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REQUEST FOR COURSE TRANSFORMATION PROPOSALS

TRANSFORMING EDUCATION, SUPPORTING TEACHING AND LEARNING EXCELLENCE (TRESTLE)

Overview
Date: November 2, 2017
To: Department Chairs and Science Education Initiative points of contact
For: Course transformation projects which will spread the use of effective teaching practices in STEM
Contact: Stephanie Chasteen (PI), chasteen@colorado.edu, Center for STEM Learning (CSL)
Proposal Deadline: February 14, 2018 ✦
CU TRESTLE Website: https://www.colorado.edu/csl/TRESTLE
National TRESTLE Website: http://trestlenetwork.org

SUMMARY

The Transforming Education, Supporting Teaching and Learning Excellence (TRESTLE) is a 7-institution NSF-funded project to support improvements in undergraduate STEM education through (1) supporting course design projects, (2) enhancing educational expertise in departments, and (3) building communities within and across campuses to enhance the impact of local experts; see http://trestlenetwork.org.

TRESTLE Course Transformation Awards support the transformation of courses to include evidence-based teaching practice, such as active learning and assessment-driven instruction. Course development awards are for departments and faculty who *have* previously engaged in course transformation activities or have sufficient expertise in-house to lead a course transformation project. This is intended to be an opportunity to build upon and deepen STEM education expertise on campus, including facilitating community-building and information-sharing within and between departments. One proposal per department, please. Available resources: Grant up to $10,000, faculty learning community, educational advisors.

The Course Development Award is for a period of one year, beginning in March 2018, though a later start-date may be requested at the time of submission. The deadline for submissions is February 14, 2018. We welcome unsuccessful Chancellor's Award applicants to revise their submission and apply for TRESTLE, and vice versa, where appropriate.

BACKGROUND

There is a substantial and growing body of research, both from cognitive psychology and from college-level STEM classrooms, that has identified several pedagogical approaches that are significantly more effective than the traditional lecture- based format used in most STEM teaching today[1,2,3,4.] The STEM pedagogies that have been shown to be effective emphasize student-centric practices that stress active learning, with much more interaction among students, and between students and instructors, than in the traditional lecture-based format. These methods emphasize building a course backwards from carefully articulated learning goals for the course as a whole, and incorporate fine-grained, real-time assessment of student learning in relation to the learning goals. Active-learning in particular has been shown to dramatically decrease student failure rates in STEM courses, as well as to improve student learning outcomes and conceptual understanding.

Here at the University of Colorado, we have engaged in major initiatives to improve undergraduate STEM education – the Science Education Initiative (SEI) (initiated by Dr. Carl Wieman, the SEI funded postdoctoral fellows in 7 STEM departments over 8 years, including APS, PHYS, EBIO, IPHY, GEOL, MCDB and CHEM), and the Association of American Universities (AAU) STEM Initiative (currently active on campus). These campus initiatives have led to many improvements in our undergraduate courses[5], and departments.

However, there is much more to be done. Some of these course improvements require further attention, or faculty would like support in continuing work on educational improvements. More departments would like to get involved. We have an opportunity at CU-Boulder, if we act now, to leverage this national interest and our growing local expertise to develop high-quality course experiences for our students, increasing learning and outcomes for *all* students and making teaching more deeply rewarding and fulfilling. The Chancellor has recently identified persistence and retention as a campus priority – a challenge well-aligned with curricular improvements.

The current grant (TRESTLE) is a project of the Center for STEM Learning (CSL), and was developed as part of a multi-institution consortium (the Bay View Alliance) interested in improving teaching and learning at their respective campuses, with the Science Education Initiative as one strong model for how this might be accomplished. The TRESTLE grant is intended to build on the expertise of CU Boulder's campus in STEM education transformation to increase and spread the use of evidence-based teaching practices on our campus.

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[1] Bransford, J. D., Brown, A. L., & Cocking, R. L. (eds). (2000). *How People Learn: Brain, Mind, Experience and School*, National Academies Press: Washington DC.

[2] Singer, S. R., Nielsen, N. R., & Schweingruber, H. A. (2012). *Discipline-based education research: understanding and improving learning in undergraduate science and engineering*. Washington, D.C.: The National Academies Press.

[3] Freeman et al., (2014) "Active learning increases student performance…," *PNAS*, 222, 8410-8415.

[4] For more detail, see the reference above and http://www.cwsei.ubc.ca/resources/course_transformation.htm.

[5] Chasteen et al., (2015) "Educational transformations in upper-division physics: The Science Education Initiative Model, Outcomes and Lessons Learned," Phys. Rev. Spec. Top., 11, 020110.

YOUR PROPOSAL

WHAT ACTIVITIES ARE SUPPORTED

The main activity of a Type II proposal is an undergraduate STEM course transformation effort. This could include course redesign, design of a new course, sustaining or extending changes made during a previous effort, or developing components of a course (e.g., clicker questions, assessments, recitation or lab materials). The proposal process also allows applicants to request support to further their own learning – such as individual consultations and faculty learning communities. Since the intention is to increase and disseminate expertise on-campus, proposals which have the potential to impact additional faculty and/or departments are preferred.

While there is no formal pre-submission process, we strongly recommend setting up an appointment with Stephanie Chasteen to discuss the proposal, and/or inviting Dr. Chasteen to introduce the project at a faculty meeting. Proposals must be sanctioned by the Chair, and only one submission is allowed per department. Proposals representing departmentally-coordinated efforts are preferred, though well-reasoned proposals from individual faculty with the potential for broader impact are welcome.

COMMON PITFALLS TO AVOID

1. Faculty leader does not have the sufficient expertise to run the project.
2. Course transformation plan is not specific enough, and/or not feasible.
3. Course transformation will likely affect only students and faculty in the course – there is not a compelling rationale for how the project might impact other faculty or departments.

THE WRITTEN PROPOSAL (5-7 PAGES)

Please address the following questions in your proposal, using the headings below.

Heading	Detail
1. Project title & PI	What is a descriptive title for your project?
2. Project leader & expertise	Only CU Boulder STEM faculty and staff are eligible to apply. Provide name, title, and department of person submitting the proposal, including contact information. What prior experience do the faculty leader(s) have in course transformation that will be leveraged for this proposal? How will the proposed work further their learning? Who will supervise any personnel (e.g., graduate students or postdocs) who might be hired? How will you ensure that commitments made in this proposal are fulfilled?
3. Compelling project rationale	How will this course transformation contribute to the teaching and learning needs in your unit or in your college?

4. Realistic and specific course development plan	A. **Course(s).** What courses will be changed, and what are the changes being contemplated? B. **Timeline.** What is the approximate timeline for making these course changes? What are the staffing plans for those courses (who will be teaching the course, and when?) C. **Assessment plan.** How will you assess whether the course changes have the impact you desire on student learning, retention, engagement, etc.? D. **Faculty & instructor involvement.** How will other faculty/instructors be involved in this work, and to what extent? How will that faculty effort be recognized or rewarded? E. **Sustainability.** How will changes in this course be sustained, especially if new instructors will be teaching it in the future? Be specific about these plans, as this is a common failure-point for course transformation efforts. F. **Coordination across the department.** How do changes in this course relate to the curriculum as a whole? Are there ways that this effort will be coordinated with other courses or instructors? At a minimum, the proposal should include a letter from the Chair supporting the work.
5. Impacts on other faculty or departments	How will this work further the TRESTLE goal of spreading the use of evidence-based teaching practices in STEM departments? *This is commonly not given sufficient attention in proposals, and is one of our primary review criteria.*
6. Resources requested	1. **Budget.** A maximum of $10,000 is available, which may be used for course buy-out, summer salary, graduate teaching assistant or postdoctoral fellow time[6]; learning assistants, equipment, etc. Travel, food, and administrative salary are not allowable. Benefits and overhead will be covered separately by TRESTLE. 2. **Non-financial resources requested.** Is there any non-monetary support would be helpful? For example, we can provide (1) facilitation of a learning community or (2) CSL educational advisors who can consult on the project. 3. **Other resources leveraged.** Are there internal or external financial resources, awards, or collaborations with other units or programs you will be leveraging?
7. Agreement to expectations	Do you agree to fulfill the "expectations of successful applicants," as described below?

Submit your proposals online at https://www.colorado.edu/csl/TRESTLE
by February 14, 2018.

[6] Some projects require time from graduate students or postdocs. If you need assistance in identifying such non-faculty experts, contact Dr. Chasteen. For details on how such staff have been productively used in the SEI, see http://www.cwsei.ubc.ca/resources/STLF-develop.htm

Review Criteria

1. Proposals will be reviewed by the TRESTLE advisory board, with funding decisions to be provided in March.
2. Critical elements include specificity of the proposal; feasibility of the scope, budget, and timeline of the work proposed; scale of impact; evidence for the capability of the team leading the work; a focus on evidence-based teaching practices; clear leadership and oversight plans; and potential for the project to positively impact faculty and/or courses in this or other departments.
3. Elements which are preferred include leverage of other resources and collaborations, and support and coordination by the department as a whole.

Expectations of Successful Applicants

1. **Sign a Memorandum of Understanding (MOU)** agreeing to the project expectations and timeline.
2. **Submit annual report and participate in project gathering.** Project leaders will submit an annual report on the project outcomes, and attend an annual gathering of all TRESTLE project participants.
3. **Participate in national meeting (optional).** Project leaders will have the opportunity (and be strongly encouraged) to attend a national meeting of leaders across all TRESTLE campuses (October 2018 at University of Kansas).
4. **Complete evaluation measures.** Faculty teaching the transformed courses will complete a survey about their teaching practices before and after the course transformation. Classroom practices may be observed using a structured observational tool, and faculty will be asked to submit their syllabus and report on basic statistics relevant to the transformed course. The department as a whole may be asked to complete a survey (it is recommended that this be encouraged by the Chair).
5. **Share expertise.** Faculty leaders will be requested to provide some support to other faculty (within or outside their department) in similar course transformation efforts, either by providing short individual consultations, giving a workshop, or leading a faculty group, as their time permits. We strongly encourage awardees to present at the DBER seminar at the beginning of the project (to solicit feedback) and at the end (to disseminate results).

Our grant competition is modeled closely after similar, larger-scale competitions run by the Science Education Initiatives at the University of British Columbia (CWSEI) and at the University of Colorado at Boulder (SEI), which have materials useful for preparing proposals. The winning proposals at UBC and CU can be found at http://www.cwsei.ubc.ca/about/funding.htm and http://www.colorado.edu/sei/about/funding.htm .