CCLI (Course, Curriculum, and Laboratory Improvement) program becomes TUES (Transforming Undergraduate Education in STEM)

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TUES versus CCLI

- Title changed to emphasize the special interest in projects that have the potential to transform undergraduate STEM education
- Review criteria modified to emphasize the desire for projects that (1) propose materials, processes, or models that have the potential to enhance student learning and be adopted easily by other sites and (2) involve a significant effort to facilitate adoption at other sites

Purpose of TUES Program

- To improve the quality of STEM education for all students by targeting activities affecting learning environments, course content, curricula, and educational practices.
- To support projects at all levels of undergraduate education.
- To support activities in the classroom, laboratory, and field settings

TUES

- Explicit encouragement of projects that have the potential to be TRANSFORMATIVE
- Increased emphasis on (i) building on knowledge of how students learn, (ii) building on prior work, (iii) and encouraging widespread adoption of excellent teaching methods

TUES

- Increased emphasis on projects that have the potential to transform undergraduate education (special interest in widespread adoption of exemplary materials)
- Increased emphasis on institutionalization of project

TUES Project Components

- Creating Learning Materials and Strategies (guided by research on teaching and learning; incorporate and be inspired by advances within the discipline)
- Implementing New Instructional Strategies (contribute to understanding on how existing strategies can be widely adopted, are transferred to diverse settings, and impact student learning in diverse settings)

TUES Project Components

- Developing Faculty Expertise (enable faculty to acquire new knowledge and skills in order to revise their curricula and teaching practices and involve a diverse group of faculty)
- Assessing and Evaluating Student Achievement (develop and disseminate valid and reliable tests of STEM knowledge; collect, synthesize, and interpret information about student understanding, reasoning, practical skills, interests, attitudes or other valued outcomes0

TUES Project Components

- Conducting Research on Undergraduate STEM Education : explore how (1) effective teaching strategies and curricula enhance learning and attitudes; (2) widespread practices have diffused through the community; and (3) faculty and programs implement changes in their curriculum.

TUES

- Type 1 Projects (small grants)

  Up to $200,000 ($250,000 when a 4-year and 2-year schools collaborate); 2 to 3 years (occurs at a single institution with primary local impact; must include assessment and community engagement

  Focus on piloting new educational materials and instructional methodologies

TUES

- Type 2 Projects (medium grants)

  Up to $600,000; 2 to 4 years; builds on smaller-scale proven ideas; diverse users at several institutions

  Focus on larger-scale development, broad testing, and assessment

TUES

- Type 3 Projects (large grants)

  Up to $5,000,000; negotiable; 3 to 5 years; combine proven results and mature products; involve several diverse institutions

TUES

- Proposals may request funds in any budget category supported by NSF, including instrumentation

TUES—Implementing Educational Innovations

- Projects must result in improved STEM education at local institution via implementing exemplary materials, laboratory experiences, or educational practices
- Implementation projects should stand as models for broader adoption in the community

TUES—Developing Faculty Expertise

- Methods that enable faculty to gain expertise
- May range from short term workshops to sustained activities
- Foster new communities of scientists in undergraduate education
- Professional development of a diverse group of faculty that leads to implementation
- May be combined with materials development, assessment, and so on.

TUES—Conducting Research on STEM Teaching and Learning

- Develop new research on teaching and learning
- Synthesize previous results and theories
- Practical focus: testable new ideas and IMPACT ON STEM EDUCATIONAL PRACTICES

TUES—Assessing Learning and Evaluating Innovations

- Design and test new assessment and evaluation tools and practices
- Apply new and existing tools to conduct broad-based assessments (must span multiple projects and be of general interest

TUES—Important Features of Successful Projects

- Quality, Relevance, and IMPACT
- Student Focus, i.e., student centered
- Use of and Contribution to the STEM Education Knowledge Base
- STEM Education Community-Building
- Expected Measurable Outcomes
- Project Evaluation

Quality, Relevance, and IMPACT

- Innovative
- State-of-the-art products, processes, and ideas
- Latest technology in laboratory and classrooms
- Have broad implication for STEM education (even projects that involve a local a local implementation)
- Advance knowledge and understanding (within the discipline; within STEM education in general)

TUES—Student Focus

- Focus on student learning (project activities must be linked to STEM learning)
- Consistent with the nature of today's students
- Reflect the students' perspective
- Student input in design of the project

TUES—STEM Education Knowledge Base

- Reflect high quality science, technology, engineering, and mathematics
- Rationale and methods derived from the existing STEM education knowledge base
- Effective approach for adding the results to knowledge base

TUES—Community Building

- Include interactions with investigators working on similar or related approaches in PI's discipline and others
- Include interactions with experts in evaluation, educational psychology, or other similar field.
- Benefit from the knowledge and experience of others
- Engage experts in the development and evaluation of the educational innovation

TUES—Expected Measurable Outcomes

- Goals and objectives translated into expected measurable outcomes (projective specific)
- Some expected measurable outcomes on student learning, contributions to the knowledge base, and community building
- Used to monitor progress, guide the project, and evaluate its ultimate IMPACT.

TUES—Project Evaluation

- Include strategies for (1) monitoring the project as it evolves and (2) evaluating the project's effectiveness when completed
- Based on the projects what are specific expected measurable outcomes?
- Appropriate for scope of the project

Questions for Intellectual Merit

Will the project produce one or more of the following:

(a) exemplary materials, processes, or models that enhance student learning and CAN BE ADOPTED BY OTHER SITES?

(b) important findings related to student learning?

(c) build on existing knowledge about STEM education

Questions for Intellectual Merit

(d) have explicit and appropriate expected measurable outcomes integrated into an evaluation plan?

(e) include an evaluation effort thyat is likely to produce useful information?

(f) **institutionalize the approach at the investigator's college or university appropriate?**

Questions for Broader Impact

Will the project

(a) involve a significant effort to facilitate adaptation at other sites?

(b) contribute to the understanding of STEM education?

(c) help build and diversify the STEM education community?

Questions for Broader Impact

(d) have a broad impact on STEM education in an area of recognized need or opportunity

(e) **have the potential to contribute to a paradigm shift in undergraduate STEM education?**

IDEAS

1. Integrate a difficult concept in the curriculum through a lab …
2. Synchronize lab and course
3. Teach calculus 1 and 2 from physics, computer science, and engineering perspectives; separate sections could be created

IDEAS

4. Integrate introductory courses in to Public Affairs Mission (community engagement, cultural competence, and ethical leadership
5. Integrate Homework into cyber-learning
6. Integrate Homework into C?????
7. Use education majors to help with labs and undergraduate teaching
8. Develop help labs through student-centered technology

IDEAS

9. Develop at-home and at-school labs
10. Develop more lab stations so that students could check out equipment and do labs at home
11. Materials Science education and learning