cell: An investigation and laboratory activity about sickle-cell anemia*. *American Biology Teacher* 61(2), February 1999: 137-148

Putting the students in the role of “expert” on their strand’s work within their home group provides them with ample opportunity to learn by teaching. Speaking to three peers and one adult decreases the anxiety that often occurs when presenting to a larger group. The adult acts as safety net in the home group, a person to whom students can turn for clarification when they aren’t certain about a science concept or outcome of their strand’s research. Furthermore, this structure provides the students who are more confident about the content with the challenge of making it understandable to their peers.

➤ *Hands-on, Didactic, and Reflective Experiences*

It is not uncommon to see hands-on engagement in educational programs touted as evidence of learning. Too often, however, hands-on activities aren’t reinforced by other methods that enhance understanding. HutchLab employs a judicious balance of modalities, experiences and time for reflection which build upon each other to create the scaffolding that fosters learning.

A typical day at HutchLab begins before the students arrive with an early morning staff meeting. Once the students arrive, the staff discuss the plans for the day, students ask questions, and they might discuss an assigned reading. Students then join their home groups where they explain and answer questions about their strand’s lab work from the previous day. During each of these activities, HutchLab staff informally assess the students’ individual and collective progress.

The students then join their strand groups. With guidance from a written protocol and supervision from HutchLab staff, they begin the day’s lab work. The students, working both collaboratively and independently, keep detailed documentation of their lab results in their journals as they follow the protocol. In the afternoon, Hutch scientists give lecture-style “lab talks” in which they share results of their own research that are relevant to the students’ work. After a short discussion and opportunity to ask questions, the students reflect on their day by writing in their lab journals. After the students leave, the staff debrief about the day.

➤ *Emphasis on Process*

Although HutchLab’s weekly activities culminate in the students’ Friday afternoon presentations, the process leading up to the presentations is seen as equally important. In fact, HutchLab staff tell the students at the beginning of the week that the Friday presentations need only be in draft form. This frees the students from worrying about getting the “right” answer and allows them to concentrate on their daily experiences. As Dave Masterman put it, “The focus of HutchLab isn’t on getting a grade, or having a complete mastery of the content, but to have growth.”

For example, during the first session the Gene Therapy strand’s lab work ultimately yielded unexpected, inconclusive results. In their Friday presentation the students used interactive models, props and posters to explain the steps of their experiments and

presented four possible hypotheses for the “problems” they encountered. One young woman in the group reflected, “I learned about the scientific process, what scientists do, testing things over and over.”

➤ *Feedback*

The HutchLab program has built-in structures that provide daily feedback about the students’ understanding of the content they are learning as well as the meaning they are making of their experiences. At the orientation session, the students receive lab journals in which they record content, process and reflections. The staff hold debriefing meetings at the end of each day where they discuss what they have read in the students’ lab journals. These meetings serve as trouble-shooting sessions and often lead to significant adjustments in the following day’s activities. The evaluations that the students fill out on the last day of each session and this review are also tools to inform the ongoing evolution of the program.

Thursday Morning: Working in the Lab

It's Thursday morning and the four strand groups are preparing for their lab session. Earlier, each student reported out the results of their strand's previous day's lab work to the other members of their home group. The students were also reminded that they would be making their final presentations the following day and were encouraged to begin thinking about what kind of media they might use. For a few minutes the large group brainstorms possibilities—Power Point presentation, a public service announcement, a lecture, a museum exhibit, a rap video.



The students then go upstairs to the lab and put on their lab coats. HutchLab teacher Penny Pagels hands out the day's lab protocol, "Visualization of the PCR products," to her group of five students who make up the Bone Marrow Transplant Success strand. As the students carefully read the protocol, one young woman stops to ask what "DNA markers" are. "Good question," Pagels replies, as she suddenly realizes the possible variety of meanings of the word in this context. She goes on to explain that a marker here refers to some pre-packaged bits of DNA of known sizes that serve as a "ladder" against which to compare the as-yet-unknown samples.

Pagels watches carefully but unobtrusively over shoulders as the students slowly begin to prepare the markers, blanks and gels for electrophoresis. After everyone has loaded their gels, they are ready to run the electrophoresis. An air of serious concentration ensues as the students draw lane maps for the gels in their journals. Their concentration remains unbroken as each student then places a lid on his or her gel box and connects the electrode wires to their power supply.

Once the power supplies are turned on and the current of each is checked and recorded, students in the Bone Marrow Transplant Success strand share a few light moments taking digital photos of each other "playing scientist" for use in their final presentations on the following day. In less than an hour they will be off to have lunch with working scientists from around the Hutch.

Content

The core content of HutchLab centers on lab experiences with four strands of current research into the future treatment of sickle cell anemia. These strands serve as a heuristic that guides students in exploring the underlying molecular biology and genetics of this well-understood genetic disease of the blood. Studying sickle cell anemia provides students with a window into the central dogma of DNA, proteins and the relevant genetics, as well as a foundation to understanding other diseases caused by genetic mutations, such as cancer.

On the advice of teachers, the staff has decided not to tell students initially that they will be studying sickle cell anemia. As Hutchison stated, "If you just say to the kids, okay, we are going to look at sickle cell anemia, then they immediately want to revert to what they already learned, heard or know about it." The recruitment materials for HutchLab only advertise that students in the program will be studying "genetic diseases of the blood." Sickle cell anemia isn't mentioned at all. Rather, through the introduction of a case study and a series of strategically designed inquiry activities, sickle cell emerges on the second day of each session.

Biology and genetics come into play implicitly in many of the lab procedures of HutchLab. Students also encounter physics. For example, through the use of micropipettes, balances, power supplies and centrifuges students work with volume, mass, current, voltage and centripetal force. They also practice their measurement skills.

Through out the week, students use technological and communication tools such as computers, scanners, digital cameras. An optional session on the basics of Power Point is offered. In addition, the staff talk with the students about different learning styles and encourage students to take learning styles into consideration in their presentations.

There is a high level of scientific discourse at HutchLab. The staff speak to students and to each other in the scientific and technical language of molecular biology and genetics. This was particularly striking in the lab talks. Even when the scientists used models and analogies, they did not "dumb down" the material. In addition to the overall level of discourse, the program invited students to discuss such issues as the ethics of in-vitro molecular diagnostics and genetic testing, the altruism involved in host-donor matching and the risks involved in bone marrow transplants. These issues brought the science content closer to the students' lives and provided opportunities for more philosophical conversations.

While we aren't scientists ourselves, our years of experience in science education tell us that the curriculum of HutchLab contains current, high quality science content. Two other researchers, a geneticist and a biology teacher, who also observed parts of HutchLab sessions described the content as "deep" and "complex."

Meeting Scientists

The students in the Host-Donor Matching strand have begun to prepare a protocol entitled “Visualize DNA with Polycramide Gels,” when one of the young women in the strand returns to the room with excitement. A researcher whom she met on the shuttle bus on the way to the Hutch has invited her and her group of students to a lab on the floor below to see a flow cytometer machine. Dave Masterman, the HutchLab teacher-in-residence, gently puts the current activity on hold to seize the teaching moment. As the group heads for the elevator, the student recounts having met the researcher, Kelly McIntyre on the shuttle bus and how the two had struck up a conversation about what each is doing at the Hutch.

Much of the space in McIntyre’s corner of the lab is taken up by the flow cytometer, a machine that bounces LASER light off of cells that have been stained. While the students seem impressed by the technology, the relevance to their host-donor matching work isn’t immediately obvious. McIntyre and her colleague Kent Singleton, who was obviously interested in meeting the students, explain that they are looking at B and T cells, and they reiterate the role of antibodies in fighting antigens.

Not all encounters with the Hutch research staff are as random as this one. Several times through out the week, HutchLab students, in groups of four or five have “lunch with a scientist.” In these informal, intimate meetings, students are able to converse with scientists about their academic trajectory, life-style and work. These lunches provide an opportunity for the high school students and scientists alike to dispel any false stereotypes they may have about each other. During the summer 2000 sessions, approximately 40 Hutch scientists volunteered to have lunch with students from HutchLab.

The Staff

The full-time HutchLab staff includes several former Hutch researchers who are now program administrators, a teacher-in-residence, and a postdoctoral fellow trained in research and interested in science education. Other Hutch scientists and researchers provide as-needed content support, meet with students over lunch, give lectures and serve as science advisors and role models throughout. In addition, three public high school science teachers are hired for the spring and summer to help design and teach the two one-week sessions. HutchLab staff intentionally hire two high school science teachers from Seattle area schools and a third from a more remote part of Washington State. This “distance position” provides HutchLab with the perspective and experiences of someone from a non-urban area as well as a vehicle for professional development for someone outside of Seattle.

HutchLab is committed to the personal and professional development of the adults involved with the program and understands that their development is both fed by and feeds the students. Working in the context of HutchLab challenges the staff to use diverse and, in many cases, new skills. Teachers are asked to do research, researchers are asked to teach, and scientists are asked to interact with youth.

For example, not only do the teaching staff serve as specialists in the pedagogical aspects of the program but, as a result of designing and running the labs, they each become authorities in the science content and the details of their strand's research. The postdoctoral fellow, on the other hand, offers science research expertise and creates authenticity around the lab work while at the same time learning about science education and working with high school students.

Besides providing the program with proficiency and passion, the mixture of teachers, scientists, researchers, and academics provides the students who attend HutchLab with a variety of adult and professional role models with whom to interact. Developmentally, this is especially important for the students, who as high school juniors and seniors are exploring their own identities and possibilities in the world.

The quality of interaction between the students and the adults at HutchLab is both respectful and informal. Dave Masterman told us, "We assume the students have had only an introductory biology class but are capable of learning at a fairly in-depth level, and that has been borne out by what we have seen happen." One student described his experience and the respect he felt at HutchLab by saying, "Lots of programs underestimate the intelligence of high school students; this one doesn't."

Friday Morning: Making Sense of the Research

HutchLab teacher Sherry Stuber's group, which has been focusing on Molecular Diagnostics, is sitting around a table in the teaching lab. Sherry stands in front of the group—proud, excited and perhaps a little bit nervous. She is giving the group a few last resources, articles and ideas they might use for their presentation. Once she is sure the students are clear about their task, she gingerly backs away from the table and reminds the group that she is there to help them if they need it.



The students now turn towards each other. The conversation starts out slowly and begins to pick up speed as their presentation takes shape. They decide against using Power Point and agree that they will do something more hands-on. They discuss how they will present the topic of molecular diagnostics and conclude that they will structure their presentation around the five labs they have covered in the previous days (a strategy that ultimately all of the groups use). Together they decide who will work on which part of the presentation and then they are off and running. One student sprawls across the floor lettering the title of the presentation along the top of the poster board. Others are at the computer looking for visuals of normal blood cells and sickled cells. Still others are working on more interactive components that they can use in their presentation. Conversations about the ethics of molecular diagnostics bubble up. “Why would you want to know if your baby in utero has sickle cell anemia?” and “What if you found out that it did?”

Sherry, who has succeeded in stepping aside so the group can put their presentation together, has suddenly become part gofer and part teacher—retrieving colored markers and tape, answering questions, and offering her thoughts and suggestions. Although she is inconspicuous, Sherry is working as hard at this point as she was when she was guiding the students through the labs. As the adult working with these students, Sherry now exists in that delicate space where her presence is felt but not interfering. It is clear that she is still holding the group—she is still teaching.

Leadership

“I love making connections and hooking people up with people they need to know about or should talk with. I realize now that I am doing this because our teachers want these opportunities for their students. My excitement comes from the team that I get to work with—pulling this together and seeing what they make from it and learning from how they are interacting. So, I learn how to teach, they get a chance to do something they hardly ever get to do, which is work with expert colleagues in their own field.”

– Nancy Hutchison

A former research scientist, Nancy Hutchison has evolved into a leader of professional development for teachers, fluent in the discourse of science classrooms. Unlike those program directors who are “youth experts” hired from the outside to run an institution’s youth program, Hutchison’s history at the Hutch provides her and HutchLab with an insider perspective and solid grounding in the institution’s core work, culture and values.

Hutchison’s access to resources and scientists within the Hutch derives directly from the relationships and professional collaborations that she built during her years as a researcher. The lab talks we observed by her colleagues Dr. Michael Bender, a pediatric oncologist and research associate, and Dr. Eric Siever, also a pediatric oncologist, gave HutchLab students and their families exposure to scientists working on the cutting edge of treatment for genetic diseases of the blood.

Hutchison leads by example. She is clearly dedicated to life-long learning and is constantly seeking out new resources and materials that will improve HutchLab. She cites articles, books and colleagues that informed her thinking about the design of HutchLab. She is also extraordinarily reflective and open to feedback from her staff.

Perhaps Hutchison's greatest skill as a leader is her ability to put together a staff whose strengths and challenges complement each other. Nancy’s own role as director reflects her greater comfort with adults and manifests mostly as a behind-the-scenes “choreographer” and supporter to the teaching staff. It is an arrangement that clearly nourishes and facilitates the staff’s work with the students.

Application Process for Students

A program’s application process is crucial because it sets the tone for participants in terms of the program’s level of seriousness. HutchLab’s application process has built-in structures to insure commitment from the students. It also conveys the tone of what is expected of a student if they are chosen to participate in the program—thoroughness, attention to detail, and tenacity.

Every HutchLab applicant is required to fill out a questionnaire, to turn in a signed parental consent form, to have completed a life sciences class, and to obtain a written

recommendation from a teacher. HutchLab staff screen the applications by selecting only those that are complete. These then become the pool from which 40 students (as well as several alternates) are chosen in a lottery. The process is both fair and functional, capable of being used whether HutchLab receives 50 or 2000 applications. HutchLab received approximately 200 applications for the summer 2000 sessions.

The staff has made HutchLab further accessible by not charging a fee for the program or accompanying materials, by providing lunch vouchers for the Double Helix Café, and by providing discounted bus passes that make it possible for students to travel to the Hutch on public transportation.

Not surprisingly, many HutchLab students we met seemed to have had positive experiences in school and were accustomed to long stretches of concentrated academic engagement. They were savvy about their own educational strengths and articulate about what they hoped they would get from their participation in the program. Some told us that they saw their participation in HutchLab as preparation for or review of Advanced Placement science classes. Several described the science content as “broader and more in depth” than what they had learned in school; others said it was a “repeat of stuff we did in school” or that “they were hoping it would be more challenging.” Some students shared with us that they saw HutchLab as a way to explore scientific research as a possible career. One student told us, “I am interested in labs and possibly studying medicine. I thought it would be better to try research out in one week rather than to waste years exploring it later.”

Friday Afternoon: Presenting the Work

The students have spent the majority of Friday morning working within their strand groups to prepare their final presentations. They have also met with “science advisors” from around the Hutch who were recruited to serve as sounding boards for the students’ ideas for their presentations. Two of the strand groups have created interactive presentations with poster boards, manipulatives and activities. The other two groups have decided to use Power Point for their presentations. At one o’clock the students are asked to join their home groups for the last time. It is within their home groups that the students will make their final presentations.



In addition to the extended HutchLab staff, other adults who have shared lunches with the students throughout the week have joined the various home groups. Each small group of students and adults is asked to stand in front of one of the four strand stations and to rotate from one station to the next in ten-minute increments. As each group stops in front of a station, individual students step forward to explain their strand’s work. The students—some nervous, some more confident—talk about the treatment for sickle cell anemia that their strand focused on during the week, and they explain what their group discovered from their lab work. The students then field questions from their small audience.

Light ripples of applause roll across the room as the first set of presentations ends, and soft chimes signal that it is time to move to the next station. HutchLab staff have added a fifth station to the rotation, a table with evaluation forms for each student to complete. At this station, the students take the opportunity to share and evaluate their experience of HutchLab. They are now accustomed to such reflecting, as it has been a consistent activity for them throughout the week. These final few hours of HutchLab are reminiscent of its first few, only this time it is the students who are attending to the various stations around the room, while the adults follow them from one to the next.

The On-Going Evolution of HutchLab

Although the HutchLab staff is generally pleased with the quality of the one-week HutchLab sessions and the experience that they provide for students, they continue to look for opportunities to refine and develop the program.

For example, HutchLab staff would like to discuss with students, in a more intentional way, the bioethics inherent in procedures such as gene therapy and molecular diagnostics. They are also exploring the ways in which they can include more teachers in HutchLab through, for example, Saturday workshops where teachers would be able to learn more about and to contribute to the HutchLab curriculum.

HutchLab staff would like to work towards serving more students through out the year while maintaining the current quality of the program. They would like a more diverse group of students (diverse in their gender, ethnicity, academic abilities, etc.) attending the one-week sessions and, as a result, are re-examining their outreach efforts to students as well as their own diversity as a staff.

The staff would like to learn more about the program's long-term impact in areas such as students' choices of college majors and careers, and are considering an evaluation and tracking system for students who participate in the program. Related to this, the staff is also considering how alumni gatherings might benefit both students and the program.

In our experience, we have seen successful youth programs *or* successful professional development programs. It is rare to see a program that does both well. We believe that HutchLab's spirit of reflection and commitment to growth will continue to serve both the youth and the adults in the program in positive ways. HutchLab is an exemplary program with a balanced and dynamic relationship between students, staff and scientific subject matter. In our experience, it often takes years for a youth program to develop thoughtful attention to detail and real depth of quality. We found HutchLab, then, striking in its maturity and feel it provides a model from which other science institutions and kindred programs can learn.