

YALE PEABODY EVOLUTIONS PROGRAM

Peabody Museum of Natural History at Yale University
New Haven, Connecticut

Summative Evaluation Report
2007-2008

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*P*ROGRAM *E*VALUATION AND *R*ESearch *G*ROUP
AT LESLEY UNIVERSITY

Yale Peabody EVOLUTIONS Program
Summative Evaluation Report
2007–08

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INTRODUCTION

In 2007, the Peabody Museum of Natural History at Yale University received a grant from the National Science Foundation (NSF) to continue the EVOLUTIONS after-school program (Evoking Learning and Understanding Through Investigations of the Natural Sciences) at the museum. The project also received funding through IMLS for the 2007–08 and 2008–09 school years. EVOLUTIONS has been running, in various forms, since spring 2005, with a focus on serving low-socioeconomic students in New Haven.

The program is designed to stimulate students' interest in science and science-related careers; increase their general science literacy; help them prepare for college; and develop connections between the museum and the local community. The Program Evaluation and Research Group (PERG) at Lesley University has been working with EVOLUTIONS staff and conducting evaluations since the 2005–06 school year. For the 2007–08 school year, EVOLUTIONS focused specifically on the geosciences.

PROJECT ACTIVITIES

The project continued to grow during the 2007–08 school year. Groups of students attended the program weekly (Tuesday–Friday). On Monday, homework help and informal 'drop-in time' was offered, with Yale student-assistants. About 82 students began the program in October 2007, and 63 remained active in EVOLUTIONS as of June 2008, a 77% retention rate.

Project activities during the 2007–08 school year included:

- A college trip attended by 35 students and 10 parents/family members; the group visited 6 colleges in the mid-Atlantic region, including:
 - the University of Delaware, John Hopkins University, Georgetown University, the University of Maryland, Howard University and Catholic University
- The development of an exhibit focusing on careers within the geosciences and a series of related videos, designed for use with elementary students in local schools and tailored to Connecticut State Science Frameworks K–6
- The production of two newsletters with information about the program
- The completion of a career project, in which students developed reports on two careers of interest, including at least one in the geosciences
- An evening presentation (for EVOLUTIONS parents) on the topic of financial aid
- SAT-prep sessions

- Completion of a variety of hands-on science experiments
- An end-of-the-year celebration, in which the exhibit and the videos were presented to family members and supporters of the program; the exhibit and videos are currently (as of summer 2008) being displayed at the Peabody Museum

In addition, a total of 27 students completed internships with Yale faculty and researchers during the summer and fall of 2007 and spring 2008. These students worked in labs and learned about doing science through hands-on experiences.

EVALUATION

PERG evaluators continued to work with the PI to follow and document project activities. We used a variety of naturalistic methods to collect the data, including: observations of the program sessions; interviews with project staff (including Yale student-assistants); interviews with several Yale faculty; focus groups and informal discussions with students; and a review of project artifacts.

EVALUATION QUESTIONS

Our evaluation focused on the following questions, which were developed in consultation with EVOLUTIONS project staff:

- 1) How are students responding to the geosciences/new curriculum? Do they show interest in and commitment to the program?
- 2) How (if at all) are students developing an academic plan and preparing for college? How does EVOLUTIONS assist students in preparing for college, and choosing prospective majors and careers?
- 3) Do students show (through interviews, surveys and/or focus groups) a greater interest in and knowledge of science? Do they show increased science literacy, as defined by project staff?
- 4) Do students show greater knowledge of and interest in science-related careers?
- 5) Do students demonstrate a greater sense of self-confidence and develop skills, such as public speaking and conducting research, based on their experiences in the program?

Additional questions for interns:

- 1) How do students, through the EVOLUTIONS internships, develop science-related skills and knowledge, and can they identify those skills?

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- 2) How, if at all, does the internship experience impact students' plans for college, career choices, and knowledge of the geosciences?

EVALUATION ACTIVITIES

PERG evaluators performed the following evaluation activities during the 2007–08 project year:

- Conducted several focus groups in December 2006 and June 2007 with current EVOLUTIONS students during two site visits to New Haven
- Interviewed students who had completed internships in Yale labs—in December 2007, January 2008 and June 2008
- Observed the end-of-year event and interviewed parents/family members of EVOLUTIONS students
- Reviewed pre- and post-surveys of students in the program and other project artifacts
- Interviewed 4 Yale faculty who employed interns and 2 Yale undergraduates who assisted in the program
- Maintained ongoing contact with the PI

REPORT

This report covers the 2007–08 project year and consists of the following sections: Introduction; Evaluation; Findings; Discussion and Recommendations, and Conclusion. An appendix with the evaluation protocols is attached to this report.

FINDINGS

I'm a parent, and I just want to say that I'm very grateful for the astounding experience that you provided for these students; it's amazing. Just look at what Yale gave back to New Haven. I hope you realize what a huge life-changing experience this was. (Parent)

PART 1: STUDENTS IN EVOLUTIONS

It's [EVOLUTIONS] way different than school. You get more freedom, get your work done. It's not easier [than school], but you get more out of it. (EVOLUTIONS student)

You learn useful things and have fun doing it. (EVOLUTIONS student)

We pretty much hang out in a museum, learn different types of science that you didn't know were science, do college prep, explore the Yale campus and visit other colleges. (EVOLUTIONS student)

Data from our observations, interviews and focus groups show that most of the students who participated in EVOLUTIONS found the program to be helpful on several levels—expanding their knowledge of science, useful in terms of preparation for college, developing transferable skills, and socially satisfying. Through EVOLUTIONS, students (many of whom had returned for a second or third year) developed networks of friends and a sense of connection with the project director, the Peabody Museum, and with each other. About half of the students who filled out the pre-survey in fall 2007 were in their second or third year of EVOLUTIONS, evidence of students' enthusiasm for and connection with the program.

Note: Our end-of-the-year interviews and observations took place with students who had stayed active in the program throughout the school year, and parents/family members of those students.

STUDENTS' KNOWLEDGE OF/INTEREST IN SCIENCE

EVOLUTIONS students cited a number of reasons for joining and staying in the program. Some were drawn by the opportunity to do 'hands-on' science and learn more than they could in their high school science classes. Others signed up for college preparatory information and guidance, to earn service credit at their high schools, for the connection to Yale University, and internship opportunities. About 60% of students in the pre- and post-surveys strongly agreed with the statement, "I like science," while

approximately another quarter (22% on the post-survey, 30% on the pre-survey) said they somewhat agreed with that statement. Students' responses in interviews and focus groups indicate that their interest in science-related topics increased during their time in the program, as reflected in the comments below. The science focus and the hands-on activities led by the project director were clearly engaging for the students.

I love it [EVOLUTIONS]. It's great because I learned more about science, not only what I want to major in. (EVOLUTIONS student)

It's fun . . . I get knowledge, and I'm learning new stuff every day I come, and it's fun to be around the people. (EVOLUTIONS student)

Knowledge of/Interest in the Geosciences

We asked EVOLUTIONS students about their understanding of the geosciences, which was the focus of this year's program. Almost all of the students said they knew little about the geosciences before participating in EVOLUTIONS this year. Most had increased their understanding over the course of the program year, though some still had questions about the specific areas included in the geosciences.

I have a sense, but not a full description [understanding]. They study rocks but it's more, beyond rocks . . . when I first came I didn't know anything about it, but I learned it's more about rocks and the environment. (EVOLUTIONS student)

Well it's rocks and studying rocks. I understand it but I'm confused about it. I know there are sections—we were doing glaciology, oceanography, volcanology, planetary geology. (EVOLUTIONS student)

I think I knew it had to do with the Earth, but now I know specific careers so my knowledge has expanded. (EVOLUTIONS student)

Most had expanded their knowledge through the career project (which enabled them to study and report on two scientific fields—one in the geosciences), and the end-of-the-year exhibit and video projects.

I think it's [career project] very useful if you plan on going to college . . . it might be a lot of work but we've had a lot of time on it. (EVOLUTIONS student)

I don't think the project was too much work, but very helpful—you learn Photoshop and PowerPoint. (EVOLUTIONS student)

Several students who had already done the career project in previous years were not enthusiastic about doing it again. They suggested having another activity to avoid repetition.

Take the career project away. Maybe for people's first year [it's OK], but veterans shouldn't have to do it again. (EVOLUTIONS student)

For some students, learning more about the geosciences increased their interest in this area, and in possibly taking college courses or working in geoscience-related fields. Those students who completed internships generally enjoyed their experiences, and it stimulated their interest in the geosciences and in science overall. Many had changed their perception of what scientists do, particularly in their labs.

I'm interested in the geosciences . . . that came out of this experience.
(EVOLUTIONS student)

Overall, student responses indicated a greater understanding of the geosciences on the post-program surveys. For example, more than 80% of post-survey respondents said that geoscientists study glaciers, compared to only 50% of pre-survey respondents.

According to project staff, students were able to correctly identify geoscience disciplines 48% of the time in pre-surveys and 66% of the time in post-program surveys. In addition, almost 21% of students were unsure of what the geosciences were in the pre-surveys, while only 7% were unsure on the post-program surveys. Finally, the rate of students who agreed with the statement “Science is hard,” decreased from the pre- to post-program surveys. About 44% agreed with this statement on the pre-surveys; less than 36% agreed on the post-surveys.

However, according to the post-program survey, many EVOLUTIONS students were not especially interested in the geosciences. About half (46%) of respondents said they were “a little” interested in the field, while about 42% were not interested. (The number of interested students actually decreased from the pre- to post-surveys).

Note: A larger sample of students filled out the pre-program survey—a total of 74 participants completed all or part of the survey. Only 42 respondents filled out all or part of the post-program survey.

Interns' Experiences in EVOLUTIONS

Virtually all the EVOLUTIONS interns found their lab experiences to be valuable, in terms of learning about science and what scientists actually do, as well as for developing transferable skills.

The following comments reflect how the internships stimulated the interns' interest in science-related topics.

These [internship experiences] opened up so many questions that I want to know about, like physics, because our school doesn't offer physics. If I had a chance to do another internship, I'd do it even if I wouldn't get paid.
(EVOLUTIONS intern)

It was a lot of fun, a new experience. It gave me a better understanding of what science is and what you do if you were to be a scientist. Before I thought you just

sat there and looked at things; [I] never thought you could sit and think of such a big concept and try to figure it out. (EVOLUTIONS intern)

Several interns said they would be interested in doing another internship and/or taking college courses in the geosciences. Others said they would consider working as a scientist, based on their internship experience.

I don't think it would change what my major would be, but I would take a class in geology. (EVOLUTIONS intern)

Yes, I could [picture myself as a scientist]. I am going for business, but I haven't made up my mind. (EVOLUTIONS intern)

I'm undecided [on future career], but science is one of my top three things . . . I'm not sure exactly, but doing science things through EVOLUTIONS, it's something I kind of like. (EVOLUTIONS intern)

Many of the interns said that before their internships, they had limited understanding of what scientists really did. After working in their labs, these students found the work more interesting than they had expected. They also found that their images of scientists—who they are, and how they work—evolved through their internships.

I had no clue what scientists really did. Now that I know, that I've had this [internship], I'm really interested. (EVOLUTIONS intern)

It's got me interested in doing internships in different fields. I'd like to see what scientists do beyond microbiology and beyond the school atmosphere. (EVOLUTIONS intern)

After meeting scientists and working with them, it gives you a lot of respect for them; the work is really important, it's really cool. I could do it in the future . . . the whole aspect of discovering new things, working with old fossils and learning about what they were in the past. (EVOLUTIONS intern)

Now I see people in the science labs—all the professors and students—they're [just] people and I'm a little more comfortable. (EVOLUTIONS intern)

The interns developed presentations and shared them at an end-of-year luncheon, which was attended by several parents and Yale faculty members. These presentations gave the interns an opportunity to reflect on their learning in the internships; they described their work in the labs, and identified new skills they had developed during their internships. In addition, by developing these PowerPoint presentations, students also learned organizational and presentation skills.

Faculty Response to the Interns

Yale faculty members who employed EVOLUTIONS interns, and sometimes worked with them in the labs, reported that students were enthusiastic and motivated. Almost all faculty said that, based on their work with EVOLUTIONS students, they would continue

to participate in the program and accept new interns in their labs. Several designed small projects for EVOLUTIONS students, directly relevant to their research.

I try to have them [EVOLUTIONS students] do meaningful research so our research group gets something out of it and they get experience that really matters. If the data has quality, it can be published . . . absolutely, I did use it, I used some of the sample pictures one student took. (Faculty)

Folks in my lab were all integrated really well; there's not a great division between people in the lab wherever they are from. They're all doing work and developing relationships; they're all benefiting. (Faculty)

I'm signing up for some [interns] this summer. It's a good experience to educate a different cohort, and to some degree we get credit for this on NSF proposals to have a broader impact on our work. (Faculty)

However, several faculty members said that, in order to provide a worthwhile experience for the interns, and do work useful/relevant to their research, students needed to spend more time in the labs. They recommended yearlong rather than one-semester internships, since students needed time to acclimate to lab procedures and learn how to work within their research projects.

Time was a challenge. I had four interns—two each semester . . . Their time was very restricted—they had only a few hours a week; that's hard to do, and having them come out with an in-depth experience. (Faculty)

I wanted them to do a full year. My projects are not short-term; they're still ongoing. I was hoping they'd see the full project to completion; they couldn't really do that—publication is a long way away but they got a good sense of technology we use and they acted responsibly, and they interacted with post doc, technology and students in a mature way, and they saw it's an interesting place to work . . . Two from the fall wanted to stay in the spring. I was very happy with them. (Faculty)

The faculty member quoted above suggested a twice-a-week commitment for EVOLUTIONS interns, so that they could be more involved in the research projects.

It is labor-intensive in terms of time—crushing rocks, going from coarse to cleaner. I think kids like that because it's hands-on; it would be nice if they could see the hands-on stuff at the end . . . if they stayed a year they'd see a lot more. (Faculty)

Whether they see the full extent of things depends on the span of the project. I'll have an undergraduate student working on a project this fall, so they will be able to see a lot of that project, so that should be a good time for them to participate. But I'd ask Jamie to set someone up with a one-year commitment . . . two days a week would be more appropriate across the board for labs. (Faculty)

One faculty member specifically asked for more guidance in designing projects for the interns.

One thing that might help—they [interns] bit off a lot. Even though I got reports from previous projects, they were more like evaluations. I didn't have a guide regarding contacts, or what learning objectives should be . . . to see some examples of sample projects . . . that would help me for project design—that's critical, having clear objectives with milestones. (Faculty)

Finally, several faculty echoed the importance of building in time for the interns to see the completion of a project, and to analyze the results.

We didn't control the students' time to the extent that I do with grad students . . . given the lighter schedule [of EVOLUTIONS interns], we should have had a more formal introduction, and more importantly the wrap-up, explore hypotheses, discarded hypotheses, look at graphs, what does it mean? (Faculty)

Students need to have time at the end to get some answers. I don't want time to run out without analysis. (This part below?) (Faculty)

COLLEGE PREPARATORY ACTIVITIES

The college-focused activities within EVOLUTIONS were a major draw and benefit of the program, especially for sophomores and juniors. The college tours, SAT-prep sessions, and information on applying to colleges were all important to participants.

Students stressed the benefits of seeing various universities and learning how to assess them. They also developed a better understanding of the college admissions process.

It [college trip] was worthwhile. I'm looking into some of them [colleges he visited]. It was just interesting—I learned how to operate, what you have to do to get into schools. (EVOLUTIONS student)

We went on the college trip and when would we get to do that without EVO? We went and learned how to do things to get ready for college. (EVOLUTIONS student)

It [the college trip] definitely helped me. Since Jamie's been in the college prep stuff, and when the guidance counselors are talking to my class at school, I already know it all. (EVOLUTIONS student)

Yeah, definitely [college prep was helpful]. I've been to a lot of college trips, and it showed me what to look for and what they [colleges] look for; also financial aid. I went to a lecture about FAFSA, and applying for it and what to include, and that helped. (EVOLUTIONS student)

Even first- and second-year high school students said that the college preparatory information was useful, and important for their future.

They educate me more about college. We had a meeting about tuition and stuff like that. I didn't know how it worked, so I learned how I could get in [to college]. (EVOLUTIONS student)

The college preparation [I liked most]. I come on Tuesdays, so every time we go in there's an SAT question and you try to solve it, and he [Jamie] will go over it, and we had a career project to choose two majors [careers] and two colleges.
(EVOLUTIONS student)

TRANSFERABLE SKILLS

Over the course of the program, the project director has emphasized the importance of skill development for EVOLUTIONS students. The students all were able to identify skills they had developed or strengthened in the program. These skills included time management, collaborating with others/group work, learning responsibility and meeting deadlines, using computers and programs like Photoshop, and becoming more outgoing/interacting with many different types of people.

I've learned working with others, like with the exhibit. In a school project I always worked independent . . . learning to talk to others and come together.
(EVOLUTIONS student)

Communication—we learn to talk to people professionally over the phone, correct conversation because we had to interview somebody [for the career project]. Last year I was shy to get on the phone with people, but this year it was a little easier since Jamie told me how to present myself with other people.
(EVOLUTIONS student)

I definitely learned a lot of responsibility, time management, teamwork . . . and learning how to use the Macs, different software, Photoshop.
(EVOLUTIONS student)

Research skills—before I didn't know how to do research stuff; [now] I know how and what to put down.
(EVOLUTIONS student)

Those EVOLUTIONS students who had completed internships cited additional skills during their final presentations in June 2008, and in interviews.

I really liked it, worked with brachiopods, 275 million years old. I got to handle them and it was alive so long ago; cool you can still learn about it. I took rocks in HCL; sediments would dissolve and the fossils were left and we classified them . . . nobody else can say that they can identify brachiopods from the Permian era.
(EVOLUTIONS intern)

Two students worked to analyze sand from Cape Cod, in the area of biogeochemistry.

It was really cool, these things were all in the sand . . . when you're at the beach, you're swimming in bacteria . . . this internship has changed my life incredibly . . . it was a very important experience for me.
(EVOLUTIONS intern)

It reassured my dreams of becoming a research oncologist. I now know what working in a lab is like and what research is all about. (EVOLUTIONS intern)

Another intern described the reward of successfully finishing an experiment, after several false starts.

I didn't anticipate how rewarding it would be, to try an experiment over and over until you finally get it. You get a sense of accomplishment.

(EVOLUTIONS intern)

IMPACT ON LIFE OUTSIDE THE MUSEUM

Student Perceptions

Many EVOLUTIONS participants said that their experiences in the program had a positive impact on their in-school performance, particularly in science, and in enriching their lives overall. They cited the transferable skills mentioned above, their readiness for the college application process, and their social connections and friendships as benefits of the program.

In a positive way it helps me with chemistry. A lot, because science is my favorite [subject] and EVOLUTIONS does help me see stuff before my classmates saw it. Helped me be more advanced. The negative is I would say the [career] project because I have two projects I'm working on at school . . . so I'm busy.

(EVOLUTIONS student)

I suppose there's a connection [to school], different ways of learning things . . . not necessarily academic, but socially; allows you to be more outgoing, get involved in things, speaking up, confidence.

(EVOLUTIONS student)

I definitely became more outgoing and I think EVO helped because it gave me another place to be social.

(EVOLUTIONS student)

Several students commented on the positive influence of being around other EVOLUTIONS participants, and the benefits of being with motivated students.

I noticed that the people here are the ones that are going to college. They are motivated.

(EVOLUTIONS student)

In mid-June, program staff hosted an end-of-the-year celebration. The event coincided with the opening of an exhibit, developed by EVOLUTIONS students, on careers in the geosciences. In addition, other students developed instructional videos designed for elementary students, which focused on the topics culled from the Connecticut State Science Frameworks, including: Daily and seasonal weather conditions (Kindergarten); Properties of rocks and minerals (Grade 3); Earth materials and resources—and their value for all living things (Grade 3); Water and how it shapes the Earth's surface (Grade 4); Water carries the products of human activities (Grade 6).

Many parents, family members, and friends attended the event.

Parents' Reactions to EVOLUTIONS

Parents (and other family members) discussed the positive impact of EVOLUTIONS on their children. Many felt the program had influenced their children in positive ways, such as teaching them responsibility, developing good work habits, working in groups, fostering a sense of maturity, and improving their in-school performance.

I see he does a lot of research. He's not on the street . . . I like that he's able to call Jamie. He can come here instead of running the street and every year he gets school credits and he gets a lot of opportunities. (Parent)

She loved it . . . just being at the museum, behind the scenes, and last year she got an internship. That made her decide to go into science . . . She's more mature . . . this was her first work experience. She learned responsibility, project leadership and work ethic. Jamie has expectations; they have deadlines to meet. (Parent)

She loves it; the big deal was the video [project] . . . It's making her enjoy science more, she's always been interested . . . Some things they did in high school [science] she already did last year in the program. (Parent)

He loves it—Jamie, the program. He's learned teamwork, working on the project. He's maturing, learned responsibility. He's interning this summer to work here [at the museum]. (Parent)

All the parents attending supported their children's continued involvement in the program, and they were very aware of their child's activities in EVOLUTIONS. Many went as chaperones on the college trip, as discussed below.

I chaperone kids on the college trip. They're so mature and they learn a lot. Helps them choose a college from this trip. The trip was excellent—the best colleges. These kids have the ability to move forward, and parents going and being involved is a support to them. (Parent)

One parent cited numerous benefits of her daughter's participation in EVOLUTIONS, and cited a connection to her in-school work.

She's getting a lot out of it . . . she's more outgoing. She's made friends from different schools. She was having trouble in high school English. I called Jamie, he arranged for Yale students to tutor her. He's a teacher and a friend. She had some fear [about going to college]. She could talk to Jamie about it. (Parent)

Another parent, who attended the interns' presentations and luncheon, expressed her gratitude for her child's opportunity to be in the program.

PART 2: STAFF FEEDBACK: PROGRAM ADMINISTRATION/ORGANIZATION

Over the course of our annual evaluations, PERG evaluators have interviewed student assistants (Yale undergraduates) and program volunteers. The evaluators have also served as “critical friends” for the project director, particularly during the EVOLUTIONS program’s early years. In June of 2008, the evaluators spoke with two Yale undergraduates—one who had been involved in EVOLUTIONS for several years as an academic mentor, and another who was a first-year mentor.

Both mentors enjoyed working in the program and plan to continue next year. They said that EVOLUTIONS was working well overall, and that students benefited from the program.

I think new students get a better grasp of plans for the future and a greater sense of camaraderie. Some really need that, some are loners; they can get to know each other and grow as people. They get more science knowledge and the college trip is really helpful. [They] get a better grasp of what college life is like and that’s another thing we can do, we [Yale mentors] can answer questions they may have.
(Yale mentor)

The mentors commented on the excellent rapport/positive relationships developed between the project director and EVOLUTIONS students. The mentors said that they brought an additional piece to the project—giving students the opportunity to talk about the college admissions process and other concerns with people close to their own age, peers who had recently been through the process.

I think they got a lot out of it. We sort of help drive home a lot of the messages Jamie is trying to get across; they get to see a successful student who has gotten into a top college, and they see students who are exemplifying what Jamie is trying to tell them. I think it’s meaningful to them. They came to me with questions about college because I’d done it more recently.
(Yale mentor)

Jamie is very good about trying to speak to students on their level, but it’s not as easy for him because he’s farther removed. We’re closer to their age and they may talk to us on a more personal level; they may ask us questions they wouldn’t ask an adult.
(Yale mentor)

The mentors took on a number of roles within the program. For example, one mentor took on leadership of the newsletter committee, and they produced two newsletters during the project year. Another, who had worked in the program for three years, served as a substitute teacher when the project director was unavailable. However, both mentors felt they could have been used more effectively with some additional planning. They suggested having meetings and/or more regular communication, so that their duties could be clearly defined, and so they could take on more responsibility within the project.

Once in a while, he [project director] would send out an email about the next class, but as time went on he was too busy to do that . . . might have been helpful, but for me it was fine for Jamie to tell me that day. For some of the others [mentors], it might have been off-putting. I think we could have used a bit more organization on our part, in [project director] telling us ahead of time on a regular basis [what would be happening] and utilizing us more effectively. (Yale mentor)

I think it might be helpful to have a weekly meeting with Jamie and all the undergrads and the grad student. That might have helped Jamie and us, because I think Jamie felt a lot of burden in trying to—he had to spend a lot of time organizing activities outside the day-to-day program, like the big college trip; that took a lot of time. If we had meetings, we could have made more of a group effort instead of having Jamie do it all and then [having him] share it with us when he had a chance . . . it wasn't a huge problem—I could come in and find out what we'd be doing—but we might have gotten more out of it if we planned it more ahead of time. (Yale mentor)

The mentors also identified aspects of the program that worked well, and discussed how EVOLUTIONS positively affected the students—increasing their maturity levels, learning about the college admissions process, stimulating their interest in science, and developing friendships, among others.

I've been with many of the same kids for three years. Over that time, [I've seen] growth in maturity; they're more willing to explain things and help each other and a little more excited about the science portion of the program . . . It's a lot easier now to get them to quiet down and listen to Jamie, and what he's trying to teach them . . . the 'fun stories in Science'—they're much more likely to ask questions and talk about what's in the picture. (Yale mentor)

At times I was surprised how interested they [EVOLUTIONS students] were in science . . . In some ways, I expected them to be going through the motions, but I found the students to be really interested in new discoveries that have been made. Jamie spends a lot of time sharing that stuff and I think it really worked; a lot are really interested in that and the program does a good job of doing that [sharing information about science]. (Yale mentor)

Finally, the experienced mentor said that there was some repetition built into the program from year to year. This mentor believed that the project director's planned changes—making a career ladder for juniors and seniors—will improve the program and make it more engaging for those students.

I think the way Jamie is changing the program will improve the program—splitting it into a two-year program and then giving them real-world experience in the museum itself. (Yale mentor)

DISCUSSION AND RECOMMENDATIONS

DISCUSSION

EVOLUTIONS has successfully engaged a group of primarily low-income students in learning about science (and specifically the geosciences), preparing for college, and developing transferable skills. In addition, some EVOLUTIONS students have gained valuable work experience and increased their understanding of ‘doing science’ through their work in the Yale labs.

Over the past two years, the program has grown, and more than 80 students took part in EVOLUTIONS during fall 2007. While most completed the 2007–08 project year, there was some attrition among juniors and seniors, possibly due to their heavy academic schedules and commitments.

The development of a career ladder, as planned by the project director, should allow continuing EVOLUTIONS students to gain more experience in working at the Yale Peabody Museum, and to develop their communications skills and understanding of key science concepts. This new format should also allow the project director to do more strategic planning, and to give more responsibility to the Yale undergraduate mentors and returning EVOLUTIONS students.

However, in implementing the new program design, EVOLUTIONS staff need to consider the bonds developed by the project director with students in the program. Data show that the project director has a unique ability to forge connections with students in EVOLUTIONS and serve as a mentor, teacher and guide for those students. Therefore, the director must find a balance between trying to deliver the program himself and planning the program without being visible/active in EVOLUTIONS activities.

RECOMMENDATIONS

Based on a review of the data, PERG evaluators recommend the following:

- Develop the career ladder program, and use Yale undergraduates to help deliver the program and oversee classroom activities.
- Hold regular meetings and staff trainings so that Yale mentors are acclimated to the program and prepared to work within EVOLUTIONS.
- Hold an orientation for faculty and provide detailed examples of sample projects for student interns.

- While the project was generally successful in retaining most of the participants who began the program in fall 2007, we suggest that program staff interview students who do not complete the program during the 2008–09 year, to determine their reasons for leaving EVOLUTIONS.
- Consider adding a full- or part-time program assistant, to allow the project director to do more strategic planning, implement program goals, and maintain some direct contact with students.
- Consider expanding the internship to a full-year or twice-weekly format to enable students to explore research projects in greater depth.

CONCLUSION

EVOLUTIONS continues to engage students in exploring science, preparing for college, and readying themselves for life beyond high school. The evaluators believe that EVOLUTIONS and the Yale Peabody Museum will continue to benefit participating students, and provide them with additional opportunities through in-class activities, internships and the career-ladder program.

APPENDICES

Appendix A: First-Year Student Focus Group Protocol

Appendix B: Continuing Student Focus Group Protocol

**Appendix C: Yale Undergraduate/Student Assistant Interview
Protocol**

Appendix D: Intern Interview Protocol

APPENDIX A
FIRST-YEAR STUDENTS
FOCUS GROUP PROTOCOL
DECEMBER 2007

- 1) Overall, how has the program been going this year? Is it what you expected? Why or why not?
- 2) What have you liked most? Liked least?
- 3) What kind of people do science? Do you have a mental picture of those people? Has your picture changed since you started the program?
- 4) Could you imagine yourself working as a scientist? Why or why not?
- 5) Some of this year's program focuses on the geosciences. What does that mean to you? Have you learned anything new about this field?
- 6) What kind of work do you think you'd like to do?
- 7) I know Jamie talks about skills. Please tell me about skills you've used or developed in the program.
- 8) Are you planning on going to college? Do you think Evo will help you with that process? If so, how?
- 9) How would you describe the program to a friend?
- 10) Has the program had any effect on how you're doing in school?
- 11) Do you think Evolutions will have an effect on what you do in the future? If so, how?
- 12) Is there anything else you want to tell me?

APPENDIX B
CONTINUING STUDENTS
FOCUS GROUP PROTOCOL
DECEMBER 2007

- 1) Overall, how has the program been going this year? How does it compare to last year/previous years?
- 2) Do you have an interest in working as a scientist? Why or why not?
- 3) What careers are you thinking about for the future?
- 4) Has your opinion changed since you came into Evolutions?
- 5) This year the focus of the program is on Geosciences. What does that mean to you? How does this focus compare to previous years?
- 6) Are you planning to go to college? How has Evolutions helped you prepare?
- 7) Has Evo had any effect on how you're doing in school, or your attitude about school?
- 8) What are you most interested in/looking forward to this year?
- 9) Have you developed any new skills through Evolutions? Please describe them:
- 10) What has kept you involved in the program? How would you describe it to a friend?
- 11) Based on your experience in the program, is there anything you'd like to change?
- 12) Is there anything else you'd like to tell me?

APPENDIX C
YALE UNDERGRADUATE/STUDENT ASSISTANTS
INTERVIEW PROTOCOL
MAY 2008

- 1) Please tell me a bit about your role within the project.
Probe: Did you know what to do? How was communication with Jamie?
- 2) What do you think students gained from their experiences in EVOLUTIONS?
- 3) What do you think the program is really about? (Goals of the program)
- 3) What did they gain from working with you and the other college students?
- 4) What, if any, changes have you observed among the students since the beginning of the school year?
- 5) Do you see any evidence of increased interest in science or science-related careers?
- 6) What went particularly well from your point of view?
- 7) What didn't go so well?
- 8) Do you have any suggestions/ideas to improve the program?
- 9) What, if anything, did you learn from working in EVOLUTIONS?
- 10) Is there anything else you want to tell me?

APPENDIX D
INTERNS
INTERVIEW PROTOCOL
DECEMBER 2007

- 1) How have things been going with your internship overall? What are your responsibilities?
- 2) What do you like most? Least?
- 3) What, if anything, have you learned from doing the internship?
 - a. What skills have you developed?
 - b. Specifically, what have you learned about 'doing science'? (Is it different than what you thought it would be? Were you at all worried about your ability to do science before the internship? How comfortable are you now in your abilities to do real science?)
 - c. What have you learned about what it means to 'be a scientist'? (How has this experience changed the way you view scientists? Do you think you could be a scientist (apart from interest)?)
- 4) Are you any more interested in science than you were before you started the internship?
- 5) Has your internship affected your plans for college and what you plan to study?
- 6) How does it feel to work with a Yale professor/researcher? When your internship is complete, do you think you will try to keep in touch with him/her? Why or why not?
- 7) Do you think your internship has affected your performance in high school? Why or why not?