MSU INVESTMENT PROPOSAL FOR INSTITUTIONAL PRIORITIES

PROPOSAL OVERVIEW

Title	Early Undergraduate Research Apprenticeship Program	**Request Date**	15 December 2011
Department	Undergraduate Scholars (USP)	**Email**	colin.shaw1@montana.edu
Requestor	Colin Shaw, USP Director	**Phone**	994-6760

STRATEGIC ALIGNMENT

Core Themes and Objectives (check all that apply)

Educate Students

☒ Our graduates will have achieved mastery in their major disciplines

☒ Our graduates will become active citizens and leaders

☒ Our graduates will have a multicultural and global perspective

☒ Our graduates will understand the ways that knowledge & art are created and applied in a variety of disciplines

☒ Our graduates are prepared for careers in their field

☒ We will provide increased access to our educational programs

☒ Communities and external stake holders benefit from broadly defined education partnerships with MSU

Create Knowledge and Art

☒ Students, faculty, and staff will create knowledge and art that is communicated widely

Serve Communities

☐ We help meet a fundamental need of the citizens of Montana by providing degree programs for our students

☒ We help meet the educational needs of the citizens of Montana by providing a wide range of educational opportunities to a variety of students

☒ Our students, faculty, staff, and administrators reach out to engage and serve communities

☒ Our students, faculty, staff, and administrator reach in to build the university community

Integrate Learning, Discovery, and Engagement

☒ Each graduate will have had experiences that integrate learning, discovery and engagement

☒ Outreach activities will educate students and address the needs of the communities we serve

☒ Students, faculty, and staff will create knowledge and art that addresses societal needs

☒ MSU is a community that will be characterized by synergy within and across disciplines, roles and functions.

Stewardship

☒ The public trusts the institution to operate openly and use resources wisely

☐ The faculty and staff are well-qualified and supported

☒ MSU will support Native American students, programs, and communities

☒ MSU will be an inclusive community, supporting and encouraging diversity

☒ Our publicly provided resources are used efficiently and effectively

☐ Natural resources are used efficiently and sustainably

☐ MSU nurtures a culture of resource conservation and ecological literacy among students, faculty and staff

☐ Our physical infrastructure (e.g., building, equipment, open spaces) will be well-maintained and useful

INSITUTIONAL BENEFIT	
Campuses	☒ Bozeman ☐ Billings ☐ Havre ☐ Great Falls ☐ FSTS ☐ Extension ☐ MAES
Cross Depts	Please List: ***All Departments***
TIMEFRAME	
Proposed Dates	Start: 1 July 2012 End: 30 June 2015
COST AND REQUIREMENTS	

Funding Type	One-Time ($)	Multi-Year ($)			Base ($)	FTE
		Year 1	Year 2	Year 3		
Personnel (*w/benefits***)**		**7,500** (*EPSCoR 34,000*) (*VPR 34,000*)	**12,000** (*EPSCoR 34,000*) (*VPR 34,000*)	**76,000**	**20,000**	0.5*
Materials & Supplies						
Travel						
Contracted Services	6,000					
Capital						
Other Operations					2,500	
TOTAL	**6,000**	**7,500**	**12,000**	**76,000**	**22,500**	0.5

Please comment, if necessary, regarding cost and requirements.

** EPSCoR + VPR contribute 2/3 of total budget ($70,000-75,000) for first two years of pilot program. These matching funds are shown in parentheses () and italics. Requested funds shown in **bold**.*
** 0.5 FTE added to existing 0.5 FTE Administrative Associate II position + Progression pay increase for added responsibilities.

BUDGET EXPLANATION
The largest items in the budget are direct support of student apprentices and peer mentors (listed under Personnel). The remainder of the budget is for program coordination and operations (Base funding), instruction (Personnel) and development of an on line application system (OTO funding). Montana EPSCoR has committed to fund 1/3 of the pilot program for the first two years. We are requesting another 1/3 funding from the Office of Research and Creativity. Amounts listed in the budget table include the Institutional Investment Program request (**bold**) and total estimated expense (*italics*).

One-Time-Only (OTO). One-time only funds are requested to develop and deploy an online clearing-house and application system for faculty to post research opportunities and students to apply. This will be contracted through the MSU web-development team at $60/hour. Based on recent experience developing the new USP online application system we estimate that the application system will require about 100 hours of work for a total expense of about $6000.

Personnel (Annual). Annual personnel expenses include stipend/salary for Undergraduate Research Apprentices ($9/hour) and peer mentors ($11/hour) as well as salary for research seminar instructors ($2500/credit). Federal work-study will pay 70% of wages for eligible students, but EURAP will be responsible for benefits (5.1%) and a 10% service charge from the Financial Aid office. Based on an average anticipated work-study eligibility of 15 hours/week we have budgeted about $2000/student ($4400 earnings with federal work-study). We anticipate funding 20-30 students for each year of the pilot program depending on the proportion of work-study eligible applicants. We have budgeted 1 peer advisor for every 6 Research Apprentices. Pay for work-study-eligible peer advisors would be approximately $2500 each. Research seminars would be limited to ~15 students. We have budgeted two credits of instruction (+ benefits) for each semester of the pilot.

Base Funding. We request $19,000 (salary + benefits) in base funding to increase the FTE of the USP Administrative Associate and provide a progression/reclassification salary step to reflect the new duties and greater level of responsibility associated with inauguration of EURAP. We also request $2500 in base funding to offset increased operational expenses.

PROPOSAL SCOPE

EARLY UNDERGRADUATE RESEARCH APPRENTICESHIP PROGRAM

We propose a three-year pilot *Early Undergraduate Research Apprenticeship Program* (EURAP) that will engage first- and second-year undergraduates in hands-on research early in their academic careers. The goals of the program are to improve retention during the critical first years and to provide a *running start* to get students up to speed for more independent research experiences. EURAP will provide a basic entry-level research opportunity with supporting instruction and peer-guidance to make research experiences accessible to a broader spectrum of undergraduates. Many of our brightest and most ambitious students already take advantage of the myriad undergraduate research opportunities at MSU with spectacular results. EURAP will build the skills and confidence needed for students who might not see research as a viable option. By helping a broader cross section of students to engage in the core research mission of the university EUROP will enhance retention and promote student success.

The first two years of the program would be jointly funded by EPSCoR, the Office of Research and Creativity and the Institutional Investment Program (this proposal). The third year of the pilot would include a comprehensive assessment of program outcomes and begin a transition to sustainable base funding. The reach of the program will be enhanced by leveraging federal work-study to supplement student stipends.

EURAP would complement existing undergraduate research programs that require highly independent work, by providing a more structured introduction to research as the first rung an a *'research ladder'* that would ultimately prepare students for more autonomous research in programs such as USP, INBRE or McNair. This research-ladder model for fostering confidence and skill in research students is time-tested. Many of the very best research students at MSU started as lab assistants with top researchers who offer lab apprenticeships that prepare students for more self-directed research projects. After one or two years immersed in the culture of research and mastering the skills and intellectual habits of their discipline students are ready to undertake ambitious independent research projects with faculty mentoring. As director of USP I frequently hear that it takes students 2-3 years of experience to truly reach their potential as independent researchers. EURAP is designed to make it possible for less-well-funded faculty in science, engineering, humanities and the arts to offer lab, field or studio apprenticeships for beginning research students, thus enhancing the preparation of students embarking on independent research projects funded by our USP, other programs, or individual grants. EURAP will broaden the reach and enhance the impact of undergraduate research at MSU by engaging students from diverse backgrounds across the academic spectrum.

EURAP would provide a sort of 'employment service' matching interested students with research opportunities posted by faculty. Students would be paid through the EURAP program leveraging federal work-study for eligible students. This would make undergraduate research apprentices more affordable for research groups in all disciplines including those that otherwise might not be able to offer such opportunities. We think that paying students for pre-professional work in their field sends a positive message and is a more constructive use of work-study funds than paying them to wash dishes, mow lawns or make sandwiches. EURAP students also would enroll in a one- or two-credit research seminar that would introduce them to exciting research through guest speakers, provide a grounding in the Responsible Conduct of Research (RCR - now required by many federal funding agencies), and build basic discipline-specific research skills in break-out workshops. We think that this training will provide significant added value that will make these students more attractive as research apprentices and enhance their contributions to faculty research productivity. More advanced undergraduate researchers (e.g. USP students or EURAP alumni) would serve as peer-mentors and role models to help students become comfortable with the culture of academic research and provide advice and guidance for beginning researchers.

EURAP is modeled after the successful Undergraduate Research Opportunities program at the University of Michigan (http://www.lsa.umich.edu/urop). We have chosen this program as a model because of its well-documented success as and introductory research experience. Assessment using a paired-random control group showed notable gains in retention for many under-represented student demographic groups (Gregerman, 2010) as well as a high rate of continuation into higher-level research programs. A similar rigorous assessment program will be incorporated into two-year pilot implementation of EURAP proposed here.

EURAP is designed to build on MSU's strength as a leader in undergraduate research (NWCCU Accreditation Report; 2009) by leveraging the infrastructure and expertise of the thriving Undergraduate Scholars Program which has nearly quadrupled in size since 2005. EURAP will complement existing student research programs on campus by providing the first step in a vertically integrated undergraduate research ladder that – with programs like USP, McNair Scholars, MSGC, INBRE and HUB – will provide a research-centered complement to the academic curriculum. This would be an enormous step toward realizing the recommendation to make research-based learning the standard laid out nearly a decade ago in *The Boyer Commission Report - Reinventing Undergraduate Education: A Blueprint for America's Research Universities* (Kenny et al., 2001).

Program Outline. EURAP will integrate hands-on research experiences in labs, studios, research centers etc. with supporting seminars, workshops and peer advising. EURAP will pair first- and second-year students with pre-defined research projects developed and supervised by faculty mentors. This builds on the model of research apprenticeships that is currently a major pathway to independent research in the laboratory sciences. The EURAP program would offer three reinforcing elements:

1. ***Research Apprenticeship.*** Students will engage in 8-20 hours/week of research, scholarly or creative activity. Activities will be *introductory-level* hands-on work supervised by faculty aided by graduate students and/or more experienced undergraduates as appropriate. EURAP projects would have less expectation of independence than USP-type projects. Examples might include routine lab, field or studio work, experimental protocol development, primary source library research, etc. Projects will be solicited from faculty who benefit from cost-free research assistance. Students will apply for projects of interest and are vetted by EURAP staff; final selection is made by the sponsoring faculty mentor. Eligible EURAP Students will be paid through federal work study program (70%) with required contributions from program funds (30% + service charge + benefits).
2. ***Research Seminar & Workshop.*** EURAP students will participate in a semi-weekly seminar (one- or two-credits/semester) to learn research concepts and skills, foster a community of scholars and introduce students to the culture of academic research and creativity. Topics will include responsible conduct of research, career tracks and learning strategies. The focus will be on interdisciplinary discovery, but discipline-specific break-out workshops will focus on basic disciplinary skills for appropriate sub-groups. During the spring semester students will work on individual or group presentations of their research experience to be presented at the *Student Research Celebration* in April
3. ***Peer Advisors.*** To complement the research seminar and provide advice and support students will meet in small groups with advanced undergraduate research advisors in their discipline to discuss their research and troubleshoot time management or personal issues. Peer advisors will compensated through federal work study (when eligible) and the EURAP program.

PROPOSAL SCOPE
Describe the broader impacts and benefits of this proposal

Broader Impact and Benefits. Early involvement (first and second year) in undergraduate research and creative activity has been shown to increase student retention significantly (Gregerman, 2010; Nagda et al., 1998). There is currently no formal program at MSU to provide this *early* connection to student research. USP, INBRE, MSGC McNair and other undergraduate research programs primarily impact high-achieving upper-division students who are already on a trajectory of academic success. These programs, along with research assistantships provided by individual PI's, are the foundation of the remarkable success of MSU students in prestigious scholarship competitions like the Goldwater that require a strong record of research achievement. EURAP is designed to offer promising students from diverse backgrounds an entrée to the world of research that might otherwise seem out-of-reach or entirely obscure. This approach is particularly likely to benefit talented first-generation college students who might not consider research as a viable academic or career path. EURAP will also provide an opportunity for faculty in the humanities and other areas that rarely compete for large research grants to offer research experiences on par with better-funded colleagues in science and engineering.

Faculty-mentored undergraduate research enhances the frequency and quality of faculty/student interactions, builds collegial peer networks among students engaged in research, demonstrates the relevance of knowledge gained in coursework, and integrates students into the campus culture of research. All of these benefits are identified by the *American Association of Colleges and Universities* LEAP project as high impact strategies for student success (http://www.aacu.org/leap/hip.cfm). Involvement in undergraduate research is a leading factor in retention and post-graduation achievement (Astin, 1997; Kuh, 2005; Pascarella and Terenzini, 2005). MSU's commitment to *"integrating learning, discovery and engagement"* (Mission Statement, 2011) is exemplified in our recognized excellence in undergraduate research. Continued leadership in this area demands continued innovation and investment. EURAP is a bold step toward broadening the reach and enhancing the impact of our undergraduate research programs at MSU.

Contribution to University Priorities. EURAP is a transformative program that will advance the mission of the university by offering every MSU student an authentic research-centered educational experience. EURAP builds on the foundation of inquiry-based learning promoted by Core 2.0 and provides an entry point for more independent research and creative projects. Provided that EURAP meets the objectives defined under assessment below, this pilot project will grow into an ongoing introductory research program at MSU Bozeman and could provide a template for creating similar programs statewide. In particular EURAP will engage students in the university's stated goals to

educate students by integrating learning, discovery, and engagement, create knowledge and art, and serve both the university and broader communities of Montana, the U.S. and the world.

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Implementation Plan *(Please describe with timelines)*

This proposal requests funds for a three-year pilot program with an annual cohort of 20-30 EURAP students. Implementation would begin spring 2012 with full funding beginning in FY 2013 (1 July 2012). During the first two years of the pilot program we will work with the Budget Council, MSU Foundation, Office of Research and Creativity, individual Principal Investigators (PI's) and others to develop a model for sustainable funding. We anticipate phasing in new sources of funding during the pilot period to gradually increase the number of participants. We also anticipate supplementing funds from this program, EPSCoR and the Office of Research and Creativity with contributions from well-funded research groups to help offset expenses related to Research Apprentices in their groups.

Efficient implementation of the program will be ensured by leveraging the infrastructure and experience of the Undergraduate Scholars Program staff. USP has grown nearly four-fold over the past six years with no increase in funding for operations or staff by improving efficiency and streamlining systems. The considerable administrative demands of the EURAP will require an increase in the FTE of the USP Administrative Associate (Scarlet Reierson) from 0.5 FTE to 1.0 FTE with a progression/reclassification salary increase to reflect the greater level of responsibility and autonomy required.

Timeline

March - June 2012	Develop online application system and web site, Solicit faculty projects, request course number designation for seminar, begin recruitment of 1st cohort
July 1 2012	Administrative Assistant/Program Coordinator begins new duties (0.5 FTE devoted to this project)
July - August 2012	Select first student cohort, Hire peer advisors
Fall 2012	Apprenticeships & Seminars/workshops
Spring 2013	Apprenticeships & Seminars/workshops, solicit new/continuing faculty projects, begin recruitment of 2nd cohort
April 2013	Research Presentations
May 2013	1st cohort participant survey/exit interviews
Summer 2013	Summer apprenticeship program? begin working to secure sustainable funding for ongoing program, select 2nd cohort, hire peer advisors
2013-14 Acad. Year	2nd cohort apprenticeships & seminars/workshops
2014-2015	3rd cohort. Begin program assessment Initiate 5 year student outcomes tracking. Phase-in implementation of sustainable funding model.
2015 →	Compile & publish assessment results. Implement sustainable funding model. Work to replicate at other campuses throughout MUS

Assessment Plan *(Please describe with indicators)*

Program Assessment & Sustainability.

During the third year EURAP would be rigorously assessed for its effect on student retention and achievement using a random paired comparison between the first two cohorts and a control group of unsuccessful applicants. Although the sample size will be relatively small a rigorous control-group methodology for comparison of retention rates and outcomes among the two initial cohorts (~50 students total) should provide preliminary insight into the effectiveness of the program. Applicants will be screened for acceptance into the program. To ensure that the control group and experimental group are comparable about half of the qualified applicants will be randomly selected for the program. These students will be eligible to apply for the 20-30 research positions funded in the pilot program. Students not selected for the program will be tracked as a non-participant control group. Note that selection of the experimental and control groups will be random, *not* merit-based. The proposed random control group comparison is much more valid than a comparison between program participants and the general student population because experimental and control groups will be randomly selected form the same pool of qualified applicants and paired according to quantifiable criteria. The participants and non-participant control group applicants will be tracked for 5 years after completion of the program to assess the 6-year retention rate and career trajectory of the cohort and control group. Participants and control group will be entered into the new *Undergraduate Research Information Database* administered by USP (implemented fall 2011) and long-term outcomes will be tracked by collating these records with *Studenttracker* Aggregate data set from the *National Student Clearinghouse* provided by the *Office of Planning and Analysis* (OPA). Standard OPA procedures would be followed to ensure student privacy in compliance with FERPA. USP will work with Associate Provost Ron Larson and Chris Fastnow of the Office of Planning and Analysis to develop and implement an assessment strategy for the pilot program. We will also consult with Mark Greenwood (Assoc. Professor, Statistics) on statistical design of the assessment.

Assessment Targets:

- First-year retention of >80% of participants and statistically greater retention than control group
- Higher rate of subsequent participation in undergraduate independent research among participants than among control group.
- Statistically significant impact on retention and subsequent undergraduate research participation for first generation and underrepresented-group college students
- Statistically significant impact on retention and subsequent undergraduate research participation for Montana in-state students
- Positive qualitative and/or quantitative outcomes related to academic program and career trajectory (long term assessment)
- Positive feedback on participating student and sponsoring faculty survey and interviews
- Publication of results in scholarly journal (2015)

We envision establishing EURAP as a long-term program and as a model for similar programs statewide. EPSCoR has committed two years of support for the pilot program contingent on development of a sustainable funding model for the program assuming it is successful in meeting the goals stated above. We propose that after successful completion of the initial three-year pilot program with documentation that all goals of the program have been met or exceeded that the program be funded through state fund dollars provided by some combination of Academic Affairs and the Research Office.

If assessed objectives are not met in the timeframe outlined, what is the plan to sunset this proposal?

If assessed objectives are not met, funding would end and the program would be mothballed. The USP Administrative Associate would be reassigned to other rapidly growing undergraduate programs (e.g. USP, REU, Beckman Scholars).

SIGNATURES		
Department Head *(please print)*	**Signature** *(required)*	**Date**
Colin Shaw		**12.15.2011**
Dept Head Priority *(please circle one):* ~~Very High~~ Medium Low Very Low		
Dean/Director *(please print)*	**Signature** *(required)*	**Date**
David Singel		**January 3, 2012**
Dean/Director Priority *(please circle one):* Very High High **Medium** Low Very Low		
Executive/VP *(please print)*	**Signatures** *(required)*	**Date**
Executive/VP Priority *(please circle one):* Very High High Medium Low Very Low		