FIRST II

Faculty Institutes for Reforming Science Teaching

Newsletter – March 2005
Volume 3, Issue 1
Supported by the National Science Foundation grant number DUE 0088847.
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FIRST II NATIONAL MEETING

The FIRST national conference, "Faculty Institutes for Reforming Science Teaching through Field Stations: Dissemination of Successes", is scheduled for May 13-15, 2005 at Kellogg Biological Station in Hickory Corners, Michigan. At the meeting, participants will hear insights from nationally renowned educational innovators and work in teams on discipline based modules. All expenses at KBS are covered. Contact your field station team leader to request travel funds.

DISCIPLINE BASED MODULES

- Cell/Developmental Biology
- Ecology
- Anatomy and Physiology
- Microbiology
- Heredity
- Evolution

The National Meeting is designed to focus on the accomplishments of FIRST faculty and to advance this national dissemination network to the next phase. Participants from all the FIRST Field Stations will have opportunities to meet and interact with each other.

Each FIRST team member is invited to present a poster that showcases their activities and outcomes. Discipline-based groups will build innovative modules based on reformed course goals and sound approaches to teaching and learning we used at all workshops during the FIRST project.

MEETING OUTCOMES

- Module Implementation Plans
- Module Assessment Tools.
- Materials to help faculty mentor graduate students or peers
- Modules posted on FIRST web site.

Registration and abstract submittals are due April 1, 2005, so register soon.
Register and submit poster abstracts at www.first2.org.

THE REFORMED TEACHING OBSERVATION PROTOCAL

An important aspect of the FIRST project is to assess the effectiveness of the project on faculty change. We do this through our assessment of curricula but also through direct observation of teaching in the classroom. Video tapes of faculty are anonymously evaluated through an instrument called the Reformed Teaching Observation Protocol (RTOP).

RTOP was developed by a team led by Daiyo Sawada as part of the Arizona Collaborative for Excellence in the Preparation of Teachers (ACEPT) to

RTOP PROTOCOL

- Each instructor is video taped twice in two different semesters for the same course.
- Tapes within a semester are separated by more than a one month period.

evaluate teacher effectiveness with respect to active learning strategies. RTOP has been used in more than 400 K-20 science and mathematics classrooms. The ACEPT project reported strong correlations between RTOP scores and normalized gains in student learning in college classrooms.

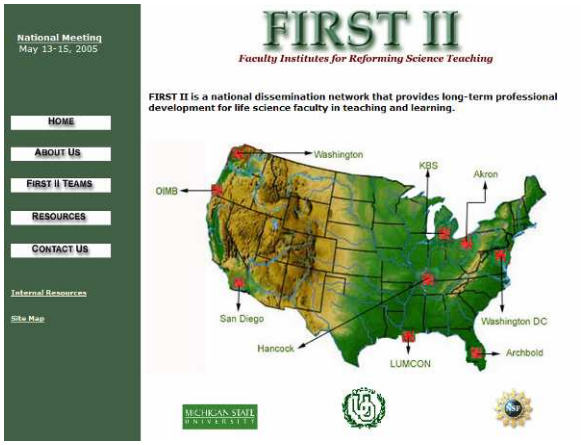
Approximately 30 faculty are currently participating in the RTOP assessment. Once at least two years of their classes have been videotaped, a certified FIRST RTOP evaluator will anonymously evaluate their tapes. If desired, the faculty member can receive their RTOP evaluations and a copy of the videotape. The evaluation breaks down RTOP score into several categories including lesson design and implementation, propositional content knowledge (concepts), procedural content knowledge, teacher and student communication and student teacher relationships.

Why would you want to be RTOPed? The evaluations provide an impartial assessment of your class which you can use to help refine your teaching. They can help you evaluate how to make your class more engaging or improve your students understanding of key concepts.

There is room for more participants to join the current faculty being RTOPed. Contact Diane Ebert-May to volunteer (ebertmay@msu.edu) and you will receive the benefits of an impartial evaluation which you can use to assess and improve the quality of your instruction.

UPDATE TO FIRST WEBSITE

Our surveys tell us that the FIRST website is underutilized. Although well organized, the content didn't attract many people. We are adding some features that are a bit more timely and active to help build our community of faculty.



The first change is on the literature cited page. We have updated the references to make them more current and added subcategories of references. You can find information on different methods of teaching or find citations on some of the most current research to help you start that grant proposal or research project. We will update the site on a regular basis and encourage participants to suggest additional categories or citations send us an email with the information.

We have also added a section listing research interests and courses of FIRST participants. If you need to teach a new course or want to discuss how to teach a particular concept, this source can help you find valuable contacts within your discipline.

Please surf over to our website (www.first2.org) and look under resource to see these changes and as always call or email if you have any comments or questions.

UPDATE FROM THE SAN DIEGO FIRST TEAM

Major misconceptions about basic scientific concepts provide huge barriers to students of all ages as they acquire biological science knowledge. Identifying those misconceptions is a difficult and sometimes daunting task, but one we must pursue as biology educators. Once we have identified carefully examined our students' grasp of basic scientific concepts, we can then proceed to either correct their knowledge gaps or build upon a scaffold of accurate understanding. To help us measure how well students understand fundamental concepts of cell division, diffusion and osmosis, energy transfer and metabolism, and natural selection, we have assembled a team of San Diego FIRST 2 faculty (D. Anderson, D. Deutschman, M. Spradley, J. Weidner, G. Wisehart) and associates to develop a set of questions focusing on known naive ideas about those processes. Kathleen Fisher and Kathy Williams of the "San Diego (FS1) Field Station Team," have been heading up this project. Dr. Mike Smith, of the Mercer University School of Medicine in Macon GA, has been joining us to help with the meiosis/mitosis items. He and Kathleen Fisher started working on a set of diagnostic questions in that area some time ago. We have met several times to organize and modify existing questions and develop new ones.

The multiple choice questions are generally "tiered" in format, with one question asking for a basic response to a problem and the second asking for the students to give us their reason for their choice. Thus, the items focus on higher level skills such as explaining an outcome. The answers are designed to expose known naive ideas and misconceptions in each topic area. An example of these questions can be seen in Anderson et al. (2002).

We have begun to validate the questions in those diagnostic tests by administer the tests to science majors and non-majors in university and community college classes of our FIRST 2 faculty. Data from over 800 students indicate a widespread lack of understanding of many of these hard-to-teach and hard-to-learn concepts. As predicted, upper division college students have a better understanding of those concepts than lower division students, yet they still hold on to many basic errors. The problems uncovered in this way can provide information faculty can use to recommend changes in supporting classes, like chemistry. In addition, faculty can recognize problem areas to focus on in their own classes and programs. We are also using these questions as pre- and post- course tests to measure the effectiveness of different teaching strategies used by faculty to enhance learning in their classrooms (as can be assessed using RTOP tools). After this semester, we hope to be able to use the tests to consistently measure basic biological literacy in our classes and calculate "normalized gains" to allow comparisons across classes.

Anderson, D., Fisher, K. M., & Norman, G. J. (2002). Development and evaluation of the Conceptual Inventory of Natural Selection. Journal of Research in Science Teaching, 19 (10), 952-978.

MY REFLECTIONS ON RESEARCH

I was hired last fall to work as a coordinator for the FIRST project. My previous research experience was in ecosystem ecology and evolutionary algorithms and I had developed some expertise in statistics and data management over the years. I now must apply those research skills to learn more about teaching and understand more about student learning.

I am interested in concept maps because of their potential to expose the underlying cognitive structure of students. Because evolution is such an important topic, I chose to look at concept maps of natural selection and compare them to other means of assessment. Concept maps can be a nebulous form of assessment and I want to understand what concept maps are

assessing. Initially, my ideas for a research project were for controlled experiments. Although controlled experiments are powerful, it would have been inappropriate to use a method of instruction or assessment that we knew was ineffective. I therefore used a design research approach, evaluating data collected from a previous year and modifying the assignments to improve learning the following year.

One of my first challenges was trying to figure out how to evaluate the concept maps. How do I boil down something as rich as a concept map into a meaningful score? I reviewed the literature on concept maps by Novak, Shavelson and Ruiz-Primo, adjusted their measures to reflect my own ideas and scored all of the concept maps based on my rubric. Luckily Dr. Ebert-May and Deb Linton had broken the exams into concept areas. We were therefore able to compare concept maps to essay, multiple choice and clicker questions.

The class has already begun this spring. I have to decide on appropriate concept maps for both the class and the research. As in other research, setting the right experimental conditions is important. If the students aren't presented with a concept that we later decide is important, the opportunity to revisit the research is lost.

At this point you may be asking, "what about the analyses?". The research didn't come out quite as expected but I still have some more analyses to run and I can tell you about those at the national meeting this spring.

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