E-lab Taskforce
Version 8
September 16, 2011

Confirmed Members

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<tr>
<th></th>
<th>Rainer Newberry</th>
<th>Orion Lawler</th>
<th>Rich Collins</th>
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<td>UAF</td>
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<tr>
<td>UAA</td>
<td>Jim Panteleone</td>
<td>Andy Veh</td>
<td>Mark Fitch</td>
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<tr>
<td>UAS</td>
<td>Mike Stekoll</td>
<td>Deborah Barnett</td>
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<td></td>
<td>Sherry Tamone or Cathy Connor</td>
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Composition:
- 10 core members
  - A current or former member of Faculty Alliance as Chair/Convener, selected by FA (in collaboration with the Statewide Academic Council)
  - Three faculty (preferably tenured) from each MAU, selected by the FS president (in collaboration with the Provost). The faculty should reflect a diversity of views and/or experiences with E-labs, and if possible a faculty from one of the MAU’s community campuses (e.g., Sitka, Bethel, Soldotna).
- 2 ex-officio members
  - An instructional designer
  - A staff person with knowledge on transfer issues
  Note: ex-officio members will come from UAA, the campus that is hosting the retreat (described below).

E-lab Problem

Whereas e-learning can do some things that traditional, face-to-face classroom learning cannot do (e.g., deliver curricula to students who are geographically isolated), many faculty are concerned about the use of E-labs as substitutes for face-to-face labs. These concerns have led to curriculum proposals that, in effect, prohibit certain labs from being offered as E-labs. Additionally, there has been debate about whether to accept E-labs as transfer credits. In the next several years, department after department at each of UA’s MAUs is likely to deal with issues around E-labs:

- Offer them or prohibit them on the main campus?
- Accept or reject them from a community campus?
- Approve labs that have some e-delivery features but require a certain amount of face-to-face time in a physical lab? Accept or reject them as transfer credits from outside UA?

Rather than having each department deal with E-lab issues anew, Faculty Alliance (at the recommendation of the Statewide Academic Council) will form an E-lab Taskforce to provide recommendations about processes to use and evidence to consider when departments and faculty governance make informed decisions about E-labs.

Charge of E-lab Taskforce and Expected Goals

In recognition that (a) SAC reviews major revisions to programs but does not review individual courses, (b) faculty have expertise in and control over their local curricula, and (c) each MAU is separately accredited with unique realities (e.g., facilities, enrollment pressures, etc), the E-lab Taskforce will not impose on the MAUs and their departments a binding policy about E-labs; rather the Taskforce will make non-binding recommendations (or best
practices) to the Provosts and Faculty Senates in the following two main areas: curriculum proposals and transfer credits.

Curriculum Recommendations

With regard to curriculum, the Taskforce will consider making recommendations on the following issues.

1. Principles by which departments evaluate the appropriateness of a lab for e-delivery
2. Departmental coordination on E-lab sections
   - How can within-department conflicts about E-labs be avoided and resolved? What if a faculty member at a community campus wants to offer an E-lab but the Chair at the main campus opposes the E-lab?
3. Departmental coordination on E-lab curriculum proposals
   - Should there be special processes for coordination when a department makes a curriculum proposal that creates or prohibits E-labs?
4. Governance’s criteria for evaluating E-lab proposals
   - What kinds of evidence/criteria are recommended when making curriculum proposals that create or prohibit E-labs? For instance, should faculty/departments seek out recommendations (for or against) from relevant professional organizations (e.g., AAC&U, American Psychological Association) or comparable departments in other universities who have experimented with E-labs?
5. Governance’s processes for approving/rejecting E-lab proposals
   - What kinds of evidence/criteria should be considered when making curriculum decisions about E-labs?
     - Should that evidence be different than when making decisions about face-to-face labs?
   - Should faculty governance adopt a practice of approving the delivery method of courses? Should such approval make reference to the different models of e-learning (e.g., level 1, 2, 3 and 4)?
   - Should there be trial periods for newly approved E-labs?
     - Should there be trial periods for other delivery methods?
     - How long will the trial period be?
     - What evidence should be considered after a trial period?
   - If a decision is made to prohibit an E-lab, how long will the prohibition last?
     - Will there be a process whereby a prohibited E-lab can be reconsidered early? If so, what will the process be? What evidence will be used?
6. Provost’s resolution of conflicts
   - How might the provost resolve conflicting positions on an E-lab proposal where, for instance, a department and Faculty Senate oppose a particular E-lab, but a faculty member and a Dean or Director supports that E-lab?

Transfer Credit Recommendations

The primary focus of the Taskforce is to make recommendations on the above curricular issues. If the Taskforce succeeds on making those curricular recommendations and, if time permits, the Taskforce will consider recommendations on the following:

1. Principles by which to evaluate the appropriateness of another university’s E-lab for transfer credit at inside UA.
2. Whether the Registrar’s office and Provost should approve E-labs as transfer credits from the other MAUs
3. Whether the Registrar’s office and Provost should approve E-labs as transfer credits from outside of UA
4. The role Departments have in making recommendations for the acceptance of E-labs as transfer credits
5. What the Registrar’s office should do if it is unsure if a lab from another university was taken as an E-lab

Operation of the E-lab Taskforce

When making these non-binding recommendations to Faculty Senates, Provosts, and the Statewide Academic Council, the E-lab Taskforce should, where possible, consult with, for example, the following:

- National guidelines on E-labs (e.g., AAC&U, AAUP)
• Various disciplinary guidelines in the on E-labs (e.g., American Psychological Association, American Geophysical Union)
• Board of Regent’s policy on transfer credits
• The goals and objectives of UA’s Academic Master Plan
• UA response to the Distance Education Legislative Audit (e.g., whether an E-lab is a level 1, 2, 3 or 4 distance course).
• Instructional design experts
• Accreditation reports from UAA, UAF, and UAS
• Empirical data and studies on the ability of E-labs to meet learning outcomes as effectively as face-to-face labs
• Demonstrations of E-labs done right and E-labs done wrong.
• Materials on transfer issues/concerns with E-labs
• Other readings on as provided by the Chair and taskforce members

The Taskforce will not make any across-the-board endorsements for or against E-labs. Given that E-lab considerations vary from course to course and university to university, curricular decisions about E-labs must be made by local faculty, departments, governance bodies, and administrators. Instead, the Taskforce will provide recommendations for agreed-upon processes that curriculum-approval bodies might use when making decisions about E-labs, and criteria that proponents and opponents can use when making their cases.

The Taskforce will aim for consensus on its non-binding recommendations. Taskforce membership is not intended to be representative of faculty support for or opposition to E-labs; rather, it is intended to span different perspectives (viz., proponents, opponents, faculty with experience in e-learning, faculty from the ‘main’ campuses, and faculty from community campuses). If Taskforce members cannot agree on a particular process and/or criterion (e.g., the length of trial periods for E-labs), the Taskforce will summarize the competing viewpoints on those issues.

Timeline:

• 30min conference call
• Collection of documents from members
• 2-day retreat
  o Discussion of documents
  o List of principles
• August 24-25, 2011: Retreat (Location: UAA)
  o Goals of the retreat:
    ▪ Discussion of the goals for the taskforce
    ▪ Discussion of ground rules for the taskforce
    ▪ Discussion of curriculum approval issues
    ▪ Development of plan to divide the work on curriculum approval issues, presumably into subgroups
    ▪ Break-out sessions for subgroups to work on criteria and processes related to curriculum approval of E-labs
    ▪ Identify dates for a video-conferences of the full taskforce
    ▪ Presentation of Blackboard site for document sharing and communication
• September-December TBA
  o Subgroup audio meetings as needed
  o Full Taskforce audio meetings monthly
• December 2011
  o 12/7: Presentation of recommendations to SAC at UAA, bringing one member from UAF, one from UAS, and one from UAA.
- January 2012:
  - Revisions based on SAC recommendations
- February 2012
  - Draft recommendations submitted to three Faculty Senates
- April 2012:
  - Comments from Faculty Senates
- May 2012:
  - Final recommendations submitted to SAC, Provosts & Senates

### Proposed Budget

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*Note: per diem is not paid for same day travel, but taxi expenses are allowed and included as per diem above.*

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**Total** $6,660.00
October 2011
Second Edition

Richard L. Collins  rlcollins@alaska.edu
Warren W. Via  wwvia@alaska.edu

Report

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B. Essential Principles and Fundamental Concepts for Atmospheric Science Literacy
C. CDE Memorandum of Agreement
D. Alaska Space Grant Higher-Ed Proposal
E. Alaska Space Grant Higher-Ed Final Report

This report presents the results of a program assessment that consists of activities undertaken to measure effectiveness of a process, program or service, the results of which are to be shared only with individuals associated with the process, program, or service being evaluated.
1. **INTRODUCTION**

The University of Alaska Fairbanks (UAF) provides access to higher education to all Alaskans through distance-delivery of courses and programs. UAF offers several Bachelor Degrees by distance (e.g., Elementary Education, Rural Development, Social Work). These distance programs require that laboratory-based science courses are made available by distance so that students can meet their core science requirements. In 2009 instructors in the UAF College of Natural Science and Mathematics’ (CNSM) Department of Atmospheric Sciences (DAS), and School of Education (SoE) began considering how they could develop ATM101: *Weather and Climate of Alaska* to meet curricular needs for students seeking degrees in elementary education by distance. The CNSM and SoE instructors recognized the need to draw on the expertise of educators from across the UAF system to better understand the resources and challenges available to instructors. Furthermore they hoped to build relationships between instructors and units that would support the development of strong science courses that would meet the needs of students across Alaska who were seeking to complete degree programs by distance.

This report describes our efforts to develop distance-delivered laboratory science courses at UAF. In section 2 we describe the *Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska* (DISLAB) workshop and present the issues raised in the workshop. In section 3 we describe five follow-up activities associated with the DISLAB workshop. In section 4 we present key themes that arose from the DISLAB workshop and associated activities. In section 5 we describe the class “ATM101: *Weather and Climate of Alaska*”. Finally, in section 6 we present our recommendations.

Our goal in preparing this report is to provide a reference and resource for administrators and instructors who are considering developing distance laboratory-based science courses. The report discusses the instructional, resource and workload issues associated with this effort at UAF.

**Acknowledgements:** The activities and workshop were made possible through financial support from the National Aeronautics and Space Administration (NASA) Alaska Space Grant Program (ASGP) and UAF College of Natural Science and Mathematics (CNSM), College of Rural and Community Development (CRCD), School of Education (SoE), and Office of Faculty Development (OFD). The DISLAB workshop received excellent support from the following staff members: Barbara Day, Atmospheric Sciences, CNSM; Brandy Pedersen and Jescia Sigh, Engineering, Science and Technology Experiment Station, CNSM; Sheena Tanner, Fiscal Office, CRCD. We thank our colleagues for their critical reading and correction of the first edition of this report. Finally, we thank the UAF instructors from across Alaska who took the time and made the effort to share their experiences and insights with us.
2. DISLAB WORKSHOP

The Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska (DISLAB) workshop took place on the Fairbanks campus on 1-2 October 2010. Thirty-five educators from seven colleges, schools, and institutes and five campuses participated -- College of Engineering and Mines (CEM), College of Natural Science and Mathematics (CNSM), College of Rural and Community Development (CRCD), Geophysical Institute (GI), School of Fisheries and Ocean Sciences (SFOS), School of Natural Resources and Agricultural Sciences (SNRAS), and School of Education (SoE) -- Bristol Bay Campus (BBC), Fairbanks Campus (FC), Kuskokwim Campus (KC), Interior Aleutian Campus (IAC), and North West Campus (NWC). The workshop included 18 presentations with discussion and featured talks by individual instructors as well as a team presentation from the Center for Distance Education (CDE). The workshop website at http://dislab.pbworks.com/w/page/28496529/FrontPage has copies of the workshop materials including presentations and notes. The emphasis of the workshop was to have practitioners share their experiences and engage in discussions with peers. Regardless of their perspectives and experiences, the attendees demonstrated energy, enthusiasm, and commitment to science education. On the second day of the workshop (Saturday afternoon) the attendees stayed beyond the scheduled time to complete their discussions.

The following themes emerged from the presentations and discussions;

1. Need for distance-delivered laboratory-based science courses
   a. University of Alaska has a commitment to educational access for all Alaskans and distance-delivery of degrees.
   b. Several degrees (Elementary Education, Social Work, and Rural Development) are offered by distance and require Core laboratory science courses.
   c. Students who cannot leave rural communities depend on distance-delivered classes to complete degree.
   d. Students find distance-delivered classes outside UAF and transfer the credits in.
   e. Faculty want to ensure that regardless of the mode -- and location -- of delivery the course standards and outcomes are equivalent.

2. Challenges of science education
   a. There is a national movement to develop science curricula in which students learn science by “being scientists”.
   b. There is a national movement to replace traditional “expert-content-delivery” approach with a “peer-learning” or “collaborator” approach.
   c. Laboratory experience is critical to understanding physical phenomena and allows students to “do” rather than “watch”.
   d. There is a need for science curricula in which education majors both understand science and learn how to teach science.
   e. Curricula need to ensure the equivalence of “field work experience” and “laboratory experience”.

2/13
f. There are differences in curricula of science courses for scientists and those for non-scientists.
g. Place-based learning incorporates local resources as well as reinforces relevance of curriculum to students.
h. Laboratory-based classes are expensive in time, space and money.

3. Lessons from distance-teaching and -learning

a. Development of distance curricula is a major effort and often requires faculty members to rethink their teaching approach.
b. Distance-delivered classes place more demands on students in terms of being motivated and taking responsibility for learning.
c. Distance-delivery tools and techniques can be used to extend face-to-face classes.
d. Instructor-student communication in distance-delivered classes can exceed that in face-to-face classes.
e. Instructor’s role shifts to one of mentoring rather than “delivering content”.
f. Distance-delivered courses are more than correspondence courses on steroids.
g. Students find distance-laboratories require more effort as they cannot rely on lab-partner(s) to get by.
h. Management of kits for distance-delivered laboratories is a major effort.
i. Travel costs of laboratory-intensive periods are much greater than can be recovered from tuition and require support through grants.
j. Enrollment in face-to-face classes is not affected by availability of distance-delivered classes.
k. Urban distance students and rural distance students have different needs in taking distance classes.
l. Distance classes can provide a globally accessible “shop window” for the university.

4. Challenges for instructors, departments, and degree programs

a. Better integration of science instructors in CRCD and science departments in CNSM and SNRAS.
b. Workload support for professional development of instructors to develop distance classes.
c. Establishment of consensus in departments about course outcomes regardless of whether they are delivered by distance or face-to-face.
d. Need to develop curricula that support student success in overall degrees as well as individual classes.

5. Resources for development of distance-delivered classes

a. CDE provides training and support for faculty members to develop distance-delivered classes.
b. CDE and OFD support redesign of pedagogical style (i.e., Understanding by Design) as well as mode of instruction.
c. Some disciplines (e.g., Chemistry) have developed virtual laboratory packages for use in undergraduate classes.
d. Various web-based packages (e.g., elluminateLive) support interactive classroom environments.
e. US Department of Education (DoEd), National Science Foundation (NSF), and the National Aeronautics and Space Administration (NASA) all support curriculum development in Science, Technology, Engineering, and Mathematics (STEM).
f. Agencies support increased diversity of STEM-educated students in both the general workforce and the STEM workforces.
3. FOLLOW-UP ACTIVITIES

Based on the DISLAB workshop Collins and Via participated in five other formal activities during the 2010-2011 academic year. These activities were;

1) Eric Mazur science education workshop
2) CDE iTeach workshop.
3) NSF TUES workshop.
4) Visit to Bristol Bay Campus
5) Alaska Space Grant Symposium

Collins and Via participated in the workshop led by Dr. Eric Mazur, Balkanski Professor of Physics and Applied Physics at Harvard University on 28 October 2010. Mazur was brought to UAF by the Office of Faculty Development (OFD) for three days of presentations and workshops. He is a leader in revising physics teaching (http://mazur.harvard.edu/education/educationmenu.php) and focuses on the role of peer-learning in science education and the need to allow students develop deep understanding through peer discussion and interaction – rather than traditional lectures. The DISLAB workshop made it clear that for distance-delivery of science classes to work for a broad student population, the class would have to be structured to allow the distance students to develop a “lateral network” of peer interactions and not just work though the central node of the “instructor at a distance”.

Collins participated in the iTeach (http://distance.uaf.edu/faculty/faculty-development/iteach/) workshop on 12-13 February and 3-4 March 2010 conducted by CDE with sponsorship from OFD. The workshop focused on curriculum design through “Understanding by Design” (http://en.wikipedia.org/wiki/Understanding_by_Design) and the tools available to support distance-delivery of courses. Key elements involved how to create a true peer-learning environment with students engaged as a cohort of science investigators, rather than a model of “web-enabled independent correspondence course”. Much of the activity in the workshop focused on improving curriculum design regardless of how the class is delivered.

Collins attended the web-based workshop on Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) program on 22-23 March 2011 (http://www.step.eng.lsu.edu/nsf/participants/). The National Science Foundation (NSF) Division of Undergraduate Education operates the TUES program (http://www.nsf.gov/div/index.jsp?org=DUE), which seeks to improve the quality of STEM education for all undergraduate students. The workshop fostered active participation. Attendees were divided into small groups and asked to reflect on questions such as: What kinds of proposals are appropriate for the TUES Program? What questions could a
proposal address? The workshop presented a variety of programs that are addressing the questions raised by Mazur and the iTeach workshop about how to inject active investigation and peer-learning into classes.

Collins visited Dr. Todd Radenbaugh at BBC on 10-12 April 2011. Radenbaugh has participated in the DISLAB workshop and provided significant feedback to Collins. The campus provides many distance-delivered courses and Radenbaugh teaches “ENVI101: Introduction to Environmental Science” (http://www.uaf.edu/courses/courses-detail/index.xml?name=Environmental_Studies - ENVI&abrev=ENVI). The goal of the trip was to better understand how distance courses are delivered. Collins attended a class that Radenbaugh delivered and talked with other BBC instructors (Jim Jones, Tomas Marsik, and Natalia Zinger) about delivering courses by distance. The visit highlighted efforts used by instructors to maintain a cohort amongst the distance students and engage them with place-based projects and investigations.

Collins chaired a forum on laboratory science education at the Alaska Space Grant Symposium in Anchorage on 17-19 May 2011 (http://spacegrant.alaska.edu/). The forum brought together a panel of instructors from UAF who had participated in DISLAB (Kim Morris, Dan Solie, Vanessa Spenser, Susan Warner) with a cross-section of Space Grant grantees (Cathy Connor, Richard Myers, Rebecca Parks, Robert Parsons, and David Scheel) to share their science education experience and identify the critical elements in laboratory-based and hands-on science classes. The Space Grant grantees provided perspectives from K-12 and university programs both in formal classroom settings as well as in outreach. Several educators emphasized the importance of hands-on team projects (e.g., robotic fighter competitions) in engaging and retaining students that would otherwise have “given up” on STEM classes.

4. KEY THEMES
4.1 Students as Scientists

Based on the presentations and discussions at the DISLAB workshop and other activities, it is clear that a major review of science curricula is underway in schools and universities. Whether talking to colleagues, studying “Understanding by Design”, listening to Eric Mazur, or hearing experiences from PIs in the TUES program, there is a widespread recognition that traditional methods of teaching science to undergraduates are not as effective as educators would like. Educators are questioning how well the traditional model of lecture and well-defined laboratory exercises contributes to students developing a deep understanding of science. In several universities across the country instructors are moving their science curricula to a model in which class time is focused on peer group learning and discussion (rather than just listening to the instructor) and laboratories support open investigations (rather than canned exercises). Peer discussion is recognized as critical for students to build deep understanding. The goal of this effort is to have students participate as scientists rather than students of science.
4.2 Investigations and Laboratories

Based on the presentations and discussions at the DISLAB workshop and other activities, science instructors believe that students who conduct scientific investigations learn science better than those who do not. Many instructors believe that for students to understand science they must have a hands-on experience conducting investigations that support a deeper understanding of the physical world. For example, many instructors in geology believe that it is crucial for students to work with real rocks, those in chemistry that it is crucial for students to work with real chemicals, those in biology that it is crucial for students to work with real plants and animals, and those in electrical engineering that it is crucial for students to build working circuits. These exercises draw students into the wonder of science and engineering, provide physical understanding, and reward them with a sense of accomplishment in completing experiments.

The laboratory component of many curricula is often facilitates students to acquire specific skills with specialized equipment (e.g., handling and manipulating chemicals, dissecting tissue and organs, building and testing circuits) that serve as a foundation for further classes, or are part of the professional skill-set held by program graduates. In several disciplines the laboratory curriculum is designed to meet the educational mandates of a professional accreditation board or agency. The effort to support laboratory-based programs, both in terms of complexity as well as cost, is a major commitment in most departments. Many educators are concerned that the move away from physical to virtual investigations is driven by financial rather than pedagogical concerns.

Individual laboratory exercises can provide a structured exercise that contributes to the students’ larger investigation and understanding. Traditional laboratories provide a well-defined environment for conducting pre-defined investigations in a readily “testable and gradable” fashion. However, instructors also recognize that laboratory exercises can also be reduced to canned exercises that do not draw students into a sense of investigation and/or development of critical scientific skills. In the worst case the laboratory exercises can become a set of compartmentalized chores to be completed. Students in such lab courses often express frustration that this component of the class is not well-integrated into the lectures.

4.3 Distance-Delivery of Courses

Based on the presentations and discussions at the DISLAB workshop and other activities it is clear that there is a wide variety of opinion about distance delivery of courses. Many face-to-face instructors are concerned that distance classes are effectively web-based correspondence courses, with no substantive interaction between instructor and students. Some of these instructors perceive distance classes as inherently inferior to face-to-face classes. Those instructors with experience teaching distance courses
feel that current technology allows the instructor develop strong working relationships with the students and a true cohort relationship amongst the students. However, they recognize that a successful distance class requires significant training, effort and organization on the part of both the instructors and the students. For example, in distance classes it is harder for the instructor or student to come to class under-prepared and respond on-the-fly to the circumstances as they find them. There is also an expectation in distance classes that the curriculum, materials, assignments and other elements of the course are largely in-place and ready to go as a complete package at the start of the semester.

One instructor drew the analogy with vegetarianism where the goal is not to recreate an “ersatz meat veg and potato meal” without meat, but to create different meals that are tasty and complete. These discussions raised the questions about the need to identify the tools and methods that are unique to distance and face-to-face classes that are most effective in those distinct settings.

Distance laboratories can be delivered in a variety of ways; (i) by having students travel to laboratories for intensive on-site sessions, (ii) by mailing laboratory kits to students, or (iii) by conducting laboratory exercises as simulation exercises. Laboratory intensives have been successfully used in several classes at UAF. However, they are expensive and often funded by external sources that supplement the departmental budgets. Some laboratory intensives depend on support from the US Department of Education to CRCD as part of the College’s service to Alaska Native students. Mailing lab kits to students guarantees that all of them can do their laboratories locally. However, this approach is labor intensive for the instructor (particularly at smaller rural campuses) who has to assemble and mail the kits and then ensure that they are returned at the end of the class. Instructors feel that the creation of a “distance stock-room” with a staff member to support handling of the kits would greatly facilitate this. Chemistry publishers have developed simulation software for basic chemistry laboratories (e.g., Virtual Chem Lab by Pearson, http://www.phschool.com/tech_support/ts_chem_lab.html). Students are required to install the software on their computers rather than use an existing web-based application. The publishers provide polished simulation packages but the Chemistry Department has not yet employed them as a virtual laboratory class.

4.4 Inter-College Collaboration

Based on the presentations and discussions at the DISLAB workshop and other activities, instructors in CRCD are delivering science courses by distance on behalf of departments in CNSM. These instructors and departments do not always feel connected to each other. The CRCD faculty member may feel that the CNSM department does not understand the particular circumstances of teaching rural students while the CNSM department may feel that the CRCD instructor is not offering the course consistent with the Fairbanks campus class. There does not appear to be a standard practice of having
instructors visit departments in Fairbanks or have department chairs visit instructors at other campuses. The percentage of tenure-track faculty is lower in CRCD than in CNSM, and so term faculty members (who have the least institutional career commitment) are addressing some of the most challenging classroom situations.

4.5 Career Development, Workload, and Faculty Resources

Based on the presentations and discussions at the DISLAB workshop and other activities, there is significant concern about the effort required to develop rigorous distance laboratory science classes. It is widely recognized that curriculum development for any class is a major effort and relatively under-recognized in the promotion and tenure process. Development of contemporary distance classes requires two distinct tasks; first a redesign of the curriculum using “backward design”, and secondly development of the technical skills to deliver the material and interact with the students. These tasks represent significant workload effort for an individual instructor and may be greeted with some caution by the instructor’s peer group resulting in lack of support in terms of both immediate workload and the long-term peer-evaluation. There is no uniform policy about whether the development of the distance version of a class should be treated as development of a new section with relatively little review by the department or as development of a new class with a major review by the department. There is no policy about how the redevelopment of a course is recognized as a workload contribution.

Training in “backward design” is being offered by CDE and OFD through the iTeach workshops. These workshops offer instructors a valuable opportunity to rethink their teaching principles and practices in discussion with instructional designers as well as instructors from other departments, colleges, and campuses. These intensive several-day workshops are also supplemented by seminars, webinars, and workshops offered by OFD.

The ASGP sponsorship of this project was a key element in attracting participation by faculty and support from deans for the DISLAB workshop and the support of the faculty in DAS (Uma Bhatt, Javier Fochesatto, Nicole Mölders, and Ken Sassen) and Dean of CNSM (Paul Layer) for the development of ATM101 as a distance class. The submission of the proposal and much of the workshop pre-planning occurred in the academic year 2009-2010. This pre-planning period allowed time for Collins and Via to develop institutional buy-in from all the co-sponsors and accumulate the matching resources for the project. The major activities of the project occurred in 2010-2011. The project supported the delivery of the DISLAB workshop, participant travel support for the DISLAB workshop, travel to the Bristol Bay Campus, participant travel support for the Alaska Space Grant symposium, and the purchase of materials and supplies for testing ATM101.
5. ATM101: WEATHER AND CLIMATE OF ALASKA

ATM F101X: Weather and Climate of Alaska is a 4-credit laboratory course that meets core science requirements for Bachelors and Associate degrees at UAF. ATM F101X is one of 29 "X" courses that meet the core Natural Sciences requirement (http://www.uaf.edu/courses/courses-detail/index.xml?name=Atmospheric Sciences - ATM&abrev=ATM). ATM F101X is the only 100-level course offered by DAS and is offered each spring on the Fairbanks campus. The ATM F101X laboratories are conducted in the Departments of Chemistry and Physics under a long-standing cooperative agreement between the three departments. DAS does not offer an undergraduate degree but offers three 400-level courses (i.e., ATM F401: Introduction to Atmospheric Science, ATM F413: Atmospheric Radiation, ATM F445: Atmospheric Dynamics) that support the Bachelor of Applied Physics with concentration in Atmospheric Physics offered by the Department of Physics and the Bachelor of Environmental Chemistry offered by the Department of Chemistry and Biochemistry. These 400-level courses are offered as stacked classes with the equivalent 600-level courses.

ATM101X is a traditional lecture-lab course, and is currently structured around semi-weekly lectures (29 lectures), weekly quizzes (11 quizzes), and weekly laboratories (10 laboratory exercises), two term exams and a final exam. There are several established textbooks that provide suitable curriculum content for the course. The current textbook is “Meteorology Today: An introduction to weather, climate, and the environment” by C.D. Ahrens, Ninth Edition, Brooks Cole, 2009 (http://www.cengagebrain.com/shop/isbn/9780495555735). The textbook material is supplemented by web-sites, articles, and videos. The course features two guest lectures (one given by a practicing scientist in Arctic climate studies and another by a practicing weather forecaster from the National Weather Service). The course also has a field trip to a weather balloon (or radiosonde) launch where the students assist in the balloon launch. The course employs a Blackboard® site for hosting announcements, course materials, and solutions.

The current instructor, Dr. Richard Collins, started teaching ATM F101X in 2006 after transferring to DAS from the Department of Electrical and Computer Engineering in 2004. Dr. Collins has taught the course each spring semester (2006, 2008, 2009, 2010, 2011) except for 2007 when he was on sabbatical and Dr. David Atkinson taught the class. Having reviewed the laboratory materials in Spring 2006, Collins identified inconsistencies and errors the laboratories. In summer 2006, Collins employed Elijah Kagan, an undergraduate student, with support from the summer Research Experience for Undergraduates (REU) program, to review the laboratories and establish a corrected and consistent set of materials for the class. In spring 2011, Kim Morris attended the outdoor laboratory on snow and provided some comments based on her experience as the GI-based Principal Investigator of the Alaska Lake Ice and Snow Observatory network (ALISION; http://www2.gi.alaska.edu/alison/index.html). The ALISON project
supports K-12 students and teachers in a scientific research and content experience program that focuses on snow and ice.

Both Collins and Atkinson recognized that some students thought of ATM101 as a “soft” alternative to “hard” science courses in Physics and Chemistry. Collins and Atkinson attempted (if not always succeeded) to ensure that the course fostered curiosity about the environment while meeting the college science requirements.

Enrollment in the course was typically between 10 and 20. Collins recognized that the class had the capacity to serve more. In fall 2009 he approached Dr. Carol Barnhardt in SoE to discuss if the feasibility of tailoring the class to serve students pursuing a Bachelor’s degree in Elementary Education. Barnhardt informed Collins that Cindy Fabbri in the School of Education had worked extensively with the Department of Geology and Geophysics to structure GEOS F101X: The Dynamic Earth (http://www.uaf.edu/courses/courses-detail/index.xml?name=Geology and Geophysics – GEOS&abrev=GEOS) as an on-campus science course that would meet the needs of K-12 educators in teaching science. Rather than have ATM101 “compete” with GEOS101 on campus, Barnhardt suggested that Collins develop ATM101 as a distance-delivered course that would meet core science requirements (i.e., include a laboratory component). Barnhardt noted that such distance-delivered classes were rare and their absence posed a real challenge to the success of distance students pursuing Bachelor’s degree in Elementary Education. Barnhardt felt that a successful distance-delivered ATM101 would contribute to the graduation of a significant number of students, and she encouraged Collins to develop this. Barnhardt also recommended that Collins work with Warren (Skip) Via who is the instructor for Instructional Technology in SoE, and has extensive experience developing programs and curricula that support educators in both taking and delivering successful distance-delivered classes. Both Barnhardt and Via urged Collins to move quickly as the General Communication Inc. (GCI) Terrestrial for Every Region in Alaska (TERRA) project was underway to bring terrestrial broadband services to 65 communities and 9000+ households in the Bristol Bay and Yukon Kuskokwim Delta regions. The project will be completed in 2012 and will include the Bristol Bay and Kuskokwim campuses. Barnhardt and Via expected that with improved web access students in these regions would be looking for distance classes to complete their degrees.

Collins and Via decided the first step was to conduct a workshop for university educators who were interested in science education and distance-delivery of lab classes to share experiences, insights and resources. Collins and Via submitted a proposal to the ASGP to enhance distance-delivery of lab-based science courses to undergraduate students in the state of Alaska in March 2010. The proposal sought support for a curriculum development workshop (Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska, DISLAB) on the Fairbanks campus and subsequent course development.
The proposal was granted by ASGP in May 2010 and the workshop was scheduled for Fall 2010. The proposal was submitted to ASGP with the support of the CNSM through the Engineering, Science and Technology Experiment Station (ESTES). The workshop was co-sponsored by the CNSM, CRCD, SoE, and OFD at UAF.

Based on these DISLAB workshop and the follow-up activities, Collins commenced the revision of “ATM101: Weather and Climate of Alaska” for distance-delivery. Working with Morris (GI) and Warner (CDE), Collins and Via also identified and acquired key laboratory supplies for developing ATM101. Collins has begun reviewing the curriculum using a “backward design” approach as described in “Understanding by Design” and practiced in the iTeach workshop. The goal is to identify the core concepts that the instructor wants the students to understand, and then to develop the curriculum that allows the students to develop and demonstrate that understanding. In science education the goal is to have students learn and develop the understanding by participating in project and investigation-driven learning. CDE have developed a process for this design. Collins is using this approach to revise the curriculum for ATM101. He has identified key understandings for the class as well as reviewing core understandings and frameworks for atmospheric sciences that have been identified by national committees. Collins and Warner have registered for American Meteorological Society (AMS) course “Weather Studies” (http://www.ametsoc.org/amsedu/online/info/). The course package includes a textbook, an investigations manual, and web-based data for an introductory college-level course. Collins and Warner will critically review the AMS materials for incorporation into ATM101.

An example of such an investigation might be “Prepare weather report for visitors to your home in the last week of March”. As part of the report the students collect weather observations from different sources: from their location in the current period; from regional weather service offices; and from archives of historical and climatological data. They use this data to understand how weather evolves locally, how this is related to weather systems, and how this relates to global circulation and climate. They explore how a week in any one-year compares to the expected weather over many years. A key element in the exercise is not just the observation, analysis and interpretation of the weather but also the presentation of the information to an audience of peers and/or clients. The approach draws the students into being a “weather person” and allows them create a contemporary presentation of their investigation that they can share with their colleagues and community. Students in the class will compare presentations and critique them as a scientific peer group. Contemporary audio-visual tools can take a student beyond the isolated lab report to sharing their investigation in a way that draws them into deeper reflection, revision and understanding of weather and climate. Clearly such an exercise requires careful design and support by the instructor to ensure a scientifically rigorous exercise with real reflection, review and revision. However, such an approach also allows the student match the study to their local environment.
and exercise place-based learning. We are particularly interested in having the students integrate unique regional and cultural insights and ways of knowing into their understanding.

ATM101 will be developed for distance delivery during the academic year 2011-2012. Cameron Martus, a 2011 physics graduate from the University of Cincinnati and graduate student in the DAS, will work with the class as a graduate assistant funded by the office of the Dean in CNSM. Martus will develop and test the laboratory elements of the course in the fall semester and serve as a teaching assistant and grader when the class is offered in the spring semester. Collins, Martus, and Warner are developing the course and will offer it via distance in Spring 2012 as an “instructor-led online course” where Collins will guide the students in the class through toward an understanding of the weather and climate of Alaska. The class will be focused on investigations that have students explore their immediate environment and make connections to global processes at work in weather and climate. Collins will conduct this work as part of a "Center for Distance Education Memorandum of Agreement Appointment of 2011 Course Development". DAS will review the curriculum as part of the development process during the Fall 2011 semester. The departmental review will be incorporated into the curriculum development. Collins will be the instructor in 2012 as part of his CNSM faculty workload and plans to oversee the instruction of the course for the immediate future. Collins and Warner will establish methods to assess the learning outcomes of the students in the Spring semester. This assessment and the student surveys will be compared with previous assessments and surveys of ATM101. Tuition revenue sharing between CDE, DAS and CNSM will be established through a Memorandum of Agreement.
6. RECOMMENDATIONS

1) CNSM establishes a working group of instructors on distance-delivery of science courses. Such a working group would allow sharing of developments in different departments and disciplines, identify and advocate for resources, and support best practices in curriculum development. Such a working group could collaborate with the OFD to develop professional resources for instructors and would support efforts in the college as well as between colleges and schools at the University of Alaska Fairbanks.

2) CNSM establishes a central stockroom to manage and distribute laboratory kits in support of distance-delivered science classes.

3) CNSM establishes a professional framework and guidelines for instructors developing distance-delivery of science courses. This framework should recognize the individual effort required to develop strong curricula, identify those elements specific to development of distance curricula, recognize the role of workload and overload accommodations in these efforts, address how these efforts contribute to instructor’s activities reports and be assessed in promotion and tenure files.

4) CNSM and CRCD collaborate to ensure consistency in courses regardless of the location and the mode of delivery. Both colleges should support opportunities for place-based learning in different locations that use equivalent (but not identical) curricula. Furthermore, the colleges should support routine faculty meetings between instructors in different campuses and visits of department chairs to instructors at other campuses.

5) CNSM, College of Liberal Arts, CRCD, and SoE collaborate to ensure that distance-delivered science courses meet the core curriculum needs of students pursuing existing distance degrees at UAF.
### APPENDIX A: DISLAB Workshop Attendees

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Earth’s atmosphere continuously interacts with the other components of the Earth System.

**FC 5.1** – Earth’s atmosphere exchanges energy and matter within the Earth System through processes such as photosynthesis, the water cycle, biogeochemical cycles, the carbon cycle, and ocean currents.

**FC 5.2** – Interactions and feedbacks among the components of the Earth System can produce short-term oscillations (such as El Niño and La Niña conditions in the Pacific Ocean), long-term changes in the state of the system (such as global warming), and abrupt, unexpected events (such as sudden release of methane from permafrost).

**FC 5.3** – Earth’s atmosphere plays an important role in biogeochemical cycles in the Earth System. For example, the atmosphere is a reservoir of carbon in the Earth System, storing carbon released from natural processes and fossil fuel burning. Plants extract carbon from the atmosphere through photosynthesis.

**FC 5.4** – As a result of the long time-scales inherent in some Earth System processes, the impacts of some events may be felt only slowly throughout the Earth System and may continue to be influential long after the original event has changed. For example, because of the long time-scale of deep ocean circulation, an abrupt regional change in ocean salinity may take centuries to be reflected in the global circulation of the ocean.

**Figure 5:** Sea surface heights during El Niño and La Niña conditions, derived from TOPEXPOSEIDON and Jason-1 measurements. Images produced by Dr. Victor Zlotnicki, Dr. Lu-Leung Fu, and Akiko Nagahashi of the Ocean Research Element at NASA’s Jet Propulsion Laboratory.

**EP 6**

We seek to understand the past, present, and future behavior of Earth’s atmosphere through scientific observation and reasoning.

**FC 6.1** – Our understanding of Earth’s atmosphere comes from analysis, interpretation, and synthesis of accurate and purposeful observations of the atmosphere, ocean, biosphere, land surface, and Polar Regions.

**FC 6.2** – Data about Earth’s atmosphere are gathered by direct (in situ) measurement of temperature, precipitation, wind, pressure, and other variables, as well as by indirect (remote sensing) measurements taken at a distance using ground-based, satellite, and airborne instruments.

**FC 6.3** – Our understanding of Earth’s atmosphere allows scientists to develop numerical (computer) models that can be used to simulate Earth’s weather and climate. Such models are fundamental to modern weather analysis and forecasting and are essential to scientists’ efforts to understand Earth’s past climate and predict future climate.

**FC 6.4** – To generate predictions, numerical models must begin with observations of Earth’s atmosphere and the planet’s land and ocean surfaces. These data are used to provide starting conditions for models that are as complete as possible.

**FC 6.5** – Inaccuracies and the imperception inherent in instruments, mathematical representations of physical processes, model resolution, and discrete numerical calculations limit the accuracy of the resulting simulations and predictions. Models improve with technological and theoretical advances, which improve data quality and quantity and our ability to represent physical processes. The chaotic nature of the interactions among some of the natural processes ultimately limits how far in advance atmospheric phenomena can be predicted, forcing the use of statistical projections.

**Figure 6:** Climate system models produce visualizations such as this one, and provide scientists, policy makers, and educators with ways to manipulate, understand, and predict what variables control the atmosphere, climate, and the Earth System. Copyright: University Corporation for Atmospheric Research, NCAR Climate System Model.

**EP 7**

Earth’s atmosphere and humans are inextricably linked.

**FC 7.1** – Most living organisms on Earth are dependent on Earth’s atmosphere and its processes for survival. We require oxygen for breathing; rely on ozone in the stratosphere to protect us from harmful radiation from the Sun; depend on prevailing wind patterns to influence ocean upwelling and so supply food; rely on wind to power turbines, sails, and ventilators; and need rain for drinking water and agriculture.

**FC 7.2** – Living organisms can and do change the composition of Earth’s atmosphere and its processes. Many human activities, such as farming, forestry, building of cities, and burning of fossil fuels, alter atmosphere composition and thereby impact the functioning of ecosystems, human health, and climate on local, regional, and global scales.

**FC 7.3** – Human cultures around the world have adapted differently over hundreds to thousands of years to their unique local and regional weather and climate. Societies have different levels of vulnerability to rapidly changing weather and climate conditions. Seasonal weather can have major impact on individuals as well as society. Global and regional climate change may bring major changes to vulnerable cultures.

**FC 7.4** – Weather forecasts and predictions of future climate assist us in implementing mitigation strategies and adaptation to new climatic conditions.

**FC 7.5** – Citizens need to become educated about Earth’s atmosphere to make informed decisions on issues at local, regional, and global scales.

**Framework Development Process**

This framework for Atmospheric Science Literacy was developed in a collaborative effort with over 100 experts including atmospheric and climate scientists, K-12 and informal science educators, university faculty, and science policy specialists. Through the efforts of the organizing committee, a workshop was convened to draft the framework at the University Corporation for Atmospheric Research in Boulder, Colorado, in November 2007. The workshop included ~60 in-person participants, as well as ~40 online and video-conferencing participants. This final version of the framework represents the work of this community and additional experts after three revisions of the original draft arising from the workshop. Further information about the process, as well as access to earlier versions and comments provided by the community, are available at http://www.co.ucar.edu/asc/. Development of the framework for Atmospheric Science Literacy was supported by the National Science Foundation’s Geoscience Education Program.

This document is a component of a larger effort to develop a comprehensive literacy framework for the entire Earth System. Several other related frameworks have already been completed, including frameworks for Ocean Literacy and for Climate Literacy. Other framework development efforts are underway at this time. We expect that the products of preceding, concurrent, and future activities will be incorporated into the larger Earth System literacy framework.

**Mapping to Educational Standards**

By completing this framework, a first step has been taken toward relating the Essential Principles and Fundamental Concepts for Atmospheric Science Literacy to educational standards, a requirement for its utilization by the nation’s schools. In order to facilitate use of this information by classroom teachers, it would be helpful to have these big ideas cross-referenced with educational standards (such as the National Science Education Standards and Benchmarks for Science Literacy). In collaboration with leading educators, we will develop an additional document providing this cross-linkage, and anticipate completion of this effort by July 2009.
Earth has a thin atmosphere that sustains life.

**FC 1.1** - Earth’s atmosphere is a mixture of gases with small, but important, quantities of liquid and solid particles.

**FC 1.2** - The atmosphere has mass, is bound to Earth by gravity, and exerts a pressure which is greater near Earth’s surface and decreases with altitude.

**FC 1.3** - The atmosphere, which is very thin relative to Earth’s radius, varies vertically in layers which differ in composition, density, and temperature. The lowest 8-16 km of the atmosphere – the troposphere - contains most of Earth’s weather systems.

Figure 3 - This view of Earth’s horizon as seen across the Pacific Ocean was taken on 27 July 2003 by an Expedition 7 crewmember aboard the International Space Station (ISS). Areal types of thunderclouds are also visible. Courtesy of NASA Human Space Flight Collection.

*Figure 3 - This view of Earth’s horizon as seen across the Pacific Ocean was taken on 27 July 2003 by an Expedition 7 crewmember aboard the International Space Station (ISS). Areal types of thunderclouds are also visible. Courtesy of NASA Human Space Flight Collection.*

**FC 2.1** - Earth receives energy in the form of electromagnetic radiation from the Sun. Some of this solar energy is absorbed by the atmosphere, some is scattered back to space, and some is transmitted through the atmosphere to be absorbed or reflected by Earth's surface. The solar energy reflected by Earth's surface is absorbed, scattered, reflected, or transmitted by the atmosphere.

**FC 2.2** - Energy from the Sun is transformed into other forms of energy within the Earth System. In the atmosphere these other forms include thermal energy of gas molecules, the kinetic energy of wind, and the latent heat of evaporation stored in water vapor.

**FC 2.3** - On human time scales, the energy emitted by the Sun is nearly constant, varying only very slightly due to solar activity. The amount of solar energy received at a point on Earth’s surface varies due to Earth’s spherical shape, its daily rotation about its tilted axis, its annual revolution around the Sun, and the slight elliptical shape of Earth’s orbit leading to important cycles such as day and night, and the seasons. In addition, cloud cover and aerosols can reduce the amount of solar energy that reaches Earth’s surface.

**FC 2.4** - Solar energy drives many chemical, biological, and physical processes that affect Earth’s atmosphere. These include processes such as photosynthesis, evaporation of liquid water to produce water vapor, formation of smog, and the formation and destruction of ozone.


**FC 3.1** - Horizontal and vertical energy imbalances in the Earth System produced by unequal heating of Earth’s surface create movement in the atmosphere and the ocean.

**FC 3.2** - Energy is exchanged within the atmosphere, as well as gained and lost across its interfaces with land and ocean through physical, geological, and biological processes organized in Earth System cycles (e.g., the water cycle). These exchanges help drive atmospheric circulations.

**Figure 4** - The formation of this massive cumulus cloud demonstrates how energy and motion in the atmosphere can give rise to dramatic weather. Copyright Robert M. Johnston.

**FC 4.1** - Weather is the state of Earth’s atmosphere at a particular place and time. The climate of a particular place encompasses the long-term range of weather conditions at that place. Earth’s global climate is determined by the energy received from the Sun and is regulated by atmospheric composition and by atmospheric and oceanic circulations.

**FC 4.2** - Weather changes over time periods ranging from seconds to weeks. Climate changes over intervals ranging from years to millennia. Earth’s history has been marked by gradual variations in global climate caused by long-term cyclic variations in Earth’s orbit and axial tilt, and modulated by changes over geologic time in the size and structure of the continental masses. These gradual variations have been punctuated by relatively abrupt climatic shifts caused by volcanic eruptions and sudden redistributions of mass and energy in the Earth System.

**FC 4.3** - Both weather and climate vary by region based on latitude, altitude, land use, proximity to physical features such as the ocean and mountains, and ocean currents.

**FC 4.4** - Weather phenomena are important to human society. As evidenced in art, literature, and human culture over time, some atmospheric phenomena are beautiful, inspiring the human spirit. Severe weather, such as thunderstorms, tornadoes, and hurricanes, can bring rapid, dramatic changes to ecosystems and to individuals, property, and infrastructure.
United Academic (F9) Union
MEMORANDUM OF AGREEMENT

Appointment for 2011 Course Development

Audioconference    Audio/Video  Computer
Print-Based          Web-based      Other

Richard L Collins agrees to accept the responsibility for the new development of ATM 101, Weather and Climate of Alaska, (On-line version), according to the standards established by the appropriate department and the requirements of distance delivery technologies.

Payment will be $3,600.00 for the development of the course syllabus(i) and associated materials (including, but not limited to readings, examinations, computer disks, audio tapes, videotapes, and web content); the first half ($1,800.00) will be paid upon acceptance of the first draft by the CDE Design Team and the second half ($1,800.00) will be paid after final approval of the CDE Design Team and the appropriate academic department.

The final version will be completed by January 13, 2012 and payment will be made in FY12.

All products produced pursuant to this agreement are sponsored works and are works for hire. Copyright to such works belongs to the University of Alaska. Any proceeds flowing from the commercialization of such works for hire shall be managed according to University policy and regulations. The instructor agrees to assign to the University all rights, title and interest to any items created for the course that may be patentable.

This memorandum does not constitute a binding agreement until the authorizing signatures are affixed.

Please sign the attached copy and return it to me within 10 days. The original may be retained for your records.

SIGNATURES:

Developer/Revisor: ___________________________ Date: 9/8/2011

CDE&IL: ___________________________ Date: 7/21/11

cc: UAF Provost
   College of Rural and Community Development Vice Chancellor
   UAF Human Resources
   University Labor Relations
   Course Department Head/Director

UNIVERSITY OF ALASKA FAIRBANKS
College of Rural and Community Development
Date: Thu, 28 Jul 2011 15:48:07 -0800
Subject: Re: CDE MOU follow Up
From: Paul Layer <pmlayer@alaska.edu>
To: Richard Collins <rlc@gi.alaska.edu>
Cc: Nicole Molders <nicole.molders@gi.alaska.edu>

Rich,

I think this could be a good opportunity for you to further your efforts with ATM101X. Although, as you point out, CNSM has already provided some support for course development, this 'overload' should not affect your current workload. If you are comfortable with the terms of condition as outlined by CDE, I encourage you to consider their offer. I also think it will be prudent to talk with Alex Hwu to discuss delivery of this course.

Paul

On Thu, Jul 28, 2011 at 11:45 AM, Richard Collins <rlc@gi.alaska.edu> wrote:

> Dear Paul,
> 
> Thanks for taking the time to discuss the "Center for Distance Education
> (CDE) Memorandum of Agreement (MOA)Appointment of 2011 Course Development"
> for ATM101:Weather and Climate of Alaska. The MOA reimburses me as an
> overload for developing a distance-version of ATM101 in collaboration with
> the CDE Design Team. As you noted the MOU is consistent with the current
> Collective Bargaining Agreement.
> 
> Though the MOA does not mention it, CNSM is supporting this effort directly
> through support of a graduate assistant to help in the course design,
> through accumulating material, testing elements of the course, and
> providing feedback as an undergraduate student. Furthermore, this course
> development represents the next step in the development of
distance-delivered laboratory courses by CNSM faculty. That development
> began in 2010 when I obtained support from the NASA spacegrant program to
> hold a workshop on these issues, held the workshop, and participated in CDE
> training workshops. These efforts were fully supported by CNSM through
> workload accommodations.
> 
> The MOA does not address the delivery of the course once it is designed. I
> understand that this will be determined by CDE, the Department of
> Atmospheric Sciences (DAS), and CNSM once the course is designed. Our goal
> for 2011-2012 is to design and test the course in the Fall and then offer
> the course by distance and on-campus with a common syllabus to test out and
> refine the curriculum.
> 
> As we agreed I plan to go ahead with the course development and sign the MOU
> in the next few days. If you have any thoughts please let me know and I will
> attach them to the signed contract.
> 
> I am cc'ing Nicole Molders, (Chair DAS),
> Regards,
> Rich.
> --
> Richard Collins
> Geophysical Institute and Department of Atmospheric Sciences
> University of Alaska Fairbanks
> 903 Koyukuk Drive
> Fairbanks, AK 99775-7320
> 
> Phone: (907) 474-7607
> Fax: (907) 474-7290
A. Project Title:

Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska

B. Applicant Information:

Applicant/PI Name:

<table>
<thead>
<tr>
<th>First Name:</th>
<th>Richard</th>
<th>Last Name:</th>
<th>Collins</th>
</tr>
</thead>
</table>

Position Title: Associate Professor of Atmospheric Sciences

Institution: University of Alaska Fairbanks

Address:

<table>
<thead>
<tr>
<th>Address 1:</th>
<th>Department of Atmospheric Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address 2:</td>
<td>903 Koyukuk Drive</td>
</tr>
</tbody>
</table>

City: Fairbanks  State: Alaska  Zip: 99775-7320

Email Address: rlc@gi.alaska.edu

Phone (Voice): (907) 474-7607  (Fax): (907) 474-7379

ASGP Funds Requested: $14,647  Proposed Match (1:1 required): 1:1.2

X I certify that any direct support (salary, wages, etc.) from this grant will be awarded to U.S. citizens only.

Signature of Director/Dean:

[Signature]  2/25/12

Paul W. Layer
College of Natural Science and Mathematics  pwlayer@alaska.edu

C. All Applications

Submit this cover sheet along with all other required application materials to:

Rebecca Lees
rebecca.lees@gi.alaska.edu
Subject: Space Grant Project Application
2. PROJECT DESCRIPTION

2.a. Synopsis
The goal of this proposal is to enhance distance-delivery of laboratory-based science courses to undergraduate students in the state of Alaska. This proposal specifically seeks support for a curriculum development workshop to be held at the University of Alaska Fairbanks (UAF) in September 2010 and subsequent course development. The workshop will convene science educators from the main campus and rural community campuses to share experiences and identify strategies and resources for development and delivery and improvement of laboratory science courses. Access to laboratory-based science courses is critical for distance students in Alaska who wish to achieve their educational goals at the Associate and Bachelors degree levels. The workshop will be co-sponsored by the College of Natural Science and Mathematics (CNSM), College of Rural and Community Development (CRCD), the School of Education (SOE), and the Office of Faculty Development (OFD). The specific outcomes are a faculty resource guide for developing distance-delivered science courses and development of a distance-delivered laboratory-based class in environmental sciences that meets educational goals at the Associate and Bachelors degree levels.

2.b. Alignment with NASA
This project is aligned with the higher education goals of all four Mission Directorates (i.e., Aeronautics Research Mission Directorate, Exploration Systems Mission Directorate, Science Mission Directorate, Space Operations Mission Directorate) through enhancing the nation's formal education system and contributing to the broad public understanding of science, mathematics, and technology. Through improving the quality and increasing the access to lab-based science courses for undergraduate students the project will meet the main goals of NASA’s education program,

i. strengthen the national (and NASA’s) workforce in science, technology, engineering, and mathematics (STEM)
ii. attract and retain students in STEM-based disciplines by increasing access to lab-based science courses
iii. increase American’s science and technology literacy by developing distance curricula

Specifically the project will establish a foundation for laboratory-based science courses that are offered by delivery to students at UAF. The project addresses the current areas of emphasis of the Alaska Space Grant Program in several key areas.

i. By improving distance delivered laboratory-based science courses, the project ensures that students seeking Associate or Baccalaureate Degrees by distance will have authentic, hands-on student experiences in science— with the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, and science-focused questions and issues.
ii. By coordinating the efforts of CNSM and SOE in developing lab-based science curricula for education majors, the project will increase the capabilities for teachers to provide authentic, hands-on elementary-, middle- and high-school student experiences in science disciplines.
iii. By coordinating the efforts CNSM and CRDC in developing lab-based science curricula for delivery by distance in rural Alaska, the project meets NASA goals for developing new relationships as well as sustain and strengthen existing institutional
relationships with community colleges. UAF extends from Fairbanks to community campuses in Bethel, Dillingham, Kotzebue, Nome and centers in Galena, Ft. Yukon, Tok, Unalaska, McGrath, Togiak, King Salmon, and Delta, and reaches out to 160 communities across Alaska.

iv. By convening science educators from multiple colleges, disciplines, and campuses, the project draws on a diversity of institutions and faculty participants and addresses educational needs of a diverse population of Alaskan students. By coordinating these efforts with OFD, the project guarantees that the effort will be integrated into the professional development of faculty at UAF.

v. Led by a faculty member in atmospheric sciences, the project will explicitly address development of curricula in environmental sciences that include environmental science and global climate change with curricular activities that allow students better understand the earth's environments.

2. c Proposed Activities
The project meets NASA’s SMART objectives. The specific (S) objective is to develop a contemporary distance-delivered laboratory-based science class by May 2011. The specific activities that will be accomplished in meeting that goal are conducting a faculty workshop, producing a handbook and resource guide, developing a model curriculum for a current environmental science class, and delivering the class in the spring semester of 2011. The measurable (M) objectives are the creation of a new distance delivered laboratory-based science course, and the handbook and resource guide that will provide a strategic framework for development of other science courses in Alaska. The appropriate (A) objective is the development of a new distance-delivered course that meets the core needs for students studying for Associate and Bachelors degrees. The objectives are realistic (R) and can be achieved within the year. The objectives are time-specific (T) with deadlines for the workshop (in September 2010), development of materials (by December 2010), and delivery of a new class (by May 2011)

The first activity is to hold a one-and-one-half day workshop on the Fairbanks campus of UAF that would convene STEM faculty from campuses across Alaska in late September 2010. The goal of the workshop is develop curricula for laboratory-based distance education classes that meet STEM requirements for students at UAF. The workshop will be designed to achieve the following:

1) Identify best educational practices
2) Establish educational methodologies and tools
3) Develop professional relationships between stakeholders
4) Identify procedures for effective use of resources.

The workshop will have the following key elements;
1) Rural science faculty members sharing their experiences, needs, and perspectives
2) Campus faculty members sharing their experiences, needs, and perspectives
3) Demonstration of School of Education capabilities for delivery of distance classes.
4) Demonstration of Center for Distance Education capabilities for delivery of distance classes.
5) Identification of target population for such courses.
6) Discussion with Office of Faculty Development on distance education.

A workshop website will be developed to advertise the workshop, coordinate workshop activities, and distribute information. Having conducted the workshop a faculty handbook and resource guide and handbook for development of laboratory-based science courses in science and engineering will be produced. The resource guide will be distributed through the workshop website.

Based on the workshop and the faculty resource guide and handbook, a curriculum will be developed for distance delivery of ATM101: Weather and Climate of Alaska. The class will be delivered using both distance and in-class tools to an on-campus population in the spring semester of 2011. The on-campus delivery will allow rigorous development of distance delivery methods and allow critical evaluation and response to student needs. One member of the research team will travel to one of the community campuses for a follow up meeting to consult on the curriculum design.

ATM101 meets Bachelor’s Degree Requirements for a laboratory course in the sciences. The course currently aims to meet the UAF requirements for sciences;

“an intellectual comfort with the sciences — including the scientific method, frameworks that have nurtured scientific thought, traditions of human inquiry and the impact of technology on the world’s ecosystems”

while providing students with insights into meteorology and atmospheric science from both an Alaskan perspective as well as in a global context. Students in the course get a variety of experience doing fundamental laboratory experiments and analyses, making measurements outdoors, working with meteorological data, as well as considering big-picture questions such as how increases in greenhouse gases may impact our environment. As part of the lectures professional scientists and weather forecasters share their experience and insights with the students.

One member of the proposing team will attend the annual Alaska Space Grant/NASA EPSCoR Programs Annual Workshop in 2011. All materials and websites associated with this activity will acknowledge the support of the Alaska Space Grant support (e.g., "This material is based in part upon work supported by the Alaska Space Grant Program."). No person shall be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination under this grant on grounds of race, color, national origin, religious affiliation, handicap, or gender. The University of Alaska Fairbanks is an affirmative action/equal opportunity employer and educational institution and is a part of the University of Alaska system.

2d. Evaluation Plan
The workshop will be developed in consultation with the UAF Office of Faculty Development. The workshop will be organized with input from the participants who have extensive experience in science and/or distance education. The workshop will be structured to allow for participant development of the handbook and resource guide. The workshop will include an exit survey of the attendees. The students who take ATM101 in spring 2011 will evaluate the class, and these evaluations will be compared with student evaluations from earlier years. We will carefully
track enrollment and evaluations of the students in the class. Our longterm (three year) goal is to have a stable enrollment of 20-30 students taking ATM101 by distance.

2e. Time Line/Schedule
The duration of the project is July 1, 2010 – May 31, 2011. The major milestones for the project are as follows;

i. July – August 2010 Organization of on-campus workshop

ii. September 2010 On-campus workshop


2f. Personnel
The budget identifies two faculty members with the main responsibilities for this project; Richard Collins (College of Natural Science and Mathematics) and Warren (Skip) Via (School of Education). Collins will serve as principal investigator and have overall management responsibility for the project. He will manage the organization of the workshop, prepare the faculty resource guide, develop a curriculum for ATM101 and instruct ATM101. Collins has taught and developed laboratory-based science and engineering courses and currently teaches ATM101. Via will assist on the organization of the workshop and the development of the ATM101 curriculum. Via runs the instructional technology laboratory at the UAF School of Education and teaches a variety of courses focused on how technology is used in teaching.

In preparing this proposal we have identified the educators who we expect to participate in the workshop and contribute to the development of curricula of distance-delivered lab-based science courses. A list of potential participants is presented in Table 1. We expect that the workshop would be attended by a wider group of faculty, but have identified these faculty members as having a core interest in the question of distance delivery of laboratory-based science courses. We anticipate that several of these attendees will make professional presentations to the workshop sharing their practices and insights.
Table 1. List of prospective workshop participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carol Barnhardt</td>
<td>School of Education - Elementary Education</td>
</tr>
<tr>
<td>Hector Douglas*</td>
<td>College of Rural and Community Development - Biology</td>
</tr>
<tr>
<td>Cindy Fabbri</td>
<td>School of Education - Science Education</td>
</tr>
<tr>
<td>Patricia Heiser</td>
<td>School of Natural Resources and Agricultural Sciences - Geography</td>
</tr>
<tr>
<td>Alex Hwu</td>
<td>College of Rural and Community Development - Distance Education</td>
</tr>
<tr>
<td>Claudia Ihl*</td>
<td>College of Rural and Community Development - Biology</td>
</tr>
<tr>
<td>Ute Kaden</td>
<td>School of Education - Secondary Education</td>
</tr>
<tr>
<td>John Kelley</td>
<td>School of Fisheries and Ocean Sciences - Marine Science</td>
</tr>
<tr>
<td>Tomas Marsik*</td>
<td>College of Rural and Community Development – Sustainable Energy</td>
</tr>
<tr>
<td>David Newman</td>
<td>College of Natural Science and Mathematics - Physics</td>
</tr>
<tr>
<td>Suzanne Nolan*</td>
<td>College of Rural and Community Development - Veterinary Science</td>
</tr>
<tr>
<td>Diane O’ Brien*</td>
<td>College of Natural Science and Mathematics - Biology</td>
</tr>
<tr>
<td>Robert Parsons</td>
<td>College of Natural Science and Mathematics - Physics</td>
</tr>
<tr>
<td>Todd Radenbaugh*</td>
<td>College of Rural and Community Development - Environmental Science</td>
</tr>
<tr>
<td>Amanda Rosenberger</td>
<td>School of Fisheries and Ocean Sciences - Biology</td>
</tr>
<tr>
<td>Brian Rasley</td>
<td>College of Natural Science and Mathematics and College of Rural and Community Development - Chemistry</td>
</tr>
<tr>
<td>Dan Solie</td>
<td>College of Natural Science and Mathematics - Physics</td>
</tr>
<tr>
<td>Victor Zinger*</td>
<td>College of Rural and Community Development - Math</td>
</tr>
</tbody>
</table>

Faculty from community campuses are designated by an asterisk (*).
4. RESUME

Richard L. Collins
P.O. Box 83683
Fairbanks, AK 99708-3683
Work Phone: (907) 474-7607
Home Phone: (907) 458-0913
Web: http://www.uaf.edu/asp/faculty.html

EDUCATION

Thesis Title: Middle Atmosphere Structure and Dynamics: Lidar studies at the South Pole, Syowa, and Urbana.

M.S. Electrical Engineering, May 1988, Case Western Reserve University.
Thesis Title: A Fractal Analysis of Colored Noise with Application to Gravity Wave Spectra in the Middle Atmosphere.

B.E. Electronic Engineering, July 1986, National University of Ireland, University College Dublin.

EXPERIENCE

University of Alaska Fairbanks
Associate Professor of Atmospheric Sciences
July 2004 - present

Assistant Professor of Electrical and Computer Engineering
July 2003 – July 2004

Assistant Professor of Electrical and Computer Engineering
August 1997 - June 2003

Research Assistant Professor of Space Physics and Aeronomy
January 1994 - August 1997

• Undergraduate and graduate education in atmospheric sciences and electrical and computer engineering
• Design and development of lidar systems for remote sensing.
• Meteorology of middle and upper atmosphere

EXPERTISE RELATED TO THIS PROGRAM

Laboratory-based courses in Department of Electrical and Computer Engineering;
Laboratory-based courses in Department of Atmospheric Sciences; ATM101: Weather and Climate of Alaska.

Organization of workshop.
Chair of organizing committee for Eighth International Workshop on Layered Phenomena in the Mesopause Region (LPMR-8). LPMR-8 hosted 50 international scientists on the Fairbanks campus for four days in 2007. Served as lead guest-editor for special issue of Journal of Atmospheric and Solar-Terrestrial Physics that presented 24 peer-reviewed papers based on presentations made at LPMR-8. Meeting was co-sponsored by ICMA, IUGG, NASA, NSF, and UAF.


Participation in NASA-related research.
Principal investigator on collaborative proposals for several rocket-based investigations of the upper atmosphere at Poker Flat Research Range.
5. PARTNERSHIPS
This project brings together several colleges and offices at UAF to address Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska. These are;

- College of Natural Sciences and Mathematics
- College of Rural and Community Development
- School of Education
and
- Office of Faculty Development.

While the project enhances partnerships within the university, the larger goal is to enhance the educational partnership in STEM between the university and degree-seeking students across the state of Alaska, and thus enhance the STEM relationships between Alaskans and their communities.

We attach statements of support from the College of Natural Sciences and Mathematics, College of Rural and Community Development, School of Education and Office of Faculty Development.
February 25, 2010

Dr. Richard Collins
Department of Atmospheric Sciences
University of Alaska Fairbanks

Dear Richard,

I am happy to write this letter of support for your proposal "Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska" which you are submitting to the Alaska Space Grant Program - 2010 Higher Education Grant Announcement. This issue is an important one for the college and I will directly support this effort through your 2010-2011 faculty workload assignment in the College of Natural Science and Mathematics and administration of funds through the Engineering, Science and Technology Experiment Station housed in CNSM.

Development of high-quality laboratory-based science courses is a goal of our college in supporting educational opportunities for students across Alaska. The fact that you are developing partnerships both between departments in the college, across different colleges, and across campuses is particularly encouraging. Should you receive this award, I will encourage strong participation in the workshop. I look forward to working with you on this important initiative.

Sincerely,

Paul W. Layer
Interim Dean
College of Rural and Community Development

Date: Fri, 26 Feb 2010 12:16:42 -0900
Subject: Space Grant workshop proposal
From: Pete Pinney <pppinney@alaska.edu>
To: Richard Collins <rlc@gt.alaska.edu>
X-Virus-Status: Clean

Hi Rich,

I would like to forward the email from Bernice Joseph approving the idea for the science workshop proposal. If you have any questions, feel free to contact me directly as the affiliate for the Space Grant program through the College of Rural and Community Development.

Pete

Pete Pinney, Associate Vice Chancellor
Rural, Community and Native Education
404 Brooks Building
Fairbanks, AK 99775-6500

Bernice M. Joseph, Vice Chancellor for Rural, Community and Native Education
College of Rural and Community Development
University of Alaska Fairbanks
Brooks Building 400
University of Alaska Fairbanks
Fairbanks, AK 99775-6500

Dear Richard,

I am happy to write this letter of support for your proposal "Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska" which you are submitting to the Alaska Space Grant Program - 2010 Higher Education Grant Announcement. I will directly support this effort through travel support for faculty in the College of Rural and Community Development to attend the workshop and through participation by staff from the Center for Distance Education in the project.

The College of Rural and Community Development reaches out to 160 communities across Alaska through our community campuses in Bethel, Dillingham, Fairbanks, Kotzebue, Nome and centers in Galena, Ft. Yukon, Tok, Unalaska, McGrath, Togiak, King Salmon, and Delta. I am particularly interested in the opportunity to improve the laboratory-based science courses available to Alaskan rural and community students. The workshop you are proposing offers an important opportunity to build professional relationships between science educators across the state which will enhance the success of students working toward Associate and Baccalaureate degrees. Should you receive this award, I will encourage and support strong participation by our faculty in the workshop and subsequent development of science curricula.

Regards,
Bernice M. Joseph
Dear Richard:

I am happy to write this letter of support for your proposal "Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska" that you are submitting to the Alaska Space Grant Program - 2010 Higher Education Grant Announcement. The SOE will directly support this effort through time commitments from Cindy Fabbri and Warren (Skip) Via's during the 2010-2011 academic year.

The main goal of the School of Education is to prepare professional educators who are culturally responsive, effective practitioners. Your project supports that goal through development of laboratory-based science courses for education majors in the State of Alaska. I appreciate the relationships that you have begun to develop with faculty in the School of Education (Carol Barnhardt, Cindy Fabbri, Skip Via). Should you receive this award, the SOE commits to supporting the initial workshop and to consider ways to support subsequent development of science curricula.

Thank you for the invitation to work with you, and for your efforts to increase the number of high quality lab science courses UAF offers to students away from the Fairbanks campus.

Sincerely,

Eric

Eric Madsen, Dean
School of Education
University of Alaska Fairbanks
Gruening Building 709
University of Alaska Fairbanks
Fairbanks, AK 99775-6480
Office of Faculty Development.

Richard Collins, Associate Professor
Geophysical Institute and Department of Atmospheric Sciences
University of Alaska Fairbanks
903 Koyukuk Drive
Fairbanks, AK 99775-7320

February 24, 2010

Dear Richard,

I am happy to write this letter of support for your proposal "Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska" which you are submitting to the Alaska Space Grant Program - 2010 Higher Education Grant. My Office will directly support this effort through provision of refreshments and meeting rooms for the workshop, and in the development and distribution of the Faculty Handbook and Resource Guide.

The Office of Faculty Development seeks to improve student learning, through helping faculty improve their competence as teachers and scholars. I am particularly interested in the opportunity to improve the laboratory-based science courses available to Alaskan students. The workshop you are proposing offers an important opportunity for faculty members to develop their pedagogical skills and to collaborate strategically on the development of curricula. Should you receive this award, I will encourage and support strong participation by faculty in the workshop and coordinate the project with the ongoing activities sponsored by this office.

Regards

Joy F. Morrison, Ph.D.
Director
Higher Education Program Form

Project Information

Name of Project: Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska

Contact Person: Richard Collins

Address: Department of Atmospheric Sciences
         University of Alaska Fairbanks
         903 Koyukuk Drive

City: Fairbanks
State: AK

Zip Code: 99775-7320

Contact Phone: 9074747607

Name of sponsor(s) of project if other than affiliate:
Alaska Space Grant program - Higher Education
University of Alaska Fairbanks (UAF)
    College of Natural Science and Mathematics (CNSM)
    College of Rural and Community Development (CRCD)
    Office of Faculty Development (OFD)
    School of Education (SoE)

Location of Project Activities (mark all that apply): NASA Center(s)
    X University Campus(es)
        Elementary/Middle/High School
        Community Facilities
        Museum/Planetarium(s)
        Industry or Private sector Facilities
        Other

Project Status Ending

End Date of Project: 31-May-2011

Descriptive Information

Please provide a brief description of the project:

The goal of this project was to enhance distance-delivery of laboratory-based science courses to undergraduate students in the state of Alaska. The project supported a curriculum
development workshop (“DisLab”) at the University of Alaska Fairbanks (UAF) in October 2010 and subsequent course development. Thirty-five educators from seven colleges, schools, and institutes (i.e., CEM, CNSM, CRCD, GI, SFOS, SNRAS, SoE) on five campuses (i.e., BBC, FC, KC, IAC, NWC) convened on the Fairbanks Campus on 1-2 October 2010. The workshop included 18 presentations with discussion. The DisLab website at [http://dislab.pbworks.com/w/page/28496529/FrontPage](http://dislab.pbworks.com/w/page/28496529/FrontPage) includes copies of the workshop materials including presentations and notes. An important element of the workshop was a pre-workshop survey, where 28 respondents answered questions about science teaching, laboratories, and distance-delivery. The survey results were provided to all the conference participants to allow them focus their presentations. The emphasis of the workshop was to have practitioners share their experiences and engage in discussions with their peers. The workshop allowed the investigators (Richard Collins and Skip (Warren) Via) to identify the key requirements and challenges for developing “ATM101: Weather and Climate of Alaska” as a distance-delivered laboratory-based science course that would support core science requirements for Alaskan students at the Certificate, Associate and Bachelors degree levels.

The workshop also allowed the investigators identify a cohort of colleagues with whom to develop the distance-delivered laboratory-based science course that was based on principles and practices of UAF faculty that will be fully integrated into the UAF core science and distance education curricula and meet the educational standards and best practices identified by the workshop attendees.

Based on the workshop four other formal activities occurred;

1) Collins and Via participated in the UAF workshop led by Professor Eric Mazur, Balkanski Professor of Physics and Applied Physics at Harvard University on 28 October 2010. This workshop provided further classroom experience for developing science courses. The workshop focused on the role of peer-learning in science education and the need to allow students develop deep understanding through peer discussion and interaction – rather than traditional lecture-based transmission. The DisLab workshop made it clear that for distance delivery of science classes to work for a broad student population, the class would have to be structured to allow the distance students to develop a “lateral network” of peer interactions and not just work though the central node of the “instructor at a distance”. Mazur has been a leader in developing curricula that support peer-learning are more effective than traditional lecture-based learning curricula.

2) Collins participated in the iTeach ([http://distance.uaf.edu/faculty/faculty-development/iteach/](http://distance.uaf.edu/faculty/faculty-development/iteach/)) workshop on 12-13 February and 3-4 March 2010. The iTeach workshop was conducted by the CRCD Center for Distance Education with sponsorship from OFD. The workshop focused on curriculum design through “Understanding by Design” and the tools available to support distance-delivery of courses. Key elements involved how to create a true peer-learning environment with students as science investigators, rather than a model of “web-enabled independent correspondence course”.

3) Collins visited with Todd Radenbaugh at the UAF Bristol Bay Campus (BBC) on April 10-12. Radenbaugh has participated in the DisLab workshop and provided significant feedback to Collins. The campus provides many distance-delivered courses and Radenbaugh teaches “ENVI101: Introduction to Environmental Science”. The goal of the trip was to better understand how distance courses are delivered. Collins attended a class that Radenbaugh delivered and talked with other instructors delivering distance courses at UAF-BBC.
4) Collins chaired an open forum on laboratory science education at the Alaska Space Grant Symposium in Anchorage on May 17-19. The forum brought together a panel of instructors from UAF who had participated in DisLab (Kim Morris, Dan Solie, Vanessa Spenser, Susan Warner) with a cross-section of space grant grantees (Cathy Connor, Richard Myers, Rebecca Parks, Robert Parsons, David Scheel) to share their experience about science-education and identify the critical elements in laboratory-based and hands-on science classes. The space grant grantees provided perspectives from both K-12 and university programs both in formal classroom settings as well as in outreach settings.

Based on these activities, Collins commenced the development of the distance-delivered curriculum for “ATM101: Weather and Climate of Alaska”. Working with Morris (UAF-Geophysical institute (Gi)), Warner (UAF-CDE), Via (UAF-SoE), Collins also identified and acquired key laboratory supplies for ATM101. ATM101 will be developed in the academic year 2011-2012. Collins and Warner will implement the course development with the goal of offering the course by distance in Spring 2012. Collins will be the instructor of record in 2012 and plans to oversee the instruction of the course for the foreseeable future.

Are Evaluation mechanisms in place? Yes.

Describe Evaluation Methodology:

The ultimate goal of the project is to deliver “ATM101: Weather and Climate of Alaska” by distance as a laboratory science course to 20-30 students per semester. The curriculum design and delivery will follow UAF curriculum standards for science (CNSM) and distance (CDE) and will undergo internal review before being delivered. In particular the course will undergo review by UAF course design team before it is offered. Starting in 2012 we will monitor student enrollment and use ongoing student assessment to evaluate the quality of the course, course outcomes, and the curriculum standards. The assessment techniques are provided as part of the existing administrative support at UAF. As a core science course ATM101 undergoes regular review by CNSM and the UAF faculty council. These periodic reviews provide an ongoing evaluation of whether the course is meeting it’s goals in academic standards and enrollment.

Choose most closely related discipline

Primary Discipline: Atmospheric Science
Secondary Discipline: Environmental Science

Funding and Collaboration Information

Actual Sources of Funding for this reporting period (include cash or non-cash).

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<th>CASH</th>
<th>NON-CASH</th>
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<tr>
<td>NASA Space Grant:</td>
<td>$14,647</td>
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<td>Other Federal:</td>
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<td>Carryover From Prior Year:</td>
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<tr>
<td>Industry:</td>
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<td>Lead Institution:</td>
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Non-Profit Organizations: $0 $0 $0
Academic Affiliates: $0 $0 $0
State/Local Government: $0 $0 $0
Participants: $0 $0 $0
Other: $0 $0 $0
Totals $14,647 $18,086 $32,733

* This represents direct salary support for Collins and Via. UAF also provided support through (1) CRCD provided frequent flier mile tickets to support participant travel in the workshop and (2) OFD supported on-site catering for the workshop. This additional support by UAF was noted in the submitted proposal, but was not used in calculating the formal match.

Actual Cost of Project for this reporting period: $32,733
Balance/Difference: $0

Please provide reason if no project costs and funding sources listed:
(limited to 1,900 characters - approximately 30 lines)

Collaborative efforts (mark all that apply):

X In Same Department
X Other Departments in same Institution
X Other Institution of Higher Education
X Community College*

K-12 Institution(s)
Teacher Resource Centers
Non-Profit Organizations
Underrepresented Organizations
Industry
Community Partnership

* UAF is a combined university-community college system. The campuses administered by CRCD (i.e., BBC, IAC, KC, NWC) meet community college needs and goals.

Give name of business and type of industry and describe collaboration:

NASA Installation(s) (mark all that apply):

Ames Research Center
Dryden Flight Research Center
Goddard Space Flight Center
Jet Propulsion Laboratory
Johnson Space Center
Kennedy Space Center
Langley Research Center
Glenn Research Center at Lewis Field
Marshall Space Flight Center
Stennis Space Center
Wallops
NASA Headquarters

NASA Installation Collaboration. Please specify:

NASA Directorates (mark all that apply):
Science Mission Directorate
Exploration Systems Mission Directorate
Space Operations Mission Directorate
Aeronautics Research Mission Directorate

List type of Collaboration:

Other Space Grant Programs. Please Specify (List Consortium and name of program):

Other Federal Government. Please Specify (List Agency name):

Other State Agencies. Please Specify:

Other Collaboration(s). Please Specify:

Additional Collaboration Information. Please Specify:

**Activity and Participant Information**

Total dollars dispersed to undergraduate students
Enter number only: $0

Total dollars dispersed to graduate students
Enter number only: $0

Number of Indirect Participants: 0
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<th>Male Underrep/Disabled</th>
<th>Female not Underrep or Disabled</th>
<th>Female Underrep/Disabled</th>
<th>Unknown Race/Gender</th>
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<td>Faculty/Instructors**</td>
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<tr>
<td>Post-Doc</td>
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<tr>
<td>Graduate Student</td>
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<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrator</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Research Assist/Tech</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other</td>
<td></td>
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</tbody>
</table>

Direct Participants (Provide numbers): 35
* Race and disability status not reported by participants.
** List of participants attached at end of report.

Are any kind of recruitment and/or retention strategies for members of underrepresented groups in place? If so, please describe:

As a core science course ATM101 will serve needs of students across the state of Alaska. Having used the workshop to establish a partnership with the College of Rural and Community Development and the School of Education and with faculty at rural campuses and

Student activities (mark all that apply):
- Coop/Intern experience
- Other Student Support Please Specify:
- Career Guidance
- Recruitment & retention strategies
- Undergraduate research experiences
- Conferences
- Meetings
- Seminars
- Other

Faculty development activities (mark all that apply):
- Faculty research experiences
- Faculty preparation
- Faculty enhancement
- Conferences
Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska

Meetings
Seminars
Other

Curriculum and instructional development (mark all that apply):
• Course Outline
• Course Revision*
• Lab
• Lecture
• Software
• Problem Sets
  • Demonstration/lab tour
  • Video
  • Book
  • Other

* We are significantly revising a class that exists as a traditional face-to-face laboratory class to become a distance-delivered laboratory class that has a broader student base. While the course exists in the CNSM catalog it will be a new offering by CDE and so I am filling in the “New Course” option below.

Institutional development activities (mark all that apply):
• New Major
• New Minor or Emphasis
• New Center
• New Course

If new course is marked (mark all that apply):
• Gateway
  • Experimental
  • Upper Division
• Lower Division
• Permanent

Are there any plans for dissemination of educational materials, products or activities? Yes
Describe:
As a distance course ATM101 will be available through the web managed by CDE and CNSM instructors and course designers. The course materials and curriculum will be available to other educators. Following CDE practice we will employ web-based tools (e.g., discussion boards,
online laboratory notebooks, etc.) which can be made available to other educators for review and use in curriculum planning.

Did the project exclusively target underrepresented minority and persons with disability? No
If yes, mark the group(s) targeted:
- African American
- Hispanic
- Pacific Islander
- Native American
- Persons with Disabilities

With respect to underrepresented groups, note the level of project participation as Below, At, or Exceeding the population represented in your state:

- African American: Below
- Hispanic: Below
- Pacific Islander: Below
- Native American: Below
- Persons with Disabilities: Below

Overall Comments:
The NASA sponsorship of this project was a key element in attracting participation and support. The project has successfully laid the foundation for delivery of ATM101 by distance in 2011-2012. The process of workshops and faculty engagement has (i) established a basis of support for the distance-delivered course where faculty and academic advisors in campuses, colleges, and schools across the UAF system will encourage students to enroll in the course and (ii) allowed Collins and Via determine the key requirements and resources available for developing this course. Furthermore, the project has allowed the investigators to align the course with UAF’s strategic goals. This alignment will guarantee institutional support for the effort beyond the immediate course development. In 2011-2012 Paul Layer (Dean of the College of Natural Science and Mathematics) will provide support for a graduate assistant to assist Collins and Warner in the ATM101 curriculum development and delivery.
## Appendix 1: Workshop Participants

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Affiliation</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jodie Anderson</td>
<td>SNRAS-FC</td>
<td><a href="mailto:jmanderson@alaska.edu">jmanderson@alaska.edu</a></td>
</tr>
<tr>
<td>2</td>
<td>Carol Barnhardt</td>
<td>SoE-FC</td>
<td><a href="mailto:cabarnhardt@alaska.edu">cabarnhardt@alaska.edu</a></td>
</tr>
<tr>
<td>3</td>
<td>Christen Bouffard</td>
<td>CRCD (CDE)-FC</td>
<td><a href="mailto:cdbouffard@alaska.edu">cdbouffard@alaska.edu</a></td>
</tr>
<tr>
<td>4</td>
<td>Gail Chagnon</td>
<td>SoE-FC</td>
<td><a href="mailto:gchagnon@alaska.edu">gchagnon@alaska.edu</a></td>
</tr>
<tr>
<td>5</td>
<td>Richard Collins</td>
<td>CNSM-FC</td>
<td><a href="mailto:rcollins@alaska.edu">rcollins@alaska.edu</a></td>
</tr>
<tr>
<td>6</td>
<td>John Craven</td>
<td>CNSM-FC</td>
<td><a href="mailto:jdcraven@alaska.edu">jdcraven@alaska.edu</a></td>
</tr>
<tr>
<td>7</td>
<td>Hector Douglas</td>
<td>CRCD-KC</td>
<td><a href="mailto:hector.douglas@alaska.edu">hector.douglas@alaska.edu</a></td>
</tr>
<tr>
<td>8</td>
<td>Cindy Fabbri</td>
<td>SoE-FC</td>
<td><a href="mailto:cfabbri@alaska.edu">cfabbri@alaska.edu</a></td>
</tr>
<tr>
<td>9</td>
<td>Sheri George</td>
<td>CRCD (CDE)-FC</td>
<td><a href="mailto:swgeorge@alaska.edu">swgeorge@alaska.edu</a></td>
</tr>
<tr>
<td>10</td>
<td>Carol Gering</td>
<td>CRCD (CDE)-FC</td>
<td><a href="mailto:carol.gering@alaska.edu">carol.gering@alaska.edu</a></td>
</tr>
<tr>
<td>11</td>
<td>Mike Harris</td>
<td>CNSM-FC</td>
<td><a href="mailto:mbharris@alaska.edu">mbharris@alaska.edu</a></td>
</tr>
<tr>
<td>12</td>
<td>Patricia Heiser</td>
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<td><a href="mailto:paheiser@alaska.edu">paheiser@alaska.edu</a></td>
</tr>
<tr>
<td>13</td>
<td>Alex Hwu</td>
<td>CRCD (CDE)-FC</td>
<td><a href="mailto:shwu@alaska.edu">shwu@alaska.edu</a></td>
</tr>
<tr>
<td>14</td>
<td>Claudia Ihl</td>
<td>CRCD-NWC</td>
<td><a href="mailto:cihl@alaska.edu">cihl@alaska.edu</a></td>
</tr>
<tr>
<td>15</td>
<td>Ute Kaden</td>
<td>SoE-FC</td>
<td><a href="mailto:ukaden@alaska.edu">ukaden@alaska.edu</a></td>
</tr>
<tr>
<td>16</td>
<td>John Kelley</td>
<td>SFOS-FC</td>
<td><a href="mailto:jjkelley@alaska.edu">jjkelley@alaska.edu</a></td>
</tr>
<tr>
<td>17</td>
<td>Denise Kind</td>
<td>CNSM-FC</td>
<td><a href="mailto:dmkind@alaska.edu">dmkind@alaska.edu</a></td>
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<tr>
<td>18</td>
<td>Agatha Light</td>
<td>CNSM-FC</td>
<td><a href="mailto:aslight@alaska.edu">aslight@alaska.edu</a></td>
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<tr>
<td>19</td>
<td>Christopher Lott</td>
<td>CRCD (CDE)-FC</td>
<td><a href="mailto:chris.lott@alaska.edu">chris.lott@alaska.edu</a></td>
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<tr>
<td>20</td>
<td>Rose Meier</td>
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<td><a href="mailto:rameier@alaska.edu">rameier@alaska.edu</a></td>
</tr>
<tr>
<td>21</td>
<td>Kim Morris</td>
<td>GI-FC</td>
<td><a href="mailto:kim.morris@gi.alaska.edu">kim.morris@gi.alaska.edu</a></td>
</tr>
<tr>
<td>22</td>
<td>Christa Mulder</td>
<td>CNSM-FC</td>
<td><a href="mailto:cpmulder@alaska.edu">cpmulder@alaska.edu</a></td>
</tr>
<tr>
<td>23</td>
<td>Joy Morrison</td>
<td>OFD-FC</td>
<td><a href="mailto:jfmorrison@alaska.edu">jfmorrison@alaska.edu</a></td>
</tr>
<tr>
<td>24</td>
<td>Rainer Newberry</td>
<td>CNSM-FC</td>
<td><a href="mailto:rjnewberry@alaska.edu">rjnewberry@alaska.edu</a></td>
</tr>
<tr>
<td>25</td>
<td>Suzanne Nolan</td>
<td>CRCD-IAC</td>
<td><a href="mailto:snolan5@alaska.edu">snolan5@alaska.edu</a></td>
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<tr>
<td>26</td>
<td>Robert Parsons</td>
<td>CNSM-FC</td>
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<tr>
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<tr>
<td>30</td>
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<tr>
<td>31</td>
<td>Denise Thorsen</td>
<td>CEM-FC</td>
<td><a href="mailto:dlthorsen@alaska.edu">dlthorsen@alaska.edu</a></td>
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</table>
Distance-Delivery of Laboratory-Based Science Courses for Students in Alaska

<table>
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<tr>
<th></th>
<th>Name</th>
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<td>32</td>
<td>Skip Via</td>
<td>SoE-FC</td>
<td><a href="mailto:wvvia@alaska.edu">wvvia@alaska.edu</a></td>
</tr>
<tr>
<td>33</td>
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<td>CRCD (CDE)-FC</td>
<td><a href="mailto:susan.warner@alaska.edu">susan.warner@alaska.edu</a></td>
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<tr>
<td>34</td>
<td>Natalia Zinger</td>
<td>CRCD-BBC</td>
<td><a href="mailto:nzinger@alaska.edu">nzinger@alaska.edu</a></td>
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<tr>
<td>35</td>
<td>Victor Zinger</td>
<td>CRCD-BBC</td>
<td><a href="mailto:vazinger@alaska.edu">vazinger@alaska.edu</a></td>
</tr>
</tbody>
</table>

Schools and Colleges

- **CEM**: College of Engineering and Mines
- **CNSM**: College of Natural Sciences and Mathematics
- **CRCD**: College of Rural and Community Development
- **GI**: Geophysical Institute
- **SFOS**: School of Fisheries and Ocean Sciences
- **SNRAS**: School of Natural Resources and Agricultural Sciences
- **SoE**: School of Education

Campuses

- **BBC**: Bristol Bay Campus
- **FC**: Fairbanks Campus
- **IAC**: Interior Aleutians Campus
- **KC**: Kuskokwim Campus
- **NWC**: North West Campus

Other

- **CDE**: Center for Distance Education
- **OFD**: Office of Faculty Development