

**Mini-Grant to Support the Scholarship of Teaching and Learning
at Evergreen**

**Conducting a “Career Week” for chemistry students in the
“Atoms, Molecules and Research” Program**

Submitted by
Dr. Dharshi Bopegedera

Name of grantee: Dr. Dharshi Bopegedera

Title of current program(s) or course(s): Atoms, Molecules and Research

Title of Grant/Grant Inquiry Area: **Conducting a “Career Week” for chemistry students in the “Atoms, Molecules and Research” Program**

Project Purpose: It is my belief that providing career counseling to students and directing them towards careers in which they can succeed is an integral part of our teaching. To accomplish this goal, I conducted a week-long workshop titled “Career Week” in my year-long, chemistry program titled Atoms, Molecules and Research.

Description of Project:

1. In the context of a particular program or course, of all the things students might learn, what matters most to you and why? –

What matters to me most in the Atoms, Molecules and Research program is that students recognize the connection between the concepts they are learning in the classroom and how those concepts are used by chemists in the workplace. I want my students to visualize themselves as future chemists when they will be applying the knowledge they are acquiring in the classroom.

It is important to me because I strongly believe that students learn better and with more enthusiasm when they recognize that what they are learning is not “book knowledge” but rather, what they need to know in order to be effective chemists. Students are willing to put the effort into learning when they understand that they will be putting that learning into practice in the not so distant future.

2. What are you doing to promote that learning (e.g. the design of assignments, curricular materials, projects, activities, or learning environments)?

In all activities of the program (i.e. lectures, labs, workshops and research projects), I discuss with students the real life applications of the concepts they are learning and how chemists use these concepts in the workplace. This leads naturally to a discussion of career options for chemistry graduates with B.S., M.S. and Ph. D. degrees.

In order to educate students about career choices available to chemistry graduates, I have designed a week-long workshop titled “Career Week”. This activity is conducted during the middle of the fall quarter in order to provide ample time for students to make decisions regarding graduate schools, summer research fellowships, academic scholarships, and other career options. During this week, all other program activities are cancelled so students and I can focus our efforts on “Career Week”.

I recently wrote and submitted an article about “Career Week” to the Journal of Chemical Education with the goal of sharing my experiences with the international community of chemistry educators. This article has been accepted for publication in the Journal of Chemical Education. A copy of this article is attached (“Conducting a “Career Week” for Chemistry Majors”, A. M. R. P. Bopegedera, Accepted for publication by the Journal of Chemical Education). A detailed description of “Career Week” activities is provided in the [Supplementary Materials](#) section of this article on page 1.

3. What evidence do you have about the effectiveness of these practices? Or, if you are implementing new practices, how will you determine the effectiveness of these practices?

Before the introduction of “Career Week”, our college graduated on average about 5 chemistry majors per year with about one student per year pursuing graduate studies in chemistry. “Career Week” was introduced in the senior chemistry curriculum for the first time in 1992, when I taught the “Atoms, Molecules and Research” program for the first time. Since then, we graduate about 15-20 chemistry majors per year. Data pertaining to the placement of these graduates during five separate academic years is given in Table 1 (page 4) of the article submitted to the Journal of Chemical Education and is provided

below. This data shows that “Career Week” has significantly improved our students’ ability to make career choices.

Placement of chemistry graduates during five separate academic years since the introduction of Career Week

Placement	Year 1	Year 2	Year 3	Year 4	Year 5[#]
Admission to graduate school in chemistry ⁺⁺	40%	62%	44%	50%	21%
Chemistry related employment	30%	0%	33%	6%	0%
Other*	30%	38%	22%	44%	79%

[#] Of this group, 57% are still undergraduates and are included in the “Other” category.

* Students admitted to professional schools (including health fields), graduate school but not in chemistry, employment not related to chemistry, and students who are still undergraduates (for year 5 only) are included in the category.

⁺⁺ The national average for students gaining admission to graduate school in chemistry is about 47%.

Note: When reliable information was available for a given student, he/she was placed in the “Other” category.

In addition, I have compiled a list of student comments about “Career Week”. These were **unsolicited** comments, extracted from student evaluations at the end of their academic year.

Comments from AMR graduates about Career Week

Matthew Church (92/93)	The “life in graduate school” section was a fascinating and informative survey of what to expect in the world of graduate studies in chemistry.
Jon Ewen (92/93)	Career Week added to my educational experience. The guest speakers from industry and graduate schools had a lot of useful information for me.
John Gabriel (92/93)	Career Week played a significant role to help me make the decision to enter a doctoral program in chemistry next year.
Linnea Heraty (92/93)	The Career Week, which was extremely helpful, was obviously designed with the student’s interest at heart.
Greg Kaufmann (92/93)	Career Week took away the mystery of Graduate School by providing us with the information needed to make an educated decision. This is important because graduate school is a major commitment.
Jason Parker (92/93)	Career Week provided me with a stack of resources concerning graduate schools and career opportunities in chemistry.
Alice Pichahchy (92/93)	Career Week was instrumental in helping me learn about graduate schools, employment in the chemical field as well as summer internships and research fellowships
Lisa Soltani (92/93)	The useful information I obtained on how to write a good resume will be helpful to me in the future
Dayle Anderson (94/95)	Career week was a valuable resource for information about gradate schools (how to select a school, how to apply, how many to apply to etc.)
Keneth Fagan (94/95)	Career Week provided valuable insights into the realities of being a chemist in industry, academia and government.
Tyler Bafus (96/97)	Career Week helped me learn a great deal about graduate schools and how I can finance my further education
Lisa Mcelroy (99/00)	Career Week was a great opportunity to see what possibilities are there for people with chemistry degrees.
Michael Swirsky (99/00)	I truly benefited from learning about the career options before it was time for graduation.
Charles Hulet (99/00)	Job announcements, scholarships, internships, and graduate school information was invaluable.
Diane Pawluk (99/00)	I was delighted to have the opportunity to understand what I could do beyond undergraduate school.
Nels Olson (01/02)	The Career Week, designed to help the class learn about graduate schools and employment in chemical industry, was one of the most beneficial resources I had in assisting me to clearly outline how to progress toward my future goal of attending medical school.
Keiko Munechika (01/02)	Career Week was an excellent learning opportunity for me. I was able to focus on my future after Evergreen and learned how to reach my goals.
Jacob Glaspy (03/04)	Timely emphasis on careers and graduate school during “Career Week” helped me to better understand my post Evergreen options. I hope this activity is continued for the benefit of students in future AMR programs.
Donna LaGarde (03/04)	I found the session addressing questions concerning graduate schools to be a great benefit.
Kathryn Monroe (03/04)	I benefited from “Career Week” and think that preparing for the future is a crucial part of being a student.
Renee Quenneville (03/04)	Being advised on upcoming life decisions during “Career Week” was important to me since I am a first generation college student and cannot get such advice from my family.

A summary of these comments is also provided in the [Supplementary Materials](#) (page 5) of the article submitted to the Journal of Chemical Education.

4. How does this area of inquiry connect with one or more of Evergreen's priorities as articulated in the Five Foci or Expectations of an Evergreen Graduate?

- Personal engagement with learning – “Career Week” empowers students to think ahead and plan their careers instead of passively waiting for a job to come their way. It shows students that they are in control of their future. The result is that a higher percentage of students are successful in meeting their career goals.
- Linking theory and practice – “What do chemists do?” is the theme of the Atoms, Molecules and Research program. “Career Week” is a great way for students to learn first hand about what chemists do in different working environments from chemists working in academia, industry, state government, and schools. This gives students a broad understanding of what they could be doing in the future.
- Articulate and assume responsibility for your own education – In response to “Career Week” students assume responsibility for their own learning by finding out information about graduate schools, summer research opportunities, job opportunities, national fellowships and scholarships. Every year, students in the Atoms, Molecules and Research program have been very successful in getting admission to graduate schools, highly competitive and federally funded summer research positions, jobs, and academic scholarships. This clearly shows that students are taking responsibility for their own education beyond the classroom.
- Participate collaboratively and responsibly in our diverse society & the ability to communicate effectively – Students learn first hand during “Career Week” that a chemist's workplace is multinational and multicultural because I make sure that the presenters invited to “Career Week” represent the international face of chemistry. Women chemists are often invited so that students can learn from their experiences.

The fact that “Career Week” has made a significant impact on my students was brought home to me this fall (2004 fall quarter) when my former students asked me if I would consider doing a “Career Day” (instead of “Career Week”) activity this year, an year when the Atoms, Molecules and Research program is not being offered. The students in the Evergreen Chemistry Club wanted to sponsor the “Career Day” activity for the benefit of science students who have not had the opportunity to take the Atoms, Molecules and Research program. At their invitation, I conducted “Career Day” and was able to connect with many Evergreen science students I had not met before. I was delighted that the initiative came from my former students, indicating that they have fully understood the benefits of “Career Week”.

The Evergreen Chemistry Club was initiated by students in the Atoms, Molecules and Research program as a way to communicate the importance of science (chemistry in particular) to their fellow students and to encourage more Evergreen students to study science. I am proud to say that many of the office bearers of the Evergreen Chemistry Club have been my students. These students have sponsored a “Women in Science” activity, conducted science labs in local schools and public libraries, participated in local and national chemistry meetings & symposia, hosted the Evergreen Science Carnival, conducted a fund raiser for the Asian Tsunami Relief, hosted many scientific presentations on campus, and have been catalysts for promoting science in our community.

**The Article Accepted for Publication by
The Journal of Chemical Education**

Conducting a “Career Week” for Chemistry Majors

by

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Title of Manuscript: Conducting a “Career Week” for Chemistry Majors

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Abstract:

This paper describes the author’s experience of conducting a “Career Week” within the chemistry curriculum, with the goal of providing undergraduates information on career options in chemistry. The article is written on the premise that active recruitment of students into chemistry careers is vital if the U.S. is to remain at the forefront of science. The impact of Career Week on students has been assessed by student responses to this activity and by the number of students who pursued careers in chemistry upon graduation.

Key words: Graduate Education/research, outreach, advanced chemistry, careers in chemistry

Conducting a “Career Week” for Chemistry Majors

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In a recent *Journal* editorial titled “Something Might be Gaining On Us” John W. Moore wrote “In every year from 1989 through 1999 the total number of doctoral degrees in science and engineering granted in Britain, Germany, and France exceeded the number in the U.S., and in 1998 the number granted in Asia equaled that in the U.S. About 400 companies have recently set up research institutes in China, not only because it costs less, but also because excellent science is being done there” (1). This editorial was largely in response to a New York Times article on “U.S. is Losing its Dominance in the Sciences” (2). These two articles forewarn us that if we are to keep our edge in the scientific enterprise we have the responsibility of educating our students in the mathematics, science and engineering.

We clearly have much work to do to prevent the possibility of “losing our dominance in the sciences.” To keep our edge, we must actively recruit future chemists by taking advantage of the captive audience in our classrooms. Our task is at least two-fold. First we must reduce the attrition of students from the freshman chemistry level to the senior chemistry level, thereby producing a larger percentage of science graduates who have studied chemistry. Second, we must ensure that our chemistry majors are advised and directed towards careers in chemistry.

In this paper I wish to discuss a step I have taken to address the second issue at The Evergreen State College by conducting “Career Week” during the middle of the fall quarter, nested within our senior chemistry curriculum. During this week, all chemistry lectures for junior and senior students are replaced with Career Week activities and student participation is mandatory. Conducting this activity during the middle of the fall quarter provides sufficient lead-time for students to complete graduate school applications, summer research applications, to take the GRE exams, to write resumes, and cover letters for job applications. On average about 25 students participate in this activity in a given year. Career Week activities include:

- Discussion of the career options for chemistry graduates with B.S., M.S., and Ph.D. degrees
- Explanation of the application process to graduate schools
- Introducing the college “Career Development Center”, their staff, and services

- Introducing students to useful resources such as the ACS Directory of Graduate Research (3), web sites that list graduate programs and research opportunities in chemistry [such as (4)], the ACS job site (5)
- Discussion of the Graduate Record Examination (6) and how to be successful at it
- Presentations by chemists from graduate schools, industry and state agencies with a variety of educational/employment backgrounds

A detailed description of the Career Week Activities is provided in the supplementary material in *JCE Online*.

Although many chemistry departments conduct activities to encourage students into careers in chemistry, I believe that the way we present Career Week is unique in the following ways and hence more effective.

- It is part of the junior/senior chemistry curriculum and not a stand-alone activity.
- Chemistry majors are **required** to attend so that the attendees are not a select few who are already interested in careers in chemistry. Many students choose careers in chemistry as a result of their participation in Career Week.
- This is not a passive activity where students listen to presentations. Instead, students are actively engaged and are encouraged, instructed, and supported to respond by completing graduate school applications, doing job searches, writing resumes, and preparing for the GRE.
- Students are provided with opportunities to mingle with the presenters (over lunch or coffee) so that they can ask questions from presenters in an informal setting.
- Career Week is the beginning of a process that continues throughout the academic year. There is follow-up and support from faculty after the event so that students are not left to their own devices to find their career paths.
- Career Development Center of the college is integrated into this event so that students establish a relationship with its staff and are more likely to use the facility.

The impact of Career Week on our chemistry graduates has been remarkable. Before the introduction of Career Week, our college graduated on average about 5 chemistry majors per year with about one student pursuing graduate studies in chemistry. In 1992, we revamped our junior/senior chemistry curriculum and included Career Week as part of the new curriculum. Since then, we graduate about 15-20 chemistry majors per year. Data pertaining to the placement of these graduates during five separate academic years is given in Table 1.

Table 1: Placement of chemistry graduates during five separate academic years since the introduction of Career Week

Placement	Year 1	Year 2	Year 3	Year 4	Year 5 [#]
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[#] Of this group, 57% are still undergraduates and are included in the “Other” category.

* Students admitted to professional schools (including health fields), graduate school but not in chemistry, employment not related to chemistry, and students who are still undergraduates (for year 5 only) are included in the category.

⁺⁺ The national average for students gaining admission to graduate school in chemistry is about 47% (7).

Note: When reliable information was available for a given student, he/she was placed in the “Other” category.

Students’ response to Career Week has been consistently positive. Without actively soliciting, all students wrote engagingly about the impact of Career Week in their end of the year evaluations. Some of these comments are provided in the supplementary material in *JCE Online*. Without exception every student stated that their participation in Career Week was a valuable experience that helped shape their futures.

The vitality of our profession depends on our ability to recruit students into careers in chemistry. My experience with conducting Career Week showed me that by playing an active role in recruiting future chemists, we have a chance at preventing “losing our dominance in the sciences.”

Note: For a description of our academic setting and other science programs at The Evergreen State College, please see references 8-10.

Acknowledgments

I am grateful to the director of the Career Development Center, Wendy Freeman, for her enthusiasm and support.

Many chemists volunteered their time to talk about their work, career goals, and answer students' questions. Many graduate schools sent representative at their cost to The Evergreen State College for Career Week. I am in debt to these wonderful individuals, without whom Career Week would not have been possible.

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Supplementary Materials

to the paper

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by

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A Detailed Description of Career Week Activities

A typical Career Week schedule a short description of each activity is provided below.

A typical Career Week schedule

Monday	Tuesday	Wednesday	Thursday	Friday
“Introduction to Career Week”	Research and recruiting talk by a chemist from graduate school 1	Research and recruiting talk by a chemist from graduate school 2	“Chemistry in the state government” by a chemist from a Washington State Government Agency	Panel Discussion on “Careers In Chemistry”
“All about graduate school”	Student lunch with the speaker	Student lunch with the speaker	Student lunch with the speaker	Student lunch with panelists
“Introduction to the Career Development Center” Presented by Director of the Career Development Center	“Chemistry in industry” by a chemist from a local industry			
	Coffee with the speaker			

“Introduction to Career Week” – This is an overview session designed to help layout the schedule for the week.

Students are encouraged to ask questions about career concerns. Many of these questions are answered but some are deferred until later in the week for appropriate sessions. I provide students information on career options for chemistry

graduates. Students learn about the needed skills to succeed in these careers. Since some students are juniors, I also discuss the value of summer research or working in chemical industry and state government labs during the summer.

“All about graduate school – This session is dedicated to exploring life in graduate school because a high percentage of junior and senior chemistry students are interested in graduate school. Many students learn for the first time (to their relief) that chemistry departments provide stipends for their graduate students, including tuition waivers. Even some good students eliminate graduate school as an option simply because they do not wish to take out more student loans. For these students a new door opens when they learn that they can fund their graduate studies without further deterioration of their (or their parents’) financial resources. Some students have concerns about their ability to support a family and be successful in graduate school while caring for children. I answer their questions honestly, often pointing to specific examples of others who have succeeded despite similar concerns. Whenever possible, I connect students (by phone or email) with former chemistry graduates from our college who have gone through similar experiences. This is an effective way to empower current students to pursue their career goals while providing former students with mentoring opportunities. I also invite former chemistry graduates to speak with current students during this session. Testimony of past students is a powerful tool in helping students see that some of “their own” have succeeded in fulfilling their career goals.

I introduce students to the ACS Directory of Graduate Research, web sites that list graduate programs in chemistry, the ACS job site, the Graduate Record Examinations, the application process to graduate schools and the materials they need to submit, what to expect during the first year in graduate school, what to consider when selecting a graduate program and a thesis advisor, job prospects with a B.S., M.S., or Ph. D. degree in chemistry, and what qualities and skills are necessary to be successful in graduate school.

“Introduction to the Career Development Center” – Students are introduced to the director of the college Career Development Center. She provides a tour of the center and introduces students to her staff. Students learn about the resources provided by the Career Center such as practice GRE testing sessions, job postings, career counseling, access to the ACS Directory of Graduate Research, resume writing workshops, and a multitude of other services. Students are

more likely to use the Career Development Center when they are familiar with the personnel, its environment, and know the type of resources available.

“Research and recruiting talks by chemists from graduate schools” – Chemists from two different graduate schools are invited to present recruiting talks. This resource is easy to find since graduate schools are eager to provide recruiting visits (free of charge) to colleges with prospective students. These visits provide us the opportunity to learn about current research and the application processes unique to each university. The one-on-one contact, usually scheduled over lunch or coffee, is a valuable information session for students and the visiting chemists. I am very particular that the visitor be a practicing chemist and not an administrator of a graduate school, because chemists can speak with passion and first hand experience about their work.

“Chemists from industry and state government agencies” – To provide students information on job opportunities in chemical industry and the state government, I invite chemists from these institutions to talk about jobs in their work places. Some students decide to pursue at least a Masters degree once they learn the limitations for a job seeker with a B.S. degree. Since our college is located in Olympia, the state capitol of Washington, many job opportunities are available to chemistry graduates in state agency labs.

“Panel discussion on Careers in Chemistry” – The panelists usually include a chemistry professor, a lab technician, a local middle or high school science teacher, and one of our graduates with a career in chemistry. Sometimes the panel may include a student who completed a summer research fellowship or currently in graduate school. Since it is one of my personal goals to encourage students to pursue careers in science teaching in K-12, a science teacher is almost always included in the panel. Each panelist gives a 5 minute talk about their education, experience, on-the-job training, and how it prepared them for their work. After the formal presentations, panelists answer questions raised by students. This is often followed by an informal lunch meeting with the panelists where discussions may continue on one-on-one basis.

Student Responses to Career Week

- It was a fascinating and informative survey of what to expect in graduate studies in chemistry.
- It added to my educational experience. The guest speakers from industry and graduate schools had a lot of useful information for me.
- It played a significant role in helping me make the decision to enter a doctoral program in chemistry.
- It took away the mystery of graduate school by providing us with the information needed to make an educated decision. This is important because graduate school is a major commitment.
- It provided me with a stack of resources concerning graduate schools and career opportunities in chemistry.
- It was instrumental in helping me learn about graduate schools, employment in the chemical field as well as summer internships and research fellowships.
- The useful information I obtained on how to write a good resume will be helpful to me in the future.
- It provided valuable insights into the realities of being a chemist in industry, academia and government.
- It helped me learn a great deal about graduate schools and how to finance it.
- I truly benefited from learning about the career options before it was time for graduation. I was delighted to have the opportunity to understand what I could do beyond undergraduate school.
- It was one of the most beneficial resources I had in assisting me to clearly outline how to progress toward my future goal of attending medical school.
- It was an excellent learning opportunity for me. I was able to focus on my future after college and learned how to reach my goals.