RCN: Advancing lake ecology by building an international community to exploit innovations in sensor network technology

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RCN Student Activities Outline

The major goal of the RCN/GLEON network is to build a community of researchers interested in the broader interface between aquatic science and information technology. Specifically, we are trying to conduct a type of network science without boundaries that has not been attempted before but has high promise for the future. To best accomplish these objectives, a major component of this community will be international student participation. The RCN proposal aims to "inform, train, and mentor" students while simultaneously "[preparing] the next generation of scientists for large, collaborative, international, interdisciplinary science." To fulfill these goals, this document outlines potential means of RCN student organization, future activities, and methods for implementation.

1) Student governance
2) Recruitment
3) Student activities
4) Notes

(1) Governance

Goals/purpose: The goal of RCN student organization is to establish an international network of students conducting GLEON-affiliated research and participating in RCN-sponsored activities. The student organization works closely with the RCN Steering Committee to give students a voice in RCN affairs, while also ensuring that the students are responsible to the larger network in working towards common goals.

Strategy: Chair and co-chair: A governance approach that allows for self-organization and leadership (optimized for maximum benefit from the student perspective) with advising from the Steering Committee (optimized for best coordination with the RCN in general). To ensure that RCN student activities are self-supported and student-directed, a graduate student chair and co-chair (selected by the Steering Committee) will act in leadership roles to organize student activities. The chair will be a member of the Steering Committee, organize student representatives to RCN working groups, and arrange for student meetings at RCN and related meetings. A suggested term for both the chair and co-chair is 2 years, with the potential to renew as appropriate. As student participation in the RCN increases, the chairs will assume or delegate any possible responsibilities that arise, as well as develop new leadership.

Activities: It would be helpful to have a co-chair that is flexible and motivated, as well as able to integrate both aquatic science with IT. Ideally, the student co-chair would be selected by the Steering Committee between the teleconference in April 2007 and the meeting 3-5 June 2007 in San Diego, to expedite preparation of plans for SIL in August 2007.

(2) Recruitment

Goals/purpose: One goal of the RCN is to increase participation, especially for scientists early in their careers. Participation in the RCN network can provide several benefits to students; namely, networking, learning new skill sets, the opportunity to develop a leadership role in an emerging organization, and traveling to different GLEON sites. Students will also be able to gain leadership experience in working and building teams, and guiding multi-institutional, multi-disciplinary, and multi-cultural organizations. By capitalizing on these strengths, the RCN will eventually aim for a core international group of 20+ students recruited from affiliated RCN/GLEON labs and RCN/GLEON student gatherings at SIL, ASLO, and ESA meetings.

Strategy: In the initial period of RCN advancement, it might be prudent to focus on recruiting an active, yet smaller group of students primarily affiliated with the RCN either through their advisor or field site. As the RCN framework develops, however, we should expand the number of involved students by recruiting non-affiliated students, both from the U.S. and abroad, to the RCN organization. Highlighting the potential advantages of student participation in the RCN and GLEON will be an important way to increase student involvement. A major goal is to recruit a diverse and multi-disciplinary group of students, representing all races, both men and women, aquatic science and IT, and at multiple points in their education. Such a heterogeneous group will ensure that the student RCN organization is adaptive to meet the unforeseen needs of the next few years.

Activities: Currently, there are only a few graduate students that are actively involved in the RCN/GLEON network. To increase student participation, I propose a meeting of students affiliated with the RCN or GLEON (via their advisor, field site, or IT team) at the SIL meeting in Montréal, August 2007. This meeting would occur during the SIL conference (but after the RCN meeting on 11 Aug 07). To best highlight RCN opportunities as well as plan for future student activities, we could invite an NSF Program Officer to discuss different funding options for graduate students. Thus, students would not necessarily have to be dependent on RCN funding to be involved in the RCN/GLEON network. The main goal of this meeting would be to plan future activities and student meetings, as well as to identify the needs of students working at GLEON sites (i.e., better data management skills, specific statistical training, etc.) Evaluating what resources or skills RCN students are lacking will help determine what student activities would be the most useful.

(3) Student activities

Goals/purpose: The purpose of this section is to describe student activities and potential implementation. The objectives of the activities are to: (a) articulate what students need to learn; (b) develop bridges between the disciplines; and (c) make connections directly with other organizations in the field, including funding organizations (RCN proposal). A major goal (and expectation) of all student activities will be student-directed proposals, peer-reviewed publications, and research presentations at major international meetings, particularly involving the integration of IT and aquatic science. To best disseminate RCN-driven student research,

students can organize a poster presentation at NSF, potentially at the yearly RCN PI meeting, or as part of a NEON meeting.

Strategies: The first priorities of organizing student activities would be points A, B, and C, (below) within RCN Year 1, and point D (below) by RCN Year 2. Delegating specific roles to certain students (i.e., choosing students for each working group, organizing an email list, etc.) while also executing some activities as a common group (proposal-writing, organizing a poster session at NSF) will most effectively utilize student resources.

Activities: I suggest at least four major activities for RCN students. These activities (site visits, student representatives at RCN working groups, a RCN/GLEON student email list, and student workshops) are key to integrating students into the RCN, as well as fulfilling the RCN's goal to build a multidisciplinary community comprised of all levels of researchers.

A. Site visits: The RCN has support for some students to travel to other GLEON sites for training as well as pilot research studies. Students can apply for funds from the Steering Committee, as well as apply for other NSF grants to support travel. This type of exchange will build and coalesce a strong student RCN community, as well as aid students in their Ph.D. research. Within the first year, the RCN student co-chair would work with several members on the Steering Committee to develop an application and review process to determine how many and which students could participate in visits to other GLEOEN sites. The goal of this endeavor is for students to begin applying for funds by RCN Year 2.
B. Student representatives at RCN working groups: Ideally, each RCN scientific working group should have at least one student representative. Students would be matched to working groups by their general interests. Further decisions on how students would be chosen or their responsibilities in a group will be discussed at the group leaders' meeting in late summer/early autumn 2007.
C. RCN/GLEON student email list: I can attest to the difficulties of working alone with data from multiple GLEON sites, and I think it would be useful to link students working in the RCN or at GLEON sites together with an email list. Having this support system would only further encourage collaboration among labs and students.
D. Student workshops: Perhaps the most unique and ambitious of these four student activities, I propose the organization of multiple student workshops that meet for several days at a time with a targeted goal to accomplish (i.e., gain certain skills that would benefit graduate-level research at the aquatics-IT interface, etc.). Workshop topics would be chosen by the students themselves during student meetings at SIL, ESA, or ASLO and would be advised by RCN Steering Committee members or collaborators. This activity would obviously require a great amount of planning and resources, but I think it would be an excellent target goal for the RCN group within the first two years and produce several manuscripts and proposals.

(4) Notes

This outline only describes potential graduate student activities, and may be biased more towards aquatic science than IT students. With the addition of an IT-minded co-chair, hopefully

we could work together to better integrate IT and aquatics activities. In addition, it may be helpful for RCN Steering Committee members and collaborators to begin exploring ways to integrate undergraduates into the RCN at their home universities, with the goal of introducing undergraduates to GLEON and the RCN at conference student meetings and GLEON workshops.

ADDENDUM A: COMMENTS BY PETER ARZBERGER

Comments on RCN Student Activities:

This is a very thoughtful document about what could be and the role of students (graduate) in the RCN.

Here are some random thoughts, put together hastily, that might or might not help in identifying what we will do and why we will do that (typically there is more than enough to do- the trick is to focus and do a couple of things really well). Perhaps they will begin a dialog (and not end it).

It might be worth stating in this document some basic underlying principles of the RCN

- First, the RCN is about building a community of researchers interested in the broader interface between lake questions and IT
    - Students are part of that community
- Scientifically, we are trying to do a type of science, a network science, that hasn't been done before (or not easily). We feel that this is our collective future.
- That science does not have any national boundaries associated with it (admittedly there are funding issues – but in principle this is international research, in addition to multidisciplinary research). Furthermore, any plan for education without a thoughtful approach to an international experience will be a disservice to the community.

With these principles, the questions are:

- What can the RCN do to advance the careers of students engaged in these activities?
- What roles and responsibilities can students assume for advancing these principles?
- What are the outputs of students engaged in this process and these activities?

I can imagine several outputs (some similar to what is expected of graduate student)

- Publications, but publications using a network
- Presentations at major, international meetings
- Leadership experience in working and building teams, and guiding multi-institutional, multi-disciplinary, and multi-cultural organizations
- Proposal preparation and awards
- Creation of globally engaged researchers

A couple of ideas regarding training: One idea is that the RCN should host / co-host an "Institute" to involve both graduate students and other researchers on specific activities. Also, the word "policy" has not been mentioned. While I don't think we are equipped to handle that – having people talk about this, as a career option, might be very inspiring.

I am providing these thoughts both to get a reaction from others on the cc list (or agreement or modification) but also as a framework to provide a set of goals – that will allow us to know whether we have accomplished this.

Finally, as you might have guessed, I feel very strongly that we must engage globally (and the current document has only one reference to that).