CSI@LSI Publications

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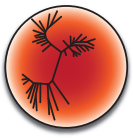
 DOI: 10.1128/jmbe.v11i2.194

Tips and Tools



The Use of Popular Fiction to Present a Professional Scientific Career to High School Students†

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INTRODUCTION

Students finishing high school have a daunting task of deciding on a successful and rewarding career. An absence of information and experience, exposure to multiple career possibilities, lack of mentoring, and the social pressures to choose a respectable career complicate the decision process. In a previous Tips & Tools article, Patricia J. Baynham advocated for the introduction of science to students by hosting scientists in classrooms (1). We approached the issue from a different perspective. Since the ability of scientists to demonstrate science could be hampered with limited time and classroom resources, we proposed to introduce students to a professional and active scientific environment for a one-day outreach program. Our goal was to give students hands-on training, mentorship, career information, and an opportunity to ask questions to facilitate a possible career choice in research.

Briefly, the "CSI at the LSI" outreach program (LSI, Life Sciences Institute), based on the popular fiction "Crime Scene Investigation" (CSI) TV show, was a murder mystery involving a plot with real characters (grad students, postdocs, and professors) to generate a fun and interactive learning environment. The students carried out experiments using modern scientific techniques to collect "evidence." At the end of the day, they share the results to identify the suspect. Most of the activities were designed with basic scientific resources so that they are suitable to be performed in other research institutes or universities.

PROCEDURE

The educational student manual given to the teachers, students, and volunteers is included as supplementary information.

Prior to the event, a call for applications from high school teachers was made through the local school board. Applications were evaluated based on merit, and a class of thirty students was selected. On the day of the event, students were introduced to the safety procedures for the institute, and given a schedule of the day. After this, the storyline and suspects were presented in an entertaining fashion. To promote interactions among the students, they were encouraged to introduce themselves to the group. In addition, folders of four different colors were randomly distributed. Those students with the same color folder were grouped together.

The schedule was divided in two main blocks. For the first two-hour block, each group of students attended only one of the four hands-on workshops. The hands-on workshops covered: (i) DNA analysis techniques, (ii) protein analysis techniques, (iii) classic microbiology procedures, and (iv) fluorescence imaging techniques. Two graduate students or postdocs were in charge of every module to allow a ratio of three to four students per instructor. For the second block, students were divided into two groups and given a tour of the electron microscopy and mass spectroscopy facilities. Here, the students were introduced to the equipment and to the potential uses of the technology.

After the completion of the two blocks, students were reassembled and one representative from each group was asked to present the techniques they had been taught. Each group had limited information on the "case." By combining the "evidence" collected in every module, they could eliminate suspects to identify the "murderer." For authenticity and entertainment, the real suspect was in the room at the time the students solved the case. To add to the drama, a security guard came into the room to arrest the suspect. Finally, at the end of the day, a brief anonymous questionnaire was distributed to students and teachers to provide feedback for subsequent years.

CONCLUSION

The general public is often curious to know how their tax dollars and donations support scientific research. However, research institutes around the country are often isolated from the community with little public access. Because of this, there is often a social disconnection between scientist and the general public. This creates a lack of appreciation for sustainable basic research that is needed to lay the foundation for new discoveries to benefit our society. As scientists we have a unique opportunity and obligation to promote, mentor and introduce science to future generations. In addition, outreach programs allow universities and research institutes to promote themselves and give back to the community through education.

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† Supplemental material available at http://jmbe.asm.org

Appendix 1 (continued): Durand, C. and S. Ramon-Garcia. (2010). "The use of popular fiction to present a professional scientific career to high school students". Journal of Microbiology & Biology Education 11:1-2

Although high schools play a fundamental role in educating students, they often lack facilities and highly trained scientific personnel. The outreach program that has taken place for the past three years in the LSI at the University of British Columbia allows some of these challenges to be addressed, and provides students with insight to the scientific process.

We took advantage of the extensive diversity of the LSI facilities and research groups to create hands-on workshops in the fields of molecular biology, microbiology, chemistry, and biochemistry. This all-day interactive outreach program allows student from grades 11 and 12 to observe and work in an active scientific environment. The activity provides students a chance to network with local researchers, grad students and postdocs, and to ask questions about different career paths in science. The modules are designed to introduce basic scientific techniques to the student in an entertaining and interactive way, allowing them to explore science while being mentored by senior graduate students and postdoctoral fellows. At the same time, the outreach program encourages students to have fun with an elaborate story line, real suspects, and social time. Finally, by asking the students to present their results as evidence to the entire group, this activity promotes communication and team-building skills.

In summary, the activities presented here could easily be implemented in any scientific institution. With the first block addressing basic scientific concepts any research center should be able to host the event. In addition, the modules can be adapted or changed to best fit the institution facilities. Our experiences organizing and hosting such an event were highly rewarding. Similarly, the students enjoyed their time in the lab and it gave them the opportunity to network with scientists.

SUPPLEMENTARY MATERIALS

Student Manual for the "CSI at the LSI" Outreach Program.

ACKNOWLEDGMENTS

We are grateful to the members of the Life Sciences Institute Graduate Student Association (LSI-GSA), who spearheaded this initiative, and the University of British Columbia Post Doctoral Association (UBC-PDA) for actively contributing to this successful event over the past three years. We want to especially acknowledge the original members of the LSI-GSA – Sarah Cohen, Meaghan Jones, Stephanie Mancini, Jenna Riffell, Amanda Starr, and Kathryn Westendorf. We would also like to thank Dr. Charles Thompson, Dr. Michael Gold, Dr. Linda Matsuuchi, Dr. Calvin Roskelley, Dr. Chris Overall, and Dr. Christian Naus who kindly supported this event by providing lab resources and equipment. Garnet Marten organized the tour and training at the UBC BioImaging Facility. We would also like to thank the LSI-GSA faculty representatives Dr. Shernaz Bamji and Dr. Jane Roskams for their support. Finally, the LSI-GSA would also like to acknowledge the LSI Associate Director Dr. Linda Matsuuchi and LSI Director Dr. Christian Naus for providing support and funds for this event. Funds were provided by the UBC Life Sciences Institute and the UBC Faculty of Science.

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Appendix 2: UBC Community Engagement "UBC Graduate Students Put a Criminal Spin on Life Science Outreach". February 2011.

UBC Graduate Students Put a Criminal Spin on Life Science Outreach

High school students use science to determine "whodunnit".

This article was first published by the Faculty of Science.

A researcher is found dead hunched over her lab bench, and seven suspects are in custody. Now it's up to 30 high school students to determine who killed her.

That's the premise for an innovative science outreach program hosted by the Graduate Student Association (GSA) at UBC's Life Sciences Institute (LSI). The one-day, hands-on lab is aimed at grade ten, eleven and twelve students in the hopes of sparking their interest in science as a career.

As a UBC graduate student Caylib Durand, along with post-doctoral fellow Santiago Ramon-Garcia and the first Executive Committee of the LSI-GSA, saw an opportunity to invite students to participate in a fun and interesting event that would afford them an inside look at a professional and active scientific environment.

Now in its third year, the outreach event was initially designed as part of Celebrate Research, a week-long UBC event that highlights key areas of research taking place on campus.

"There is so much incredible research happening at the Life Sciences Institute, but there's limited public access," says Durand. "We felt we had a unique opportunity to give back to the community through education."

"Our goal was to give students hands-on training, mentorship, and an opportunity to experience and ask questions about research as a possible career choice."

Durand, Santiago and fellow graduate students based the lab on the popular Crime Scene Investigation (CSI) television show, dubbing it "CSI at the LSI". They scripted their own murder mystery, providing students with a list of suspects complete with mug shots, motives, and analysis of prepared evidence samples of blood, saliva, hair and skin.

"We wanted to introduce students to basic science techniques in an entertaining and interactive way," says Santiago. "We came up with a pretty elaborate story line, but it allows students to have fun with it."

The program's methodology was published in the December issue of the Journal of Microbiology and Biology Education's Tips and Tools segment.

The latest class of crime busters to tour the facility, made up of grade ten and eleven students from Eric Hamber Secondary School in Vancouver, was given an orientation on the Institute's safety procedures. Graduate students and post-docs then set the scene: a female graduate student has been

Appendix 2 (continued): UBC Community Engagement "UBC Graduate Students Put a Criminal Spin on Life Science Outreach". February 2011.

found dead at her bench, and the students must use basic scientific techniques to test evidence collected from the scene and find her killer.

The students were broken up into four groups and assigned a workshop where one of four samples was evaluated, using DNA analysis, protein analysis, fluorescence imaging techniques, or classical microbiology procedures. They were also given tours of the mass spectroscopy and electron microscopy facilities.

After completing their workshop module, students reconvened to share their results and use deductive reasoning to rule out suspects one-by-one.

"We wanted all of the students to get the chance to participate in the experiments," says Santiago. "It's great to see them collaborate and share what they've learned."

"At the end of the day, the students gather to use the results from the workshops to determine the killer. We bring the killer into the lab, and when the students make their announcement, a security guard comes and takes them away. It's a really fun way to get students interested in science."

Students and teacher take home worksheets and a memory stick of materials, so they're able to revisit and build on what they've learned during their time in the various work-shop labs.

Durand and Ramon-Garcia say that the program is just as popular with the grad students and post-docs as it is with its high school participants.

"When we started this program three years ago, we had no idea it would take off like it has," says Durand. "Now we wish we could invite more students or host more events."

"It's a rewarding experience. Maybe more rewarding for us than it is for them!"

View the paper in the Journal of Microbiology and Biology Education
The Use of Popular Fiction to Present a Professional Scientific Career to High School Students

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Appendix 3: UBC Public Affairs "High School Students Solve UBC Murder Mystery". April 2011.

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UBC News

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High school students solve UBC murder mystery

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April 6, 2011 - by By Ashley Turk

A researcher is found dead hunched over her lab bench, and seven suspects are in custody. Now it's up to 30 high school students to determine who killed her.

That's the premise for "CSI at the LSI," a murder mystery-based science outreach program for high school students. The program, designed to get students interested in science as a career, is hosted by UBC's Life Sciences Institute (LSI).

Students from Grade 10-12 are invited to the LSI, where graduate students and post-docs set the scene: a female graduate student has been found dead at her bench, and the students must use basic scientific techniques to test evidence collected from the scene and find her killer.

A workbook provides additional background, and includes mug shots and possible motives for each suspect. The workbook also contains methodology for the experiments the students will be performing, along with prepared samples of blood, skin, hair, and saliva.

Students are broken up into groups and assigned one of four samples, which they evaluate using DNA analysis, protein analysis, fluorescence imaging techniques, or classical microbiology procedures.

After completing their workshops, students are asked to reconvene to share their results and use deductive reasoning to rule out suspects one-by-one.

"It was a lot more interesting than I thought it would be," one student from Eric Hamber Senior Secondary said in his post-workshop feedback. "It was cool to see how the electron microscope worked."

"Everyone was really helpful," said another. "We learned how to use a pipette and how bacterial cultures are grown. It was great to do the experiments ourselves in a real lab."

"These students are a motivated bunch," says their teacher Brenda Dowle, head of the science department at Eric Hamber. "Still, being part of CSI at the LSI was a real eye-opener.

"I could see the passion and excitement in their eyes while they were doing the workshops."

Initially designed as part of Celebrate Research – UBC's week-long celebration of research and its impact on the society – the program has been popular with students, teachers and now has received attention from academia and government funders.

The program's methodology was published in the December 2010 issue of the Journal of Microbiology and Biology Education and was recently awarded $14,500 from Year of Science, a Province of B.C. initiative that encourages youth to explore the world of science.

The grant will allow LSI to host an extended, two-day version of the program for schools outside the greater Vancouver area and cover the cost of meals, transportation and overnight accommodation for students, teachers, and chaperones, as well as an expanded number of hands-on activities.

The expanded program will also build in more time for students to spend with graduate students and post-doctoral fellows, as well as a panel session with members of the LSI who will share their educational experiences.

"At the end of the day, the students gather to use the results from the workshops to determine the killer," says Santiago Ramon-Garcia, co-creator of the program. "It's great to see them collaborate and share what they've learned."

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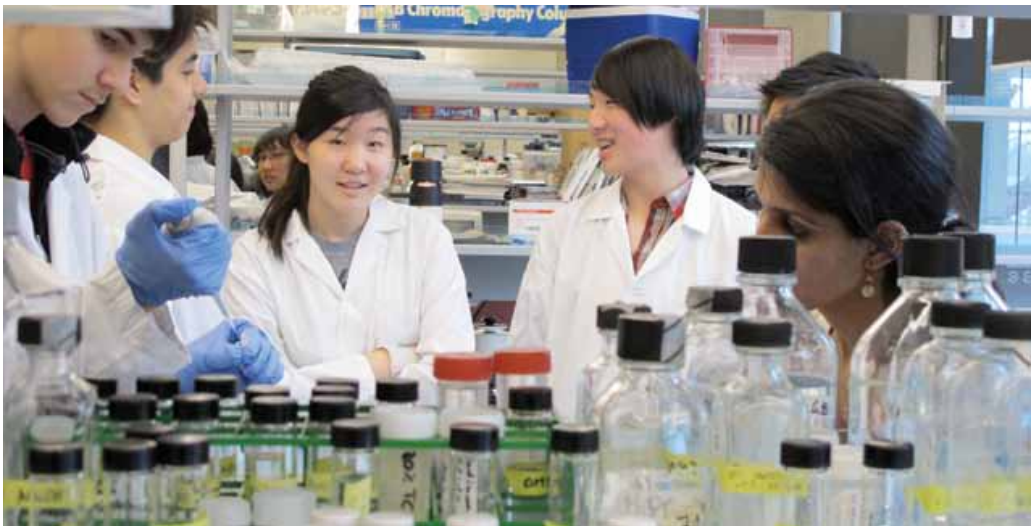
Appendix 4: UBC Synergy "Adding a Criminal Element to Science Outreach". July 2011.



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Appendix 4 (continued): UBC Synergy "Adding a Criminal Element to Science Outreach". July 2011.

Students from Eric Hamber Senior Secondary take a stab at DNA analysis, fluorescence imaging and classic microbiology procedures at UBC's Life Sciences Institute.

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See more photos from the last iteration of UBC's Life Sciences Institute CSI at the LSI program. **science.ubc.ca/synergy**

Appendix 5: UBC in Your Community – North Coast Haida Gwaii. September 2011.

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UBC in Your Community

North Coast – Haida Gwaii Issue **2** 2011

People

As of Sept. 2011	NEW UNDERGRADS	TOTAL UNDERGRADS	TOTAL GRAD STUDENTS	TOTAL STUDENTS
Vancouver Campus	5,913	37,551	10,230	47,781
Okanagan Campus	2,049	7,191	710	7,901

Students

UBC students come from all over British Columbia and the world, bringing their unique perspectives and experiences to our Vancouver and Okanagan campuses. By connecting with each other and exploring different settings, relationships, and challenges, UBC students learn, grow, and engage. UBC students are talented and passionate and the University is commited to supporting students as they develop their skills, in whatever field they choose: students like **Jennifer Wolowic**, a fourth-year PhD Candidate from San Francisco, who is exploring the extensive social networks and technologies that connect people in Prince Rupert and the surrounding region. Jennifer came to UBC following social science research funding opportunities as a Masters student and stayed for her PhD work because of the university's commitment to cutting edge and responsible community-based research.

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Community Connections

UBC supports numerous local outreach programs and research projects in a wide range of areas including public health, sustainable development, legal aid and education.

CSI@LSI

In May, nineteen grade 10 students from the Bella Bella Community School were chosen to participate in UBC's Life Sciences Institute-Graduate Student Association Crime Scene Investigation (CSI@LSI) program. The Bella Bella School was selected from amongst 13 applicants and their trip to UBC was jointly funded by the Year of Science, the Vancouver Foundation, the Windsor Plywood Foundation and the Life Sciences Institute. The visiting students spent a day eliminating suspects by analyzing crime scene data through six scientific modules. The CSI@LSI program was designed by the UBC LSI-Graduate Students Association and the UBC Postdoc Association. The program allows high school students to explore science while interacting with UBC undergraduates, graduate students, postdoctoral fellows, faculty and staff. The students from Bella Bella spent two days at UBC, participating in the CSI program, and touring the Museum of Anthropology and the First Nations Longhouse.