CAIN PROJECT
THE CAIN PROJECT IN ENGINEERING
AND PROFESSIONAL COMMUNICATION

# The Communication Factor

*Supporting excellence in communication*

## Graduate Student Networking in Action

*Jan Hewitt*

Graduate students at the University of Michigan recently invited me to give two presentations to science and engineering graduate students. The Michigan graduate students had heard about the Cain Project's good work from Jason Deibel, a Michigan graduate who is now a post-doc working with Daniel Mittleman from Rice's Department of Electrical and Computer Engineering.

Desperate for help with developing speaking and writing skills, several students contacted Debbie Taylor, Michigan's Assistant Director of Women in Engineering, College of Engineering; tracked me down via the Cain Project website; secured funding; and invited me for a two-day visit.

Some 35 graduate students attended the evening session on "Strategies for Giving Persuasive Oral Presentations." The next afternoon, 17 students participated in a two-hour workshop about "Writing for Publication."

In the first session, after a lively discussion about what the students had noticed in good and in poor talks, I suggested presentation strategies in five areas: audience, content, delivery, visuals, and fielding questions (see box in right-hand column). After the talk, one young man said to me, "You have really helped me. I didn't have any idea about how to prepare a talk, and now I do. And I have a role model to emulate."

The interactive workshop about ways to write a publishable paper began with a discussion about what makes a paper publishable—for example, leading-edge research, adaptation for a specific readership and for specific journal requirements, and answers to the Seven Key Questions. We then focused on the seven key content questions, with the students first analyzing a model abstract from a published paper to see how all seven questions can be answered, even in an abstract of only 95 words. (See the Winter 2004 Cain Project Newsletter for a more detailed discussion of the key questions and the model abstract. The newsletter is available online on the Cain Project Website: http://www.owlnet.rice.edu/~cainproj). After analyzing the model abstract, the students worked in pairs to answer the seven questions about their own work.

The workshop ended with a guided analysis of portions of the published paper, looking at foregrounding of main ideas, transitions, completeness of explanation, incorporation of related references, use of relevant visuals, and summary of results. The students were enthusiastically grateful for such specific guidelines.

### How to Field Questions

- Repeat the question so that everyone can hear it (and to verify what is being asked)
- Answer to the entire group, not just to the questioner
- Remain positive, even if the questioner is negative
- Number slides so you can easily go to the one being asked about
- Have back-up slides to help answer possible content questions
- Let no one dominate the question-answer time (Say "I'd enjoy talking with you in greater detail after the session.")

### Seven Key Content Questions

1. Problem/Focus/Claim?
2. Importance?
3. Method(s)?
4. Context?
5. Results?
6. Unique contribution?
7. Possible applications?

I also talked about the Cain Project with graduate students from the two women's organizations that sponsored the trip: Movement of Underrepresented Sisters in Engineering and Science, and the Society of Women Engineers. One of them was Saumya Sivaram VanderWyst, a Rice BIOE graduate, now working toward a PhD at Michigan. Graduate students at Michigan hope to convince their university to initiate their own version of the Cain Project.

Jan Hewitt, PhD, works mainly with graduate students. She teaches thesis-writing groups each semester.

### Table of Contents

# From Alzheimer's to Tsunamis: Mentoring Student Writing in Bioscience and Earth Science

*Mary Purugganan*

Each year, the Cain Project invites the best writers from the previous year's introductory biology course to become BIOS Writing Mentors. The Cain Project trains about a dozen mentors to work with over 100 students in BIOS 201/202. The mentors meet individually with students to help them understand assignments, read journal articles in the biosciences, and write clear, concise, and audience-focused summaries and reviews.

To prepare new mentors for these roles, Mary Purugganan, a Cain Project instructor, trains mentors over a three-week period every fall. The eight hours of training begin with discussions about how to conduct a mentoring consultation and strategies for advising students with various needs. The training culminates in a three-hour mock grading session using student papers.

Sharon Ho
Photo by Mary Purugganan

*"Mentoring has been a way for me to become more knowledgeable about current research while helping students improve their reading and understanding of research articles."*
– Sharon Ho
BIOS and ESCI Writing Mentor

## Sharon Ho

As a sophomore majoring in psychology, Sharon Ho has been mentoring for two semesters. She decided to work as a mentor because she had such a rewarding experience with her own BIOS mentor last year. "As a freshman," Sharon says, "I felt lost reading a complex research article, but my mentor showed me where to look for main points that helped me better understand the article. I decided to become a mentor in hopes of doing the same for other students."

In the first part of BIOS 201: Introductory Biology, students write about the molecular basis of a human disease; topics range from Alzheimer's and Huntington's to cholera and leprosy. As the course progresses to topics in population biology, students critique a paper from an ecology or evolutionary biology journal, identifying "the good, the bad, and the ugly" in the article.

This spring, Sharon and four other BIOS mentors have extended their experience and skills to mentoring earth science students in the introductory course ESCI 102: Evolution of the Earth. Students in ESCI 102 write four short papers on topics ranging from the causes of the Indian Ocean earthquake and tsunami to an analysis of conflicting theories on what caused the Permian extinction.

Sharon still has two years before she graduates, but she is planning a career in pediatric medicine. Skills she has developed as a BIOS Mentor will help her communicate more effectively with a range of audiences—patients, their caregivers, and other physicians and professionals.

### Mentors Are Not Proofreaders

Grammar and punctuation are not enough. Mentors address issues of organization, readability, clarity, evidence, argument, and audience, as shown in these representative feedback comments that mentors made on a recent biology assignment.

- "This 'aim' sentence should have been in the first paragraph in order to provide context for the procedures."
- "The purpose [of the study] should appear here. Although transgenic mice were created, this was not the end purpose."
- "Not necessary for [your] audience."
- "Would be helpful to clarify how the major components of the study (e.g., SCAN, CTD, capsid, HIV-1) are interrelated."
- "You really presented the conclusions well, but what were the initial hypotheses?"
- "Are you certain of this [assertion]? Was this determined for sure, or was it a hypothesis?"
- "Try to focus a bit more on the big picture of the experiment—make sure the overall picture is clear before getting too deep into experimental procedures."
- "What did this procedure actually show?"
- "What is the significance of these results?"
- "Great job summarizing conclusions."
- "What are the long-term implications?"

## Megan Gray

As a senior mentor with a double major (policy studies; ecology and evolutionary biology), Megan Gray enjoys mentoring students majoring in English, history, Asian studies, geology, and psychology. She observes that students may be strong in their own disciplines, but they have little experience with scientific writing. The assignments in ESCI 102 expose students to critical analysis, the scientific method, and writing about research. Megan notes, "Students start out with an assignment to pick out key parts of papers and end up understanding the structure of scientific research."

Mentoring enriches the lives of mentors as well as the students who come for help. Because students write about current and often "hot" research topics, the mentors—who typically continue to mentor until they graduate—are exposed to leading-edge work in biology and earth science. Advising students about writing also improves the mentors' own critical thinking and writing skills, contributing to success in their future careers.

When she graduates this spring, Megan plans to pursue MD and MPH degrees and eventually conduct research about the effects of environment on health. Her experience with tailoring writing for specific and varied audiences will be valuable in disseminating her findings.

Megan Gray
Photo by Mary Purugganan

*"I especially enjoy watching students improve their papers throughout the semester as they become more confident writers."*
– Megan Gray
BIOS and ESCI Writing Mentor

Mary Purugganan, PhD, works with the writing mentors who support bioscience and earth science courses.

### Writing Mentors 2004-05

| Name | Major | Class of |
|---|---|---|
| Carla Bossano | Bioengineering | 2005 |
| Leslie Fogel | Biochemistry | 2007 |
| Chloe Franklin | Biochemistry | 2006 |
| Megan Gray | Policy Studies; Ecology & Evolutionary Biology | 2006 |
| Kenda Hartley | NSCD | 2007 |
| Sharon Ho | Psychology | 2007 |
| Jerry Hopkins | Psychology | 2006 |
| Lindsay Lawley | MEDI | 2005 |
| Junho Lee | Bioengineering; Pre-med | 2007 |
| Ashley Martin | Cell Biology | 2007 |
| Michael Mathews | Biochemistry & Cell Biology; English | 2007 |
| Gloria McCahon | Policy Studies (environmental); History | 2006 |
| Leah McKay | Biochemistry | 2007 |
| Joey Neggers | Computational & Applied Mathematics | 2006 |
| Christina Tjok | Art History; Pre-med | 2007 |

# Rice Winners in the Texas Space Grant Consortium Design Challenge with Cain Competition Coaching

*Julia Amborski*

In Dr. Maria Oden's BIOE 452 class, senior bioengineering students design, develop, and test devices in biotechnology or biomedicine. This year, two groups from this course took their projects one step further by participating in the Texas Space Grant Consortium Design Challenge. Representing Rice in the Consortium Challenge were Team Cobra and the Space Owls.

According to Dr. Oden, participation in the program is voluntary and requires "extra work, effort, reports, presentations and deadlines." The hard work paid off, though. In Fall 2004, Team Cobra was presented with six awards for excellence in participation and the Space Owls were presented with three. In Spring 2005, six official awards and eight additional "fun" awards were given. The Rice teams took first place in all six of the official awards and five of the eight additional awards.

> ***"[The Rice teams'] ability to communicate their research clearly, confidently, and expertly to the audience made a lasting, positive impression. Without a doubt, each team's communication skills had an enormous impact on how well their projects were received by NASA researchers, representatives from Texas institutions, and peers in attendance."***
>
> – Debbie Mullins
> Program Coordinator, TSGC Design Challenge

## Space Challenge

The Texas Space Grant Consortium Challenge is described as "a unique academic experience designed to provide undergraduate students with an opportunity to propose, design, and fabricate a solution to a topic of importance to NASA and its mission." In this semester's challenge, 16 teams represented seven Texas universities.

Each team selected a project from a list of topics submitted by NASA researchers or its contractors. Both Rice teams selected the same challenge: Countermeasures for Bone and Muscle Loss in Orbit. Along with their Rice faculty advisors, Dr. Michael Liebschner and Dr. Maria Oden, both teams had the guidance of Tara Ruttley, a Johnson Space Center Biomedical Systems Division researcher.

**Team Cobra** (left to right): Austin Elam, Christopher Gibson, Thomas Rooney, Roland Robb, Zeyad Netwalli

### Team Cobra Leader: Christopher Gibson

Christopher Gibson, team leader of Team Cobra who is pursuing a BS in BIOE as well as a BA in the MANA honors program, was first introduced to the Cain Project his freshman year in honors chemistry and has been further exposed to the Project's resources in several of his BIOE courses.

While working for a biotech start-up company this past summer, Christopher was asked to create company presentations in PowerPoint as well as to represent the company by presenting its business plan to two well-known venture capitalists. He feels that his skills learned through the Cain Project as well as his Rice undergrad experience in general will be "supremely beneficial" in his years after graduation.

To meet the rest of Team Cobra, go to http://www.riceteamcobra.com/team.htm.

**Space Owls Team Leader: Allison Bean**

Since her sophomore year, Allison Bean, a BIOE major and team leader of the Space Owls, has been assisted by Tracy Volz, Cain Project Assistant Director. Allison and her peers have worked with Dr. Volz in most of their BIOE classes to learn everything from how to construct an effective PowerPoint presentation to how to stand and gesture during presentations. Allison feels that the presentation help from Dr. Volz as well as from the Cain Project-trained TAs became most evident when she and her teammates attended the TSGC Design Challenge last semester to present their first-semester progress reports.

Allison believes that the Space Owls were much better prepared than the groups from other schools and acknowledged that the audience seemed impressed with her team's presentation skills. To meet the rest of the SpaceOwls, go to http://www.owlnet.rice.edu/~mkolnik/spaceowls/aboutus.html.

**Space Owls** (left to right): Danika Hayman, Kimberly Hsu, Sriram Eleswarapu, Allison Bean, Martin Kolnik

## Outstanding Presentations

Members of both Team Cobra and the Space Owls credit the Cain Project as a positive influence on their presentations and also on their experiences as Rice undergrads. In order to prepare for their presentations, the teams (as well as the other students in BIOE 452) were assisted by TAs Kyle Allen and Ryan McGuire, who were trained by the Cain Project to be presentations coaches.

The teams were given presentation feedback about their slides, presentations styles, and speaking skills. Cain Project instructor Dr. June Ferrill also visited BIOE 452 on several occasions to give the students tips about their business presentations as well. Although an award was not given for best oral presentation, Debbie Mullins, Program Coordinator of the TSGC Design Challenge, feels that both Rice teams provided "outstanding oral and poster presentations that effectively and interestingly communicated the work they had undertaken."

Want to see Team Cobra's latest developments? Go to: http://www.riceteamcobra.com.

Want to see a slideshow demonstrating the Space Owls' prototype? Go to http://www.owlnet.rice.edu/~mkolnik/spaceowls/product1.htm

Links to both sites are available in this article on the Cain Project website.

*"I believe that the Cain Project is an incredibly vital part of Rice's engineering program since it supplements our learning of the material in class, with knowledge of how to communicate our ideas effectively. I have no doubt that the Cain Project has helped prepare every engineering student at Rice for the future in one way or another."*

– Allison Bean
Space Owls Team Leader

Julia Amborski is the Administrative Coordinator for the Cain Project.

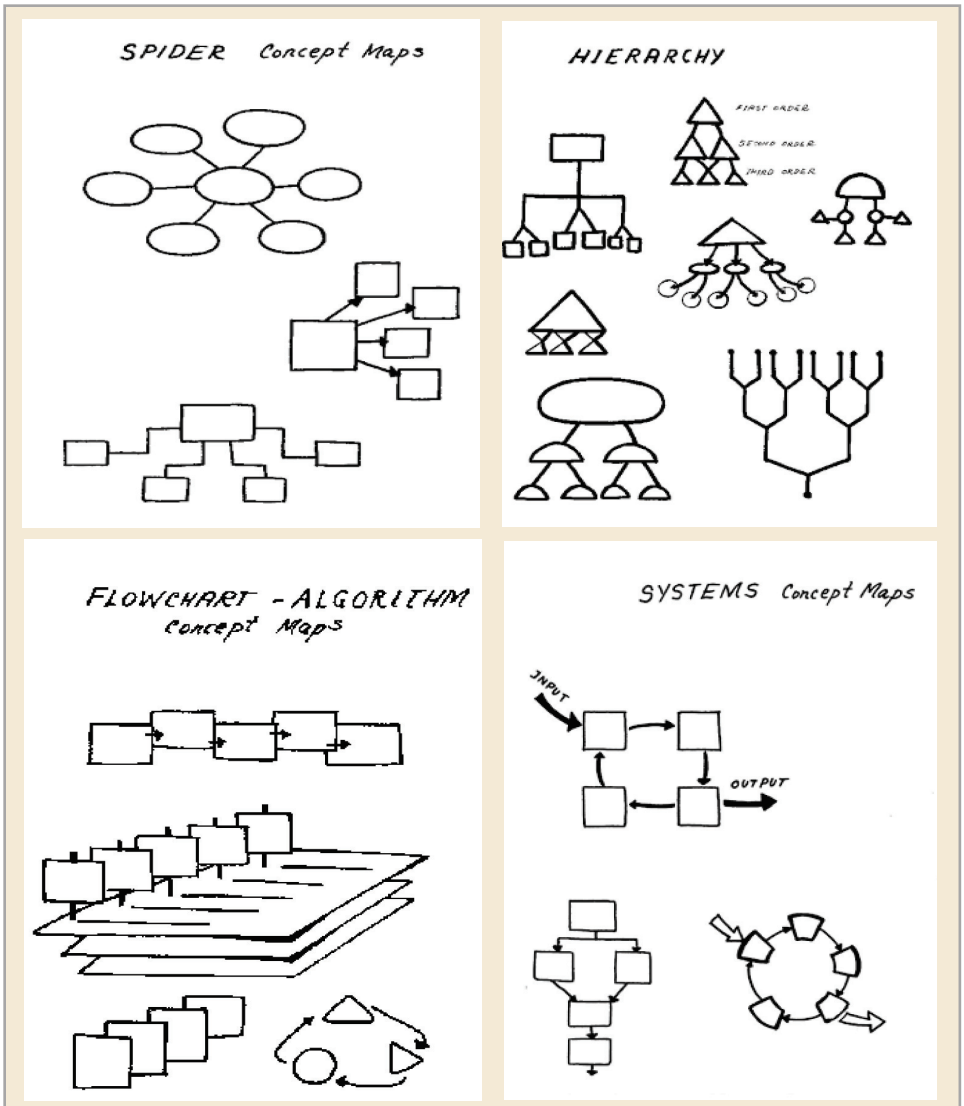
# Concept Mapping: A Science-based Tool for Planning to Write

*Janie Hammons*

Scientists and engineers use mapping tools (e.g., flow charts, Gantt charts) to visualize ways to control, understand, and balance various aspects of projects. These mapping tools prompt visual thinking, which is valuable for engineers and scientists as they plan, revise, and write.

A particularly useful mapping tool is the *concept map*, which can depict ideas and relationships in several different ways as displayed in the thumbnail sketches below: spider, hierarchy, flow chart, systems. Concept maps were developed in the 1960s by Joseph Novak of Cornell, reflecting his interest in the ways in which science students learn and make knowledge meaningful. The left-hand column on the next page identifies the basic steps for constructing concept maps.

In the Cain Project's "Writing the Research Proposal" workshop, graduate students, during an initial session, prepare concept maps depicting their individual research proposals. As students identify components of their proposals, they identify the proposal's general shape. Organization occurs as students create a hierarchy by which to order components. Revision begins as students look for connections and relationships. Determining those relationships requires the highest level of critical thinking. As Jon Margerum-Leys (Univ. of Michigan) says, concept mapping is a "sneaky way" to get students to revise at the concept level instead of at the word or sentence level. As students move to other proposal topics, they return to their maps to jot ideas or to refine connections between concepts.




**Source**: Kinds of Concept Maps.
Retrieved April 26, 2005, from http://classes.aces.uiuc.edu/ACES100/Mind/c-m2.html

Mapping encourages convergent thinking and a number of additional benefits that are shown in the box in the left-hand hand column on the next page. Perhaps the greatest return on the time invested is the retention and insight that come from manipulating the information. Because students must first articulate their central idea, all other information stems from this core; thus, students examine the ways in which ideas fit together and look for new ideas that should be included. One PhD student commented, "The good thing [about mapping] is that it gives me a chance to step away from my proposal. Then, I can see the big picture in my problem."

If you want to try an easy electronic version of mapping, download a trial version of Inspiration®, a software program that enables users to quickly and easily create concept maps. Originally designed for K-12 use, Inspiration® has been embraced by many engineers and scientists as a first-rate planning tool: www.inspiration.com/productinfo/inspiration/index.cfm.

Janie Hammons is a writing coach for the Cain Project.

**Basic Steps for Constructing Concept Maps**

1. Jot down single-word components of the topic.
2. Identify the main idea.
3. Order and organize the supporting components into individual boxes.
4. Use arrows to show the progression from the main topic to each component.
5. Place a word or short phrase on each arrow to explain the relationship of one box to another.
6. Use additional arrows to indicate cross-linkages between ideas.

**Benefits of Concept Mapping**

- Organizes and orders knowledge
- Checks for understanding
- Identifies key components
- Develops connections
- Indicates relationships
- Checks for missing information
- Encourages cross-linking

**References to Concept Mapping**

Beck, R. J. (1999). Concept Mapping. Retrieved March 2, 2005, from http://awe.tufts.edu/caeoccasional_papers/concept-map.htm

The Concept Mapping Homepage. Retrieved March 2, 2005, from http://users.edte.utwente.nl/lanzing/cm_home.htm

Margerum-Leys, J. (1999). Concept Mapping as a Prewriting Activity. Retrieved March 2, 2005, from http://www-personal.umich.edu/~jmargeru/conceptmap/

Novak. J.D. (2000). The Theory Underlying Concept Maps and How to Construct Them. Retrieved January 14, 2002, from http://cmap.coginst.uwf.edu/info/printer.html

# Software Specs? Why Bother?

*Tracy Volz*

Dan Wallach, an assistant professor in the Department of Computer Science, and his colleagues made national headlines last year when they published a paper describing serious security flaws and poor software engineering in the Diebold AccuVote-TS voting system. According to Wallach, "Diebold's software specs, such as they were, were terrible, making it no surprise that their code was riddled with design flaws."

In addition to studying computer security, Wallach also teaches Rice's COMP 314, a course about algorithms, data structures, and software engineering. COMP 314 has always required students to write software specs before writing any actual code, but the specs were never particularly detailed or insightful. Wallach wanted to change that: "I wanted to be able to say that my own students write better specs than Diebold."

By learning to write good specs, students think through their design decisions in advance and have fewer bugs or other surprises waiting for them later. "The sooner you start writing code, the longer it will take," warned Edsger Dijkstra, a famous computer scientist, and that became Wallach's motto when redesigning the ways in which COMP 314 students write specs.

To support the course's increased emphasis on writing, Wallach sought the Cain Project's assistance. He and his staff of TAs and labbies worked with Tracy Volz to create a new spec template.

This group began by identifying the features of good specs. Based on that list of features and the project assignment, they created a spec template that also includes annotated examples. In addition, this group revised the grading rubric to match the criteria stated in the spec guidelines. Among other requirements, COMP 314 students must now keep their specs up to date as their implementation changes. "If your specs differ from your code, then both are wrong," emphasized Wallach.

After the students' first projects had been submitted, Wallach led a class discussion and asked for feedback about the project, in particular the usefulness of the new spec requirements. He was excited because students reported that, while the specs were difficult to write, they noticed it was far easier than they expected to finish the project. Said Wallach, "You could see the light bulbs turning on over my students' heads."

The students weren't the only ones to find the new spec template helpful in streamlining their workload; the course TAs and labbies also remarked that grading the first project was much easier this year than it had been in the past. They described the improvement in students' analysis, organization, and presentation of specs as "amazing" and "stunning."

To view the spec template and revised grading rubric, visit:

- http://www.owlnet.rice.edu/~comp314/05spring/Project1/specguide.html
- http://www.owlnet.rice.edu/~comp314/05spring/project-grading.html

Tracy Volz, PhD, has worked with several faculty in Comp Sci over the course of five years to enhance their students' communication skills.

# VIGRE Online! Got Questions?

http://www.vigre.rice.edu

- **What is VIGRE Online?**
  A dynamic on-line environment in which interdisciplinary groups working on parallel themes can achieve the full potential of vertical integration and the merging of education and research.

- **What is a PFUG?**
  Postdoc Faculty Undergraduate Graduate
  A group of undergrads, grads, faculty, and postdoc(s) devoted to the study of a specific problem in mathematics and/or statistics and applications.

- **What interdisciplinary PFUGs can I join?**
  - o Computational Algebraic Geometry
  - o Computational Finance
  - o Developmental Biology
  - o Simulation-Driven Optimization
  - o Statistical Genomics
  - o Computational Neuroscience
  - o Stochastic Processes & Molecular Biology
  - o Geometric Calculus of Variations
  - o Computational Image Processing

- **Benefits? For me?**
  - o Communicate with members of PFUGs
  - o See what other groups are doing
  - o Access information electronically anytime, anywhere
  - o View class materials, research projects, and various resources

- **Want to do research with faculty this summer?**
  Undergraduate Summer Research Program Applications are available on the VIGRE homepage: http://www.vigre.rice.edu

- **Curious who is a member of VIGRE Online?**
  Membership on the website has gone up from last semester. Check the Members Directories to see who's a member.

- **Interested in attending a VIGRE seminar?**
  Current and upcoming VIGRE events are posted on the homepage everyday.

- **Curious about research in other disciplines?**
  View research projects that are in progress, see who's working on them, and learn how you can participate.

- **Need some help with your research project, discovered something interesting, or just want to talk about it?**
  Use the Discussion Forums to share your questions, messages, and ideas.

- **Want to join VIGRE Online?**
  Students interested in joining VIGRE Online can go to www.vigre.rice.edu and click Request to Join.

# Fast Facts

- For several years, The Cain Project has helped students in the Rice Undergraduate Research Symposium (RURS) prepare their poster presentations for the competition. This year participation in The Cain Project workshops increased 200% to include fully half of all RURS participants.

- Did you know that The Cain Project offers Leadership and Professional Development workshops for Rice Graduate students? Topics include:
  - o Writing for Publication
  - o Data Presentation
  - o Oral Presentation Skills
  - o Poster Design
  - o Evaluating Student Writing

The Cain Project in Engineering and Professional Communication helps Rice students become expert speakers and writers. Because of the Gordon and Mary Cain Foundation's generous gift, undergraduate and graduate students in science and engineering are developing the communication skills necessary for successful professional leadership.


| | |
|---|---|
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