

**An Expanded Evaluation Plan for the South Dakota  
EPSCoR Research Infrastructure Improvement  
Project (NSF EPSCoR RII)\***

**The 2010 Initiative: Science-Based Leadership for  
South Dakota**

**May 2006 - April 2009**

**Evaluation Plan Revised and Submitted**

**by**

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**to the**

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## **An Expanded Evaluation Plan for the South Dakota EPSCoR Research Infrastructure Improvement Project (NSF EPSCoR RII)**

### **The 2010 Initiative: Science-Based Leadership for South Dakota May 2006- April 2009**

#### Background and Project Summary

The Experimental Program to Stimulate Competitive Research (EPSCoR) is a program designed to fulfill the National Science Foundation's (NSF) mandate to promote scientific progress nationwide. The EPSCoR program is directed at those jurisdictions that have historically received lesser amounts of NSF Research and Development (R&D) funding. Twenty-five states, the Commonwealth of Puerto Rico, and the U. S. Virgin Islands currently participate. Through this program, NSF establishes partnerships with government, higher education, and industry that are designed to effect lasting improvements in a region/jurisdiction's research infrastructure, R&D capacity, and, hence, its national R&D competitiveness.

EPSCoR goals are: a) to provide strategic programs and opportunities for EPSCoR participants that stimulate sustainable improvements in their research and development (R&D) capacity and competitiveness and b) to advance science and engineering capabilities in EPSCoR jurisdictions for discovery, innovation, and overall knowledge-based prosperity. Within this framework of mission and goals, EPSCoR objectives are:

- to catalyze key research themes and related activities within EPSCoR jurisdictions that empower knowledge generation, dissemination, and application;
- to activate effective jurisdictional and regional collaborations among academic, government, and private sector stakeholders that advance scientific research, promote innovation, and provide multiple societal benefits;
- to broaden participation in science and engineering by institutions, organizations and people within EPSCoR jurisdictions;
- to use EPSCoR for development, implementation, and evaluation of future programmatic experiments that motivate positive change and progression.

The purpose of an EPSCoR Research Infrastructure Improvement (RII) grant is to provide support for lasting improvement in a jurisdiction's academic research infrastructure, its research capacity and capability in identified research areas, and, hence, increased national competitiveness. EPSCoR support is intended to add specific value to the jurisdiction's academic infrastructure not generally available through other funding sources. Starting with the FY 2005 competition, RII grants focused on building the strength needed to develop collaborative efforts for the successful pursuit of significant regional opportunities having national importance.

Further, and prior to submission of a full proposal and an NSF grant award under this program, each jurisdiction must establish and utilize an EPSCoR governing committee that works closely with leaders in academe, government, and the private sector. This committee will identify potential R&D improvement strategies and activities that are most likely to advance the development of a nationally competitive academic R&D capability.

In partnership with NSF EPSCoR, South Dakota has made steady progress in developing its basic science and engineering research infrastructure since it received its first EPSCoR award in 1989. Since Governor Mike Rounds took office in 2002, South Dakota (SD) has seen major changes in the government's investment in university-based research and higher education initiatives, including a state commitment to provide \$2.4M cost-share for this RII project and provide \$2.5M annually in new funding to create an Office of Research, fund four (4) new research centers, and create five (5) new PhD programs. The driving force behind these positive changes is the Governor's "2010 Initiative." The partnerships formed between state government, higher education, and the private sector through the Initiative have produced the largest single investment in academic research in state history, including funding four multi-institutional research centers. In February 2006, The 2010 Vision for "The Future of Research and Technology in South Dakota" was announced as a vision and plan for the state. Six major outcomes were projected and described in the published vision for research and technology.

- Outcome One: Become a Recognized Leader in Research and Development by 2010
- Outcome Two: Make Technology Based Economic Development a Focus of Economic Development Efforts
- Outcome Three: Nurture Entrepreneurs Through the State's Education System
- Outcome Four: Incubate and Grow Innovative Entrepreneurial Companies
- Outcome Five: Invest in Diverse Sources of Risk Capital
- Outcome Six: Align K-12's Educational Standards and Expectations with the Knowledge and Skills Essential for Research and Technology-based Economic Development

The Board of Regents (BOR) created the Office of Research, directed by a new full-time System Vice President for Research; and the Office of Commercialization was established in the Department of Tourism and State Development. This latter office will be administered by a full-time director who is an expert in technology transfer. Both of these efforts signal a serious intent to enhance the importance of research and innovation in South Dakota.

In accordance with expectations of the NSF, an organization, the South Dakota REACH (Research Excellence: A Critical Hallmark) Committee, with bylaws first adopted in 1986, was invigorated to play a major role in providing guidance and coordination responsibilities for all EPSCoR and EPSCoR-like programs. In this role, SD REACH will ensure that these programs complement and build upon each other's investments. This committee includes a powerful membership, including the respective Presidents and Vice Presidents of Research of SD's three comprehensive universities, representatives of the tribal colleges and universities, the Governor's

economic advisor, state legislators, the Executive Director of the BOR, and partners from SD's private sector leadership.

In September 2005, a proposal was submitted to the NSF for a project entitled "The 2010 Initiative: Science-Based Leadership for South Dakota." This proposed project, submitted on behalf of the various partners and the State of South Dakota, will be administered out of the South Dakota EPSCoR Office located at South Dakota State University. Partners who will be heavily involved in programmatic aspects of the project include the three major research universities in the state (the University of South Dakota, South Dakota State University, South Dakota School of Mines and Technology), the SD Tribal Colleges and Universities, and the Center for Advancement of Math & Science Education (CAMSE) located at Black Hills State University.

Dr. James Rice, who is also Executive Director of SD EPSCoR and head of the Department of Chemistry and Biochemistry at SDSU will serve as Principal Investigator of the project, and there will be four co-PIs. Serving as a part of the project's management team, these co-PIs include, Drs. Mary Berry (University of South Dakota), Jon Kellar (South Dakota School of Mines and Technology), Leland Bordeaux (Sinte Gleska University), and Ben Saylor (CAMSE), and Dr. Mel Ustad, (SD Office of Commercialization). The Management Team will report to the SD EPSCoR Project Director and to the SD REACH Committee.

Based on recommendations from two external reviews, it was determined that the science research focus of the current EPSCoR project would be "Photo-Activated Nanoscale Systems" (PANS) with ongoing components at the three SD research universities. This is in recognition of the intellectual merit and opportunities that exist at the intersection of light-activated materials and nanoscale systems. The American Association for the Advancement of Science (AAAS) convened a panel to conduct one of the external assessments on behalf of the SD EPSCoR in October 2003. This panel identified some existing obstacles in South Dakota that helped shape the plans in the new EPSCoR project. Among those identified obstacles were 1) the need for statewide coordination of all EPSCoR and EPSCoR-like programs; 2) a lack of substantive inter-institutional collaborations among faculty; 3) the small number of faculty on any single SD campus, making it difficult to create critical mass in any one science area; 4) the need for increased accountability through solid metrics and benchmarks for those receiving EPSCoR funding and; 5) the limited number of PhD programs, which restricts growth of competitive research programs. As proposed, the PANS effort, which is aligned with the state's R&D priorities, will bring together faculty from USD, SDSU, and SDSMT together with the Center for Accelerated Applications at the Nanoscale (CAAN) and the Center for Research and Development of Light Activated Materials (CRDLM), two research centers established through the Governor's 2010 Initiative. There will be several research components that will investigate topics and questions directly related to the PANS' goals. This research will be conducted through a collaborative process involving faculty from the three SD research universities.

The Education, Outreach, and Economic Development of the EPSCoR will center around efforts to strengthen the overall climate for an innovation-driven economy by improving science education at all levels and developing a culture of entrepreneurship, which is wholly critical to the success of the 2010 Initiative. To accomplish this goal, the proposed EPSCoR education, outreach, and economic development activities will integrate the PANS science initiative with statewide education and outreach activities to form a High Performance Community (HPC). Components of the education and outreach element of the project are ethnographic research, operation of the mobile science laboratory, research experience for non-science majors, K-12 math and science specialist endorsement programs, and entrepreneurship. Considerable work in these areas will address identified needs among K-20 Native American students through outreach activities designed to enhance and connect the SD Tribal Colleges and Universities.

Other outreach activities will focus on efforts to enhance economic development by contributing to other activities in the state to create an entrepreneurial culture necessary for HPCs to emerge. These activities will include entrepreneurship promotion, job growth from within, increasing global markets for innovative products, forming/participating in technology based clusters and networking with outside resources, engaging in regional collaboration, vetting research-based innovations, and pursuing commercialization of SD technology or start-up ventures. The management team for this component of the project will include Ben Saylor (CAMSE), Mel Ustad (SD Office of Commercialization), and Leland Bordeaux (Sinte Gleska University). The management team will report to the EPSCoR Project Director and the SD REACH Committee.

The overall project will be collaboratively managed by a partnership consisting of the PD and Co-PIs who will monitor the progress towards meeting the annual objectives and project goals. Each project component's technical leader and mentor will meet with their team on a regular basis (at least semi-annually) and will submit regular progress reports to the Project Management Team. All project participants will meet quarterly at a central location for program coordination, assessment of metrics, and collaboration. Formal written progress reports will be required of each project component every six months.

An ongoing goal-based evaluation effort, using both internal assessment/evaluation personnel and an external evaluation specialist or team of specialists, will involve gathering and analyzing project-related data regarding relevant contextual factors, processes, outputs, and outcomes. The overall goal of the evaluation is to create a cycle of continuous improvement by providing information that allows project leadership and primary stakeholders to determine the project's progress toward achieving annual benchmarks and meeting stated goals and objectives.

In Year 3, SD EPSCoR will commission an external evaluation of the SD's entire EPSCoR program by the AAAS's Research Competitiveness Program to assist SD REACH in assessing progress being made in developing the research infrastructure improvement progress and EPSCoR program components.

Table 1 provides a display of implementation milestones and a time line for project activities, based on the final revised proposal to NSF.

**Table 1**  
**REVISED IMPLEMENTATION MILESTONES AND TIME LINE**

	Year 1	Year 2	Year 3
PANS (global)	Host NSNC workshop	Host NSNC workshop	Host NSNC workshop
	Host Annual PANS workshops	Host Annual PANS workshops	Host Annual PANS workshops
	Host Monthly NSNC Seminars and Interstate Faculty Exchanges	Host Monthly NSNC Seminars and Interstate Faculty Exchanges	Host Monthly NSNC Seminars and Interstate Faculty Exchanges
	Hire three part-time technicians for Internet 2 Access Grid (USD, SDSU, and SDSM&T)		
	Purchase CCD x-ray diffractometer (housed at USD)		
	Hire PANS secretary		
	Establish user agreements/relationships with DOE labs (occurs annually)		
Gen III Photovoltaics	Hire new EE faculty (SDSU)	Hire new synthetic chemist for nanomaterials (USD)	
	Hire postdoctoral research associate (SDSU)	Hire postdoctoral research associate (USD)	Hire second postdoctoral research associate
	Purchase/construct Gel-pulling chamber and TOF-MS for LCVD (USD)	Purchase LCVD deposition chamber (USD)	
	Add graduate students to project (USD)	Add graduate students to project (USD)	Add graduate students to project (USD)
	Purchase liquid and vapor phase epitaxy (LPE and VPE) systems (SDSU)		
Photo-active Nano-inks	Hire research scientist (SDSM&T)		
	Add graduate students to project (SDSM&T)	Hire new research scientist (SDSM&T)	
	Purchase Vector Network Analyzer		
	Hire new EE faculty #1 (SDSM&T)		
<b>REVISED IMPLEMENTATION OUTCOMES AND METRICS</b>			
PANS (global)	Year 1	Year 2	Year 3
	Increase NSNC Collaborative Proposals to Three/Year	Increase NSNC Collaborative Proposals to Four/Year	Increase NSNC Collaborative Proposals to Five/Year

		Begin Planning for SBRC Proposal with NSNC Partners	Submit SBRC Proposal in Conjunction with NSNC Partners
	Submit NSF I/URC Proposal		Begin Planning for submission of a MRSEC proposal by NSNC (including PANS) within 5 years
	Build on current Dreyfus Foundation and NSF-URC awards between USD and SGU to develop joint education/research opportunities in Materials Science as it relates to Natural Products	Creation of a new Materials Chemistry PhD Program	
	Run a workshop with state schools and Tribal colleges to explore new collaborative "3+2" science and engineering programs for the state. Year 1. Develop funding for same. Year 2.		
	Submit NSF -ADVANCE- Institutional Transformation proposal to increase representation of women faculty in STEM by Year 2		
Gen III Photovoltaics	Submit two proposals to federal agency (NSF, DOE, DARPA)/industry (XCEL Energy) (SDSU, USD)	Submit two proposals to federal agency (NSF, DOE, DARPA)/industry (XCEL Energy) (SDSU, USD)	Submit two proposals to federal agency (NSF, DOE, DARPA)/industry (XCEL Energy) (SDSU, USD)
		Submit one NSF CAREER Proposal (SDSU)	Submit one NSF CAREER Proposal (SDSU)
			Submit one STTR/SBIR (SDSU,USD)
Photo-active Nano-inks	Submit NSF MRI Proposal for M3D Machine Development	Submit NIRT Proposal	Resubmit NIRT Proposal (depending upon NSF review)
	Submit NSF Sensor SERG proposal	Resubmit NSF Sensor SERG proposal (depending upon NSF review)	Submit two additional proposals to major funding agencies (SDSM&T)
	Submit one NSF CAREER proposal (SDSM&T)	Submit one additional proposal to major funding agency (SDSM&T)	

## The Evaluation Plan

This RII project will implement a goal-based evaluation approach in which an evaluation team comprised of internal and external evaluators will gather and analyze project-related data regarding relevant contextual factors, inputs, processes, outputs, and outcomes. The overall goal of the evaluation is to create a cycle of continuous improvement by providing information that allows project leadership and primary stakeholders to determine the project's progress toward achieving annual benchmarks and meeting stated goals and objectives. Proposed evaluation activities will incorporate appropriate quantitative and qualitative data collection methods designed to assess impacts of this initiative on: (Goal 1) SD's university research infrastructure and faculty productivity in PANS; (Goal 2) SD student and faculty recruitment and retention in STEM disciplines; (Goal 3) the SGU infrastructure pilot and outreach to other tribal colleges; and (Goal 4) the project's contributions to the State's 2010 Initiative. These objectives are imbedded in the overarching goals of the project, which are directly aligned with the State's 2010 Initiative. Major elements of the project that will be considered in developing and formalizing evaluation activities include:

- **Overarching Goals**—conditions, environmental circumstances, and needs of SD, including factors which can influence project inputs, processes, outputs, and outcomes;
- **Inputs**—available resources for project implementation, such as faculty, post-docs, PhD students, and technicians; access to facilities and equipment; availability of 'match' funds, earmarks, competitive awards, and support from the administration, etc.;
- **Process**—activities and procedures associated with the project's implementation that are required to develop and enhance capacity to progress toward project goals;
- **Outputs**—direct accomplishments such as state funding, peer-reviewed articles, proposals submitted, grants awarded, PhDs graduated, new facilities, equipment, etc.; outputs represent "what" gets done as a result of a project; and
- **Outcomes**—long term accomplishments demonstrating that a difference has been made as a result of the project—the "so what" as a consequence of the outputs; among outcomes might be improvements in national standings, recognition/awards, increased representation from Native Americans and other underrepresented groups, increased participation as NSF and other agency proposal reviewers, and increased number of high-quality applicants for graduate school and junior faculty positions.<sup>1</sup>

To this end, the evaluation plan will employ formative and summative evaluation approaches. The purpose of the formative evaluation is to collect evaluation data during project development and implementation with a focus on improving implementation, identifying and addressing unanticipated problems, and enhancing understanding of potential challenges to project success with respect to performance, processes, and deliverables. The summative evaluation will be

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<sup>1</sup>The analytical framework for the project evaluation is based on NSF's May 2005 EPSCoR Workshop on Evaluation Metrics.

conducted for accountability and will determine overall project effectiveness and impact. Relevant formative evaluation data and results will be used in the summative evaluation.

**Formative Evaluation** activities will assess the effectiveness of SD EPSCOR policies, initiatives, and resource allocations which will ultimately influence the success of the project. General formative evaluation questions include but are not limited to: Is the project being implemented as intended? If not, why not? Are there sufficient and appropriate resources (inputs) available for project implementation? If not, what is lacking? Which aspects of the project are most effective? Least effective? What are the challenges associated with project implementation? How have these challenges been addressed? Quantitative and qualitative data related to project activities during the formative evaluation (e.g., review of extant data, document review, surveys, interviews, observations) will be collected, analyzed, synthesized, and reported to the leadership teams in a timely fashion to inform project modifications and improvements as necessary.

**Summative Evaluation** will examine the extent to which SD EPSCoR has achieved each of the goals stated in this proposal. A comprehensive review of the objectives and evaluation findings - particularly evidence of the outputs and outcomes, but also a summary of the context, inputs and processes - will be used to determine the extent to which the project has achieved its goals. Another purpose of the summative evaluation is to document the broader impacts of change across SD and to share these findings with SD REACH and other stakeholders. For example, the Evaluation Team will examine the relationships between student recruitment and retention, and faculty professional development based on EPSCoR mentorship activities. Specifically, we are interested in understanding the context(s)/circumstances in which strategies outlined in this proposal can be most effectively applied to increase STEM learning and decrease achievement gaps among Native American students.

The Evaluation Team will be advised by Jerry Horn, an independent consultant and former Senior Principal Research Associate at The Evaluation Center at Western Michigan University. He will serve in the role of the lead external evaluation specialist for the project. Other members of the evaluation team, in addition to associates of Dr. Horn, will be the internal evaluators Dr. Jo Ann Sckerl (Director, Academic Evaluation and Assessment, SDSU), Dr. William Schweinle (Director, Academic Evaluation and Assessment, USD), and Dr. Kate Alley (Associate Vice President for Academic Affairs, SDSM&T) with assistants at their respective institutions.

The external evaluator, Dr. Horn and his team will provide feedback on the overall program evaluation design, assist with instrument development and interpretation of data, review formative evaluation findings, and review evaluation reports. The internal evaluators will document the initiation and completion of project activities, coordinate and conduct local data collection, and lead data analysis, interpretation, and reporting.

The conduct of an effective evaluation of the project using a collaborative model of internal and external evaluators will require fairly frequent and continual communications between the two

groups. To ensure that this occurs, it will be necessary for periodic electronic communications and face-to-face meetings between and among the evaluators. At the same time, the project director will need to be continually advised of ongoing evaluation procedures. In addition, the various participants and leaders of each of the components will need to be willing contributors to the data collection process.

The overall evaluation of the project is a collaborative effort involving internal and external evaluators. The internal evaluators will include Drs. Jo Ann Sckerl (SDSU), William Schweinle (USD), and Kate Alley (SDSM&T). The external evaluation team will be lead by Dr. Jerry Horn. While most of the data collection will be the responsibility of the internal evaluation team, Dr. Horn will assume responsibility for designing interview and focus group protocols, survey instruments, and other materials as appropriate. Further, he will be the primary evaluation contact with SGU and with CAMSE. It will be necessary for the external evaluator to conduct an on-site visit to each of the participating components at least twice a year and likely more in some cases to ensure that he understands the activities, recognizes opportunities and real or potential barriers to obtaining/accessing valid data for the evaluation, and develops a sense of credibility among the SD program groups. The first such visit will occur in Fall 2006 with an additional visit during Year 1 in Spring 2007 before the Year 1 annual report is written. Likely, this will be the pattern through Years 2 and 3, but this practice will be reviewed at the end of Year 1. In addition, he will plan to participate in REACH meetings as determined appropriate by the project director. Feedback sessions on the progress and preliminary findings of the ongoing evaluation will be offered to the project director for inclusion in REACH meetings and with him and others as determined to be appropriate and useful. Likely, some of the feedback may be accomplished through conference calls and as extensions of other planned visits to the state.

Table 2 provides a summary of the evaluation metrics, outputs/outcomes, and activities which are aligned with SD's 2010 Initiative's time frame. The primary objective of SD EPSCoR is to meet goals 1, 2, and 3 (as stated above), while contributing to goal 4. The information in this table was included as a part of the formal proposal to NSF and was reviewed and accepted as a part of the award process; therefore, this original plan will form the basis for refinement and enhancement of the evaluation plan. Other sections of Table 2 reflect more specific project-goal related questions.

Practically, there are a number of general evaluation questions that should be continually addressed across the project and as a part of the formative evaluation. Table 3 contains a list of these questions, the potential sources of information, data collection procedures, and the time frame in which these data will be most appropriately collected.

**Table 2**  
**Proposed Elements of the Evaluation Plan of the SD EPSCoR Project**

Goal	Inputs	Processes	Examples of Outputs/Outcomes
<ul style="list-style-type: none"> <li>• <b>Become a Recognized Leader in Focused R&amp;D Areas in 2010</b></li> <li>• (EPSCoR Goal 1)</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment acquisitions</li> <li>• PANS faculty start-up</li> <li>• Faculty release-time</li> <li>• Postdoctoral fellowships</li> <li>• PhD research assistantships</li> <li>• Travel funding for collaborations</li> </ul>	<ul style="list-style-type: none"> <li>• Development of a PANS science and engineering focus</li> <li>• Strategically hire faculty</li> <li>• Collaborations with national laboratories</li> </ul>	<ul style="list-style-type: none"> <li>• Publications</li> <li>• Single PI proposal submissions/awards</li> <li>• Multi-PI proposal submissions/awards</li> <li>• New faculty hired</li> <li>• Integrative proposals: IGERT, UUCRC</li> <li>• New PhD programs</li> </ul>
<ul style="list-style-type: none"> <li>• (EPSCoR Goal 1)</li> </ul>	<ul style="list-style-type: none"> <li>• U/I graduate research assistantships: 75%/25% EPSCoR/private funding Yr. 1, 50%/50% Yr. 2, and 25%/75% Yr. 3</li> </ul>	<ul style="list-style-type: none"> <li>• Build private sector research capacity</li> <li>• Partner private sector &amp; higher ed research</li> </ul>	<ul style="list-style-type: none"> <li>• U/I GRAs funded by project completion</li> <li>• U/I GRAs hired by SD private-sector partners</li> <li>• SBIR/STTR awards</li> </ul>
<ul style="list-style-type: none"> <li>• (EPSCoR Goal 3)</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic planning</li> </ul>	<ul style="list-style-type: none"> <li>• Develop tribal college in infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Single PI proposals submitted/funded</li> <li>• Development proposals: TCUP</li> <li>• SD BOR articulation</li> </ul>

Goal	Inputs	Processes	Examples of Outputs/Outcomes
<ul style="list-style-type: none"> <li>• <b>Make Technology-Based Economic Development a Focus of Education and Development Efforts</b></li> <li>• (EPSCoR Goal 4)</li> </ul>	<ul style="list-style-type: none"> <li>• E-Teams</li> <li>• State EPSCoR meeting programming</li> <li>• Outreach and Education</li> <li>• N2TEC partnerships</li> </ul>	<ul style="list-style-type: none"> <li>• Support: CEO Centers</li> <li>• N2TEC Institutes</li> <li>• Action Summits</li> <li>• TBED communications</li> <li>• HPC strategic plans</li> </ul>	<ul style="list-style-type: none"> <li>• N2TEC E-Team participants</li> <li>• University/industry partnerships</li> <li>• SBIR/STTR proposal submissions/awards</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Create a Spirit of Entrepreneurship through the State's Education System</b></li> <li>• (EPSCoR Goal 2)</li> </ul>	<ul style="list-style-type: none"> <li>• Research &amp; TBED communication program</li> <li>• Science &amp; TBED leadership development</li> </ul>	<ul style="list-style-type: none"> <li>• Target: SD schools</li> <li>• General SD public</li> <li>• Community leaders</li> </ul>	<ul style="list-style-type: none"> <li>• SD Radio &amp; TV programming</li> <li>• Coverage in state, local and regional print media</li> <li>• Monthly 2010 Columns</li> </ul>
	<ul style="list-style-type: none"> <li>• N2TEC</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher ed/SD Jr. Achievement/ partnerships</li> </ul>	<ul style="list-style-type: none"> <li>• Submission of STEP and ISE proposals</li> </ul>
	<ul style="list-style-type: none"> <li>• Mobile Science Lab</li> <li>• MSL PANS modules</li> </ul>	<ul style="list-style-type: none"> <li>• Outreach builds community support</li> </ul>	<ul style="list-style-type: none"> <li>• Programming based on ethnographic research</li> </ul>
	<ul style="list-style-type: none"> <li>• Discoveries by PANS scientists</li> </ul>	<ul style="list-style-type: none"> <li>• PANS E-teams and Cross Geo E-Teams</li> </ul>	<ul style="list-style-type: none"> <li>• Discoveries are commercialized</li> </ul>

Goal	Inputs	Processes	Examples of Outputs/Outcomes
<ul style="list-style-type: none"> <li>• <b>Grow Innovative Entrepreneurial Companies</b></li> <li>• (EPSCoR Goal 4)</li> </ul>	<ul style="list-style-type: none"> <li>• Form N2TEC partnerships</li> <li>• CEO Centers</li> </ul>	<ul style="list-style-type: none"> <li>• Provide tech transfer &amp; entrepreneurship programs to support CEO Centers</li> </ul>	<ul style="list-style-type: none"> <li>• SBIR/STTR proposal submission/awards</li> <li>• Patent applications and awards</li> <li>• Tech-based start-ups</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Increase the Emphasis on Math and Science Education</b></li> <li>• (EPSCoR Goal 2)</li> </ul>	<ul style="list-style-type: none"> <li>• SD REACH works with SD Dept. of Ed.</li> </ul>	<ul style="list-style-type: none"> <li>• SME curriculum expertise</li> </ul>	<ul style="list-style-type: none"> <li>• New graduate SME teacher endorsement into state rule</li> </ul>
	<ul style="list-style-type: none"> <li>• SD REACH works with universities and tribal colleges</li> </ul>	<ul style="list-style-type: none"> <li>• SME curriculum expertise</li> </ul>	<ul style="list-style-type: none"> <li>• New graduate program for SME Master teachers</li> </ul>
	<ul style="list-style-type: none"> <li>• Research opportunities in PANS labs</li> </ul>	<ul style="list-style-type: none"> <li>• Design MSL lab modules based on PANS research</li> </ul>	<ul style="list-style-type: none"> <li>• PANS MSL lab modules</li> <li>• NSF CCL/ILI grant proposals</li> </ul>

**Table 3**  
**Evaluation Work Plan\***

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
General Program Questions			
GP-1: Is the project being implemented as intended/proposed?	<ul style="list-style-type: none"> <li>a. component leaders and project management</li> <li>b. component/project reports</li> <li>c. institutional representatives</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews</li> <li>b. document review and observations</li> <li>c. interviews</li> </ul>	<ul style="list-style-type: none"> <li>a. November and March of each year</li> <li>b. quarterly</li> <li>c. November and March of each year</li> </ul>
GP-2: Are resources sufficient and appropriate, and are they being utilized in a timely and effective manner?	<ul style="list-style-type: none"> <li>a. component managers</li> <li>b. project director</li> <li>c. key component personnel</li> <li>d. budget records</li> </ul>	<ul style="list-style-type: none"> <li>a.-c.interviews</li> <li>d. review and observations</li> </ul>	<ul style="list-style-type: none"> <li>a. November and March of each year</li> <li>b. quarterly</li> <li>c.-d. November and March of each year</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
GP-3: Are communications channels functioning among components and project administration as appropriate?	<ul style="list-style-type: none"> <li>a. REACH members</li> <li>b. component managers</li> <li>c. project director and staff</li> <li>d. parent university contacts</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews and discussion item</li> <li>b.-d. interviews</li> </ul>	<ul style="list-style-type: none"> <li>a. May and September of each year</li> <li>b.-d. November and March of each year</li> </ul>
GP-4: Are project elements/ components moving toward stated goals and objectives?	<ul style="list-style-type: none"> <li>a. progress reports</li> <li>b. records and reports</li> <li>c. components' staff/faculty</li> </ul>	<ul style="list-style-type: none"> <li>a.-b. review and compare to proposed plans and immediate intentions and current activities</li> <li>c. interviews</li> </ul>	<ul style="list-style-type: none"> <li>a. November and March of each year</li> <li>b. quarterly</li> <li>c. November and March of each year</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
GP-5: What general challenges or barriers to success are being encountered?	<ul style="list-style-type: none"> <li>a. project staff and administrators</li> <li>b. documents and copies of reports and public communications</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews</li> <li>b. review documents, reports, and public communications</li> </ul>	<ul style="list-style-type: none"> <li>a. November and March of each year</li> <li>b. quarterly or ongoing as documents are made available</li> </ul>
<b>Component Evaluation Questions</b>			
1. To what extent is the PANS component being implemented as planned?	<ul style="list-style-type: none"> <li>a. component managers</li> <li>b. progress reports</li> <li>c. documents</li> <li>d. selected researchers</li> </ul>	<ul style="list-style-type: none"> <li>a. and d. interviews</li> <li>b. and c. review and comparison to plans</li> </ul>	<ul style="list-style-type: none"> <li>a. November and May</li> <li>b. every six months as available</li> <li>c. as available</li> <li>d. May in Year 1 and May and November in Years 2 and 3</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
2. To what extent is the education, outreach and economic development component being implemented as planned?	<ul style="list-style-type: none"> <li>a. component managers</li> <li>b. documents, including schedules, announcements, etc.</li> <li>c. Selected REACH members</li> <li>d. selected program participants</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews</li> <li>b. reviews and comparison to plans</li> <li>c. interviews</li> <li>d. survey</li> </ul>	<ul style="list-style-type: none"> <li>a. November and May</li> <li>b. ongoing as materials are available</li> <li>d. May-August after Year 1 and April in Years 2 and 3</li> </ul>
3. To what extent is the plans for outreach to enhance and connect tribal colleges and universities being implemented?	<ul style="list-style-type: none"> <li>a. Tribal college representatives</li> <li>b. student participants or program eligible students</li> <li>c. project management</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews or focus group meetings</li> <li>b. interviews or focus groups</li> <li>c. interviews</li> </ul>	<ul style="list-style-type: none"> <li>a. November and May in Years 1</li> <li>b. November and May in Years 2 and 3</li> <li>c. November and May in Years 1, 2, and 3</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
4. Is there evidence that the participating entities and the targeted higher education institutions are improving their R&D capacity and competitiveness?	<ul style="list-style-type: none"> <li>a. academic unit administrators</li> <li>b. documents (grant records, patent activities, appropriate communications, etc.)</li> <li>c. selected faculty researcher CVs</li> <li>d. project researcher participants</li> <li>e. external professional colleagues</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews</li> <li>b.-c. review</li> <li>d. interviews</li> <li>e. survey of designated professional colleagues</li> </ul>	<ul style="list-style-type: none"> <li>a. November and May in Years 2 and 3</li> <li>b. semiannually in Years 2 and 3</li> <li>c. April in Years 1-3</li> <li>d. May in Year 1 and November and May in Years 2 and 3</li> <li>e. January in Years 2 and 3</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
<p>5. Is there evidence that the education, outreach, and economic development components of the project are forming/ developing a High Performance Community (HPC)?</p>	<ul style="list-style-type: none"> <li>a. local and state records/documents</li> <li>b. selected university and school and community personnel</li> <li>c. REACH representatives</li> <li>d. SD public component</li> <li>e. managers</li> </ul>	<ul style="list-style-type: none"> <li>a. review and summarize</li> <li>b. interview university personnel and survey school and community personnel</li> <li>c. interview</li> <li>d. survey</li> <li>e. interview</li> </ul>	<ul style="list-style-type: none"> <li>a. ongoing as records are made available</li> <li>b. April in Year 1 and November and April in Years 2 and 3</li> <li>c. regular REACH meetings</li> <li>d. survey at conclusion of Year 1 for base line and at the end of Year 3 for comparison of growth</li> <li>e. April in Year 1 and November in Years 2 and 3</li> </ul>

<b>Evaluative Question</b>	<b>Potential Source(s) of Information</b>	<b>Data Collection Procedures</b>	<b>Time Frame for Completing Task</b>
6. Is an entrepreneurial culture developing among the institutions and within the state?	<ul style="list-style-type: none"> <li>a. REACH</li> <li>b. representatives of new/innovative start-up experience in SD</li> <li>c. selected local economic development directors</li> <li>d. school and community leaders</li> <li>e. project and component management personnel</li> <li>f. Tribal college/university representatives</li> </ul>	<ul style="list-style-type: none"> <li>a. interviews</li> <li>b. telephone or electronic interviews</li> <li>c. interviews and survey</li> <li>d. survey</li> <li>e. interviews or focus groups</li> <li>f. interviews or focus groups</li> </ul>	<ul style="list-style-type: none"> <li>a. near end of Years 1, 2, and 3</li> <li>b. near end of Years 2 and 3</li> <li>c. near end of Years 2 and 3</li> <li>d. near end of Years 2 and 3</li> <li>e. April in Years 1-3</li> <li>f. April in Years 1-3</li> </ul>

Evaluative Question	Potential Source(s) of Information	Data Collection Procedures	Time Frame for Completing Task
7. Is there evidence of collaboration occurring among participants and to what extent has this increased as a result of involvement in the EPSCoR project?	a. Project director and staff b. component managers c. component staff/faculty d. documents/grant proposals	a. interviews b. interviews c. interviews and survey d. reviews	a. May of each year b-c. November of Years 2 and 3 d. May or near the end of Years 1-3

\*The source, procedure, and time frame for collecting the data may be read across the table for each lettered (a-z) source.

Based on information provided in NSF-sponsored workshops and printed resource materials on evaluation, proposed metrics and indicators in the SD plan, and feedback from focused face-to-face discussion sessions with members of REACH and project staff, the following indicators will be fully considered in the collection and analyses. In some cases, these indicators may be used to address more than one problem or issue, and in other cases they may apply to single questions. From discussion sessions, the list has been pared down to reduce duplication and potential misunderstandings. However, it should not be considered all inclusive or even a final set of indicators for this evaluation.

- Increase in monies for research—this could include external funding and/or additional or redirected existing or regularly allocated research funding at the state or institutional level
- Elevated Carnegie classification at each of the participating institutions with particular emphasis on those elements related to research capabilities and abilities to attract external resources in support of project-related endeavors

- Quality of portfolio to include the complete package of expertise, experience, resources, and confidence/success with particular emphasis on recognition among colleagues and research field
- Entrepreneurship/initiation of enterprises to include new or spin-off enterprises or businesses
- Citizen buy-in/change of perception by legislators and taxpayers as reflected in voter opinions, legislative action, and perceived acceptance of conditions supportive of increased institutional research, entrepreneurial activities, etc.
- Increase in STEM student enrollments in local K-12 schools and public and Tribal colleges and universities, with particular attention to those courses that are considered advanced and challenging and likely to lead to advanced study and STEM-related careers
- Choice of career locations and path of STEM students and graduates as evidenced by availability of opportunities for study and experience, employment, and entrepreneurial ventures
- Increase in the number of patents with regard to both effort/number of applications and success ratio compared to others in the same general area
- Increase in research dollars/monies from internal and external sources
- Cultural change that values research and innovation in higher education as reflected in personal recognition and reward systems, start-up monies and other resources for new faculty, encouragement of collaboration with colleagues in the private and public sectors, etc.
- Improved self-concept regarding research among SD faculty with regard to responsibilities and potential ability to compete and produce
- Changes in use of grant monies, i.e., changing the infrastructure and building collaborations in terms of building a recognized emphasis compatible with the SD 2010 plan as opposed to pursuing monies that may support operational costs but not improve capacity
- State science and technology plan that is considered challenging for all students and will lead to fulfillment of the vision proposed for South Dakota by 2010
- Increasing presence of conditions that encourage public and private partnerships which might include sharing expertise, facilities, and equipment, collaborative public policy with regard to elements that support these partnerships, etc.

- Increased number and quality of employment opportunities requiring STEM educated and trained personnel
- Identification of myths and attitudes that serve as barriers to research and entrepreneurialship activities among public employees, university faculty and administrators, legislators, and the general public as well as taking action to correct and/or address these in an effective manner
- Long term presence of quality and good paying jobs
- K-12 after-school programs, summer camps, etc.
- Increased opportunities at Tribal Colleges and in regions served by the Tribal Colleges for Informational Technology programs, increased participation in undergraduate research center activities, and other home/center-based opportunities for student participation
- Broad-based support for collaborative research that generates valuable products/procedures/techniques that enhance the capacity for further development and the production of quality, good-paying jobs

This evaluation plan is broad reaching and will require a considerable amount of collaboration in the data collection process and the analyses and interpretation of the findings. To that end, continual communications must be maintained among the various persons with assigned evaluation responsibilities. While each institutional evaluation representative will be primarily responsible for his/her institution, there may be times in which it is more efficient and valid for one person to have cross-university project responsibilities for defined factors. In any case, the evaluation team members will openly share data and information among themselves and with the project leadership as requested and as appropriate. Details of these type of arrangements will be addressed in the first meeting of the internal and external evaluators. The evaluation will be a dynamic process with an eye toward recognizing unintended positive and negative factors as well as unexpected outcomes that could not be anticipated.

The external evaluator will be open and available as needed or requested for communications regarding the evaluation activities and the reports. Further, he and/or an associate, as a member of the external evaluation team, will respond to requests for review of data collection instruments and interpretation of data sets as appropriate.

In summary, the SD EPSCoR project is focused on the following areas, and the evaluation efforts will reflect on the extent to which the associated goals were achieved.

- Research productivity and products
- Research portfolio quality
- Research collaboration and networking

- Research investment and materials
- Research climate, culture, and communications

As defined in the contract, the external evaluation activities and reports will include an annual assessment of the project's progress in achieving its goals as specified in the indicators and metrics by the end (May 1) of each of the first three years; and an overall assessment of the project will be due in the SD EPSCoR state office no later than May 1, 2009.

The external evaluation work will adhere to the professional standards of practice as listed and described in The Program Evaluation Standards by The Joint Committee on Standards for Educational Evaluation (1994).