

Goal 2 Initiative 2: Applying the Science of Learning to the Learning of Science (SENCER Program)

Introduction/Background – What will you do?:

SENCER at ISU

Indiana State University has adopted the Science Education for New Civic Engagements and Responsibilities (SENCER) Teaching Model which fits well with our strengths in experiential learning and community engagement. Our committee is working hard to promote the SENCER Teaching Model at ISU and requests the following budget to meet the goal of making our STEM education classes more engaging and to provide students with a deeper learning experience across all disciplines using this interdisciplinary approach.

The SENCER Teaching Model promotes project-based learning and community engagement to engage students in a meaningful education. The funds that we are requesting will provide faculty development workshops, funds to convert classes to this interactive and interdisciplinary model that incorporates community engagement, and to fund a student SENCER team that uses their learned skills from their disparate majors to bring SENCER alive at ISU. Most of the requested funds will go to undergraduate and graduate student wages and provide funds for them to travel to conferences to present the work that they are doing at ISU. These travel funds will also help other students participating in these classes to present their findings at conferences and to gain this professional experience that they can put on their resumes.

Previous Achievements of Goal 2 Initiative 2

Over the past two years funds for this initiative have enabled us to engage over 70 faculty and staff in professional development workshops at ISU. We have 23 courses listed as SENCERlike courses throughout the University and have provided course development funds for two new courses in the College of Education. Sixteen of these faculty, staff, and students traveled to the SENCER Summer Institutes in Asheville North Carolina and Chicago Illinois in the last two years to learn about this teaching model and to present the work that ISU has done over the past year. This summer we will have 10 more faculty staff and students attend the SENCER Summer Institute at Butler University in Indianapolis Indiana. We will be presenting five poster presentations and three concurrent sessions at this conference. This will likely be the largest group of participants from any institution and the largest number of presentations from a single institution at the summer institute (this conference is July 21-25, 2011, but funds were approved in FY 2011 so that we could plan for this event). We hired a graduate student (Ross Alexander) to oversee the student leadership team and hired eight undergraduates for portions of the preceding fiscal years (Emily Pugh, Dorothy Rosene, Peter Rosene, Elise Hobbs, Adri Lehman, Chase DuPont, Lauren Adams, and Andrea Kelley). These students have presented at the Washington DC Symposium in April 2010 and 2011, attended the Summer Institutes and will

be attending the Summer Institute this summer. At this event last April, ISU was awarded the William E. Bennett Award for Extraordinary Contributions to Citizen Science for our work with the SENCER Teaching Model and specifically for the development and use of the SENCER Student Leadership Team. This was an innovative advancement and has been suggested as a model for other institutions to follow. Also, the SENCER program continues to produce new stories that are featured on local television and radio news broadcasts as well as on ISU's web pages. This program has been successful in bringing much positive media attention to the experiential learning and community engagement that our students have completed.

As the faculty and staff bring this model to campus, the student SENCER team puts the energy into the campus effort to provide this project-based learning around civic issues. Our current student workers are providing the student leadership that is needed to engage the rest of the student community in these engaging classes.

Initiative 2 is working to meet three of the four benchmarks listed under goal 2. These benchmarks are the following:

- by 2014, increase the percentage of students who participate in internships, practicums, and field experiences before graduation to 100 percent;
- by 2014, increase the percentage of degree programs with a required significant experiential learning component to 100 percent;
- increase the participation in experiential learning each year, until 100 percent of ISU students engage in at least one significant field experience within their major before graduation;

We are approaching this from a different direction by incorporating field experiences into the foundational studies classes have been SENCERized and through major courses using this teaching model. Furthermore, these classes also emphasize community engagement around civic issues that grab the interest of the students such as global climate change, environmental issues, the Riverscape, and ISU campus life itself.

Our goals for Fiscal Year 2012 are the following:

1. to complete the assessment of the first two years of our SENCER program at ISU which will result in two publications with the national SENCER organization (one of which will be in a peer-reviewed journal).
2. expand the SENCER Teaching Model into the other sciences especially into the Biology department.
3. present the results from our current SENCER classes at national venues.
4. develop a sustainability minor that is truly interdisciplinary and incorporates new SENCER classes.
5. integrate SENCER more into the College of Education curriculum to help model inquiry-based education in the sciences.

Proposal/Purpose/Justification – Why will you do it?:

Inquiry-based, hands-on learning has been shown to be the most effective means to teach science to all age groups (Haury and Rillero 1994). Kolb (1984) states that “Learning is the process whereby knowledge is created through the transformation of experience.” SENCER classes focus on this process of learning by giving students the opportunity to practice science by developing and testing hypotheses. Through these efforts they learn the scientific method and learn the specifics of the subject matter deeply, rather than memorizing facts for an exam. The National Research Council has produced multiple studies and publications that support the concept that actively participating in scientific research is the best way to deeply learn the skills of a scientist (NRC 2000, 2002, and 2005).

Haury, David L. and Rillero, Peter. 1994. Perspectives of Hands on Science Teaching. Columbus, Ohio: ERIC Clearinghouse for Science, Mathematics, and Environmental Education. 151 pp.

Kolb, D.A. 1984. Experiential Learning: Experience as the source of learning and development. Prentice Hall. Englewood Cliffs, NJ.

National Research Council. 2000. How People Learn: Brain, Mind, Experience, and School. Bransford, J.D. *et al.* (eds.) Committee on Developments in the Science of Learning and Committee on Learning Research and Education Practice. Commission on Behavioral and Social Sciences and Education. Washington D.C. National Academy Press. 374 pp.

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Work Plan – Action Steps –

How will you do it – brief work plan – please point to Benchmark Goals?

During the summer of 2011, Peter Rosene, Ross Alexander, and Jim Speer will work on the assessment of our past SENCER classes using long-term SIR and more recent SALG results to assess the impact of our program. The result from this analysis will be multiple presentations at the SENCER Summer Institute and submission of a journal article to the peer-reviewed international journal *Science Education and Civic Engagement*. Besides this article, we have completed a “backgrounder” on the ISU SENCER program that we will continue to work on which will be published on the SENCER website this coming year. We expect the backgrounder to be published in Fall 2011 and hope to have the journal article accepted in Fall 2011 and posted in Spring 2012.

During the Fall 2011 we plan to work closely with Dr. Kit Murphy (chair of biology) to convert some courses in that program to SENCER classes. This is likely to be the focus of our next SENCER Implementation Award which we will apply for in the Fall of 2011.

We plan to have many presentation at the SENCER Summer Institute from July 21-25th with the intent of reporting our and showing what ISU has achieved with the SENCER program. We also have two faculty (Dr. Kathy Bauserman and Dr. Larry Tinnerman) who plan to present at the Association of American Colleges & Universities conference in February of 2012.

In May 2011, a group of faculty applied to the NSF TUES grant opportunity for funding to create a cognitive fellowship around sustainability minor. Whether or not we receive those funds, we plan to move forward on a sustainability minor with new classes that are interdisciplinary and use the ideals of the SENCER teaching model. We also hope that these classes will be made into foundational studies classes in the next round of classes that are accepted for that program.

We have started conversations with the Dean Balch and Associate Dean Susan Powers of the College of Education about encouraging more of their students to take SENCER classes to model inquiry-based education. This work will continue with the likely result that student will be advised to take courses and sections of courses that have SENCER components.

The long-term goal of all of these efforts is to make SENCER classes more accessible to students across campus, to study the impact of these courses, and to encourage more faculty to take on this teaching model in their own courses. We are at the phase where we hope to have hard data from the assessment of our current courses to help convince faculty of the efficacy of these courses. These efforts contribute to the benchmarks of Goal 2 to increase the participation in experiential learning through integration of experiential learning and community engagement into foundational studies and majors courses throughout the university.

Reporting and Deliverable Schedule – When?:

Summer 2011

Presentation at the SENCER Summer Institute (July 21-25)

Writing of a peer-reviewed journal article on the assessment of the ISU SENCER program

Working with the National SENCER organization on publication of the ISU SENCER Student Leadership Team Backgrounder

Fall 2011

Apply for a SENCER Implementation Award to convert some biology courses to SENCER courses

Complete submission of the peer-reviewed journal article on assessment of the ISU SENCER program

Continue to teach multiple SENCER courses at ISU

Work to make the ENVI 110 course more SENCERlike through innovative and original research projects with the students taking this course

Spring 2012

Work on Sustainability Minor classes to include the SENCER Ideals and to gear them towards Foundational Studies so that we can incorporate more SENCER classes in the Foundational Studies Program

Attend the Association of American College & Universities Conference and present on our Education SENCER courses

Attend the DC Symposium with students to have them report out on their research in their SENCER classes

Budget – How Much will it cost?:

Our initiative requested \$146,121 from the strategic plan for the Fiscal Year 2012. In this request, we include funds for the SENCER Summer Institute for Summer 2012 (in Fiscal Year 2013) so that we can plan for the July conference during the Spring semester when abstracts and team rosters are due. The majority of the budget is for student wages for the SENCER Student Leadership Team. This project provides them leadership skills, experiential learning within their major, and an opportunity to improve education at their own institution.

Management Plan – Who (by name if possible) will do the work?:

Dr. Jim Speer is the faculty member in charge of Goal 2 Initiative 2. He holds weekly meetings with the SENCER Student Leadership team, almost daily meetings the graduate student overseeing the team, and monthly meetings with the faculty and staff members of the SENCER team. He will teach two sections of ENVI 110: Introduction to Environmental Science and one section of ENVI 465/565: Fundamentals of Tree-Ring Research in the Fall semester. In the Spring he will teach ENVI 460: Conservation and Sustainability, ENVI 418/518: Soil Genesis and Classification, and will oversee the ENVI 110 lab sections. All of these classes are SENCER classes that will continue to be assessed with the SALG tool.

Ross Alexander is the graduate student who oversees the SENCER Student Leadership Team. He will continue to manage this team and to enter data into Task Stream.

The SENCER Student Leadership Team over the summer and the Fall semester will be composed of Peter Rosene (Senior student member of the team and Political Science – Pre-Law major), Adri Lehman (Human and Environmental Systems Major), Lauren Adams (Psychology Major), Andrea Kelley (Public Relations and Communications Major). We will search for two new student members on the Student Leadership Team.

Dr. Larry Tinnerman, Dr. Kathy Bauserman, and Dr. Susan Berta have converted courses to SENCER courses and continue to teach these classes at ISU. Dr. Feng-Qi Lai conducts research in inquiry-based education and has recently joined the team. Dr. Carolyn Wallace was recently hired to be the new director of the Center for Science Education and is an expert in qualitative assessment. She will be examining the SENCER program at ISU from an outside perspective since she will be new to campus in August of 2011.

Jennifer Sicking (ISU Public Relations and Communications), Liz Metzger (Office of Sponsored Programs), and Heather Miklozek (Center for Community Engagement) remain engaged with the SENCER program and bring their skills and expertise from their offices to advance SENCER at ISU.

Dr. Kit Murphy is the new chair for the Biology department and we will be working closely with him to convert some biology courses to the SENCER teaching model this coming year.

Outcome Assessment & Future Testing – How Well did we do?

How will we know that we have moved us toward our benchmarks goals?

We are studying the effect of SENCER classes through an innovative assessment tool called the Student Assessment of Learning Gains (SALG). Each SENCER class completes this extra assessment survey of the students' gains and understanding of larger issues such as critical thinking and importance of civic issues. This work is building to the point where we will better understand how our students learn and what engages them in their education which will result in student retention and success (see benchmarks under **Goal 1** as well).

We also are looking at long-term data from the Student Instruction Report (SIR) scores from the past 10 years to examine classes before and after the SENCER model was implemented at ISU. We will know that we are succeeding if we see an increase in SIR scores in SENCER classes and if we see positive responses regarding critical thinking, knowledge of science is done, interest in science, and interest in the science of civic issues from the SALG assessment.

Budget Narrative for Goal 2 Initiative 2

Faculty salary. Dr. Jim Speer has been overseeing the SENCER program at ISU for more than two years and has received national recognition for his work on this project. We are requesting \$6,000 in summer salary for the time that Dr. Speer puts into overseeing this part of the strategic plan. He also continues to teach multiple SENCER courses each semester which have been the basis for assessment of the SENCER program at ISU. Furthermore, funds are requested to be awarded to four faculty members as subawards at \$3,000 each (total of \$12,000) to develop new SENCER courses.

Student Stipends, Wages, and Tuition Waiver. Indiana State University was nationally recognized for its SENCER Student Leadership Team which is composed of a graduate student and six undergraduate students. Our current graduate student (Ross Alexander: BS in Biology from Hanover College; Current MS Earth and Quaternary Sciences) has had one year of experience in leading the student team and is now trained in the Task Stream program. He is skilled enough in Task Stream that he has been called upon to train other graduate students in entering updates on different initiatives into the program. This is why we are asking for an increase in his salary (from \$15,000 to \$17,000) for fiscal year 2012.

In the last two years, we have been able to build a SENCER Student Leadership team with skills from different majors that they could bring to the program. Besides the science students, we have hired students with majors in public relations, political science, psychology, and construction management. This is another example of experiential learning where students are working on important projects and getting real world experience using the skills that they learn in their majors. The majority of the requested funds are to go to student wages to help this program run and to provide that resume building experience to these students. Many of the students on the team will be in their second year and deserve a raise as they have learned new skills on the job. We are requesting funds to pay the students \$9/hour for 20 hours a week during the school year and 40 hours a week during the summer.

Supplies and Expenses. Many SENCER classes use specific scientific equipment and sampling gear. \$10,000 are requested to be able to purchase this equipment to enhance our SENCER classes and to give students hands-on experiences with scientific tools. We plan to use these funds to purchase supplies needed for those classes to make them more interactive and hands on.

Faculty Development Workshops, Guest Speakers, and Promotional Material. We continue to hold faculty development workshops and to bring in guest speakers to enhance the SENCER programs at ISU. These funds are both to teach our faculty members about the SENCER program and to bring guest speakers into their classes to enhance the educational experience for students.

Travel Expenses

The SENCER Summer Institute (SSI) is the main event that is sponsored each year by the National SENCER organization to share knowledge about the SENCER program and for institutions to report out on their efforts in their own institutions. We have been participating for three years (Chicago 2009, Asheville 2010, and we will be sending a team to Indianapolis 2011 on last fiscal year's funds). We are requesting \$10,000 to pay for a 10-member team to attend the SSI 2012. ISU has been prominent in these conferences since we started to attend and we have received national recognition for the work that we have completed using the SENCER

Teaching Model. This venue is the highlight of the year and gives us an opportunity to report out on our good work. This is also a venue where our students can present their work at a national conference.

We have also had the opportunity to support our students presenting at national conferences in Washington DC and Seattle in the last year. We request \$8,000 which will specifically be used for our SENCER students and students taking SENCER classes to present at national conferences around the United States.

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