Evaluation Plan for the Education Program
At the Center for Remote Sensing of Ice Sheets (CReSIS)

Dana Atwood-Blaine

University of Kansas
2335 Irving Hill Road
Lawrence, KS 66045-7612
http://crisis.ku.edu

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Program Overview

Established in 2005, the Center for Remote Sensing of Ice Sheets (CReSIS) is a Science and Technology Center (STC) funded by the National Science Foundation (NSF) and led by the University of Kansas. The overall mission of CReSIS is to understand and predict the role of polar ice sheets on sea level change. In addition to the scientific research and technology development that goes on at CReSIS, the center is committed to inspiring and educating the next generation of scientists and engineers, benefiting society by increasing diversity in science and engineering and by transferring knowledge to industry, the public, policy makers and the scientific community. The three departments at CReSIS: Research, Education, and Knowledge Transfer are equally responsible for the achievement of the Center’s mission. Diversity is a fourth component of primary importance to the mission; however, diversity goals are not managed by a separate department, as they are integrated throughout the Center’s other departments. CReSIS’ lead institution is the University of Kansas, and the Center is comprised of four other partner institutions: Haskell Indian Nations University (Haskell), Elizabeth City State University (ECSU), Pennsylvania State University, Ohio State University, and the University of Maine. The original grant funding through NSF will last five years, through 2010, with the possibility of funding being extended for another five years.

The primary focus of this evaluation plan is the Education program at CReSIS. The overarching mission of the Education program is to mature future generations of scientists and engineers and who will be capable of assuming the responsibility of polar science and engineering research and who more closely mirror the diversity in our World. Therefore, the Education program’s first priority is to the graduate students who are most likely to begin supporting CReSIS’ work in the near-term. As a logical extension, the secondary focus is on generating a diverse pool of talented undergraduates to begin filling graduate student roles in Center activities. Thirdly, CReSIS strives to provide opportunity, motivation, and
focused supplemental content for K-12 students in order to create larger pools of STEM-capable and -interested students at the college level. The CReSIS Education Project Plan states:

“The Education Program’s *guiding philosophy* emphasizes the importance of *hands-on, direct involvement* for every level of student. At the graduate level, this means providing opportunities for students to participate in fieldwork and lab work, design their own research, and forge interdisciplinary, inter-institutional connections among people and ideas. At the undergraduate level, we strive to integrate research with the undergraduate curriculum, and to provide these students with some of the same research opportunities as graduate students. For K-12 students, we will provide teachers with both the materials and the tools to improve their teaching skills and enrich the classroom experience of their students. We will also engage directly with students in the classroom or through informal educational opportunities, letting them see firsthand what our researchers do and participate in project-based investigations and authentic research.”

As with any type of grant-funded project, especially those that are federally funded, evaluation is a critical and key component. The Education department needs to continually monitor and evaluate how well its program components are meeting the stated objectives. Such formative evaluation enables the department to continually improve its programs and ensures that the department has data illustrating the worth and merit of its programs to share with the funding agency. Without such data, future funding could be jeopardized. Because thorough, accurate, timely, and useful evaluation data is so important, the Education department added an internal program evaluator to the Education team in the summer of 2006. This graduate research assistant, a PhD student in education, will design and implement the evaluation plan, collect and analyze data, and report the results of the evaluation to project stakeholders.

**Approach**

The education program needs evaluative information that is ongoing and formative, that will help guide and inform program implementation, and that will
summatively demonstrate the worth and merit of the overall program as well as its components. The education program at CReSIS is guided by clearly articulated objectives that were developed and revised by the education team and the administrative director. (Appendix A) For these reasons, it seems most appropriate to employ an evaluative approach that is both objectives-oriented and management-oriented. The evaluation should answer the question, “How well is the program meeting its stated objectives?” The answers should provide useful information to the Education Coordinator to aid in making program decisions. The evaluation process should also be responsive to the possibly changing needs of the Education Coordinator and the Center itself. This evaluation plan will give shape and direction to the process, but it is understood that the plan is a living document that will grow and change along with the Center and the Education program.

True to the objectives-oriented evaluation approach, an appropriate first step is to develop a logic model that identifies program objectives, activities that can be evaluated, and expected short- and long-term outcomes. The logic model is included as Appendix B. This logic model leads to the development of a more fully articulated evaluation plan. What exactly is going to be measured (to determine how well the objectives are being met), how is it going to be measured, and who is responsible for measuring it? The Evaluation Plan by Objectives is included as Appendix C.

It is critical to interview the key stakeholders at the outset of the evaluation process to identity their key concerns, questions, and needs. In addition, periodic re-visits with these stakeholders will keep the evaluation on track and keep stakeholders apprised of evaluation information in a useful and timely manner.
Focusing the Evaluation

The purpose of evaluating the educational program component of CReSIS is two-fold. First, the evaluation plan is designed to provide formative information to the education coordinators to help modify and improve the educational program during the grant period. Second, it is designed to provide summative information about the ultimate impact of the education program’s efforts on graduate students, undergraduate students, and K-12 students and teachers. Both formative and summative aspects of the evaluation plan are guided by the objectives articulated in the Center’s Education Project Plan.

This section will identify the primary stakeholders in this evaluation and the key questions that focus the evaluation study.

Primary Stakeholders/Decision Makers:
- Education Coordinator at KU
- Administrative Director
- CReSIS Center Director
- National Science Foundation

Secondary Stakeholders:
- Education Team:
  - K-12 Outreach Coordinator
  - Education Coordinators at partner institutions
  - Project Coordinator
  - Education Program Evaluator
  - Graduate Research Assistant
- CReSIS Faculty
- CReSIS Graduate Students
- CReSIS Undergraduate Students
Key Questions:

- How successful is the Education Program at CReSIS at producing:
  - Graduate/Undergraduate students with:
    - Appropriate theoretical and practical content knowledge?
    - Sufficient skills to conduct independent (grad) or supervised (undergrad) research?
    - A service-orientation and world perspective?
    - An understanding of viable career paths available to engineers and scientists in the STEM fields?

- How successful is the Education Program at CReSIS at:
  - Exposing K-5 students to the STEM fields using Polar Science content?
  - Reinforcing 6-8 students’ foundational skills necessary to pursue careers in the STEM fields?
  - Motivating and encouraging 6-8 students to pursue careers in the STEM fields?
  - Enhancing 9-12 students’ foundational skills necessary for careers in the STEM fields?
  - Motivating 9-12 students to pursue careers in the STEM fields?

- More broadly, how successful is the CReSIS Education Program at:
  - Increasing the diversity of students entering the STEM fields, and polar science in particular, to more closely mirror the diversity of American society?
  - Maturing a sufficient, but not overabundant, diverse pool of future scientists and engineers who are talented, capable, and eager to assume the responsibility for polar science research?

The measures of success for the tasks that support these objectives are outlined in the Chronological Evaluation Plan included as Appendix D.
Implementation Plan

Initially, the evaluation will focus on the formative part of the evaluation plan. The formative evaluation will be used to help determine the degree to which the CReSIS education program efforts are implementing the action steps and meeting the objectives of the Education Project Plan. Appendix C, entitled Evaluation Plan by Objective, lists objectives, the measures that can be used to assess the objectives, and the time period during which the assessment will be made. The most common methods for collecting the evaluation data will include pre-/post- tests for CReSIS courses, attitude surveys of those involved, and interviews with faculty and students. Occasionally, the evaluator will conduct first hand observations of project activities. Whenever feasible, baseline data will be collected to provide a comparison for program outcomes. Baseline data for the diversity objective is available at the National Science Foundation's website, <http://www.nsf.gov/statistics/wmpd/> The evaluator will also study archived records to use as evidence of program implementation and successful achievement of program objectives.

Data (diversity included) will be collected via pre-/post-test, survey, and/or observation during and/or following every CReSIS sponsored course and/or activity and analyzed on a rolling basis. All participating students will be included in the data; there will not be a need for any sampling strategies. An overall evaluation of Education Program activities will be conducted at the end of the Spring Semester. Student/faculty attitude surveys will be conducted twice a year, immediately preceding Spring Break and at the beginning of the Fall semester. Overall diversity data will be collected and analyzed annually, at the beginning of the Spring Semester. Interviews of local key stakeholders will be conducted annually at the beginning of the Summer Session.
Pre- and Post- tests will be designed and administered by the course instructor. Attitude surveys will be designed on a five-point Likert scale (Appendix E) and will be administered either by the course instructor, the program evaluator, or another member of the Education team. All quantitative data will be analyzed by the evaluator and presented first to the Education Coordinator. This data will be presented in numeric and graphical form accompanied by a narrative evaluation. Data obtained through interviews will be written up in narrative or bulleted form and used both to triangulate the validity of quantitative evaluation data, but also to check stakeholder perceptions and expectations against the direction and outcomes of the Education Program and its evaluation.

A note about conflict of interest:
As an internal evaluator, my first priority is to conduct an accurate and useful evaluation of the Education Program. As a member of the education team who contributes ideas and assists in program implementation, I may also have more of a personal stake in the success of some Program activities than in others. However, I recognize that it is neither in the Program’s best interest, nor in my own, to allow personal biases to color the outcome of the evaluation.

Reporting and Utilizing Results

The Education Coordinator and the rest of the Education team will be apprised of all evaluation data collected and analyzed at the weekly team meeting. It is at this weekly meeting that unintended or unanticipated outcomes can be examined and decisions can be made to adjust Program activities as a result of evaluation data. Evaluation results may also be presented at the monthly videoconferences with the Education Coordinators at the partner institutions. At the Coordinator’s direction, evaluation reports can be distributed to any and all relevant stakeholders. Evaluation reports may include both a written summary of evaluation findings and an oral presentation of evaluation results to an individual (i.e. the Center Director) or a group of relevant stakeholders. In addition, at the
discretion of the Education Coordinator, the Program Evaluator may amend this evaluation plan at any time.

Prepared by
Dana Atwood-Blaine
Education Program Evaluator
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