Prepared for Xavier University of Louisiana
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Founded in 2003, Hanover has over 300 employees, including a high-caliber staff of researchers, survey experts, analysts, statisticians, and grant professionals. Hanover provides grant development and strategic advising support to education and healthcare organizations. Our grants professionals deliver customized proposal review, revision, and production support, while also helping to align their needs and strategic priorities to funding trends and federal, state, and foundation grant opportunities.

This *Project Planning and Proposal Development* guidance memo has been prepared to help Xavier University of Louisiana (XULA) produce a competitive proposal for the National Science Foundation's 2017 **Improving Undergraduate STEM Education: Education and Human Resources (IUSE:EHR) program**. All information in this document has been derived from the 2015 IUSE:EHR Program Solicitation (NSF 15-585) and the current NSF Proposals and Awards Policies and Procedures Guide (PAPPG, NSF 17-1).

The latest IUSE:EHR Program Solicitation (15-585) was released on June 29, 2015. The solicitation covered IUSE:EHR competitions through January 2017. A new IUSE:EHR Program Solicitation is expected to be released by July 31, 2017, with expected deadlines beginning in early November 2017 for the Exploration and Design Tier for Engaged Student Learning & Institution and Community Transformation, and January 2018 for the Development and Implementation Tiers for Engaged Student Learning & Institution and Community Transformation. It is expected that the new solicitation will remain substantially similar to IUSE:EHR Program Solicitation 15-585, and will continue to feature two tracks (Engaged Student Learning and Institutional and Community Transformation) and two tiers of projects within each track (Exploration and Design and Development and Implementation). Immediate, careful review of the entire new solicitation and pertinent sections of the PAPPG is strongly recommended.

The previous program solicitation increased the award limit and duration for the Exploration and Design (formerly Exploration) tiers for both the Engaged Student Learning and Institutional and Community Transformation tracks for up to $300,000 over a period of up to 3 years. It is not known at present if funding award limits for new IUSE:EHR projects will increase or remain at the levels designated in 15-585.

While the IUSE program is intended to fund projects that improve STEM education at its awardee institutions, it is foremost a research and development effort. NSF reviewers and IUSE:EHR program officers will be seeking to fund projects that employ promising tools, resources, or models that can be repurposed for broader adoption.

PROGRAM OFFICER CONTACT INFORMATION

The NSF recommends outreach to cognizant program officers to discuss project ideas prior to proposal preparation and submission. The cognizant program officers for the IUSE program are:

Myles G. Boylan, (703) 292-4617, mboylan@nsf.gov
Katherine J. Denniston, (703) 292-8496, kdennist@nsf.gov
Terry S. Woodin, (703) 292-4657, twoodin@nsf.gov

Depending on the disciplinary focus of the proposed IUSE project, input from a discipline-specific Program Officer may be warranted. Discipline-specific program officers can be identified on Pages 11-12 of the PDF version of the Program Solicitation.

EXPECTED AWARD AMOUNTS & GRANT TERMS

FY16 IUSE funding limits are summarized in the table below:

	Exploration & Design	Development & Implementation
Engaged Student Learning Track	Up to $300K over 3yrs	Level 1: Up to $600K over 3yrs
		Level 2: $601K-2M over 5yrs
Inst. & Community Transformation Track	Up to $300K over 3yrs	Up to $3M for 5yrs

IUSE PROGRAM SUMMARY

The IUSE Program is focused on spurring curricular improvement in undergraduate STEM education, within formal and informal learning environments. The two tracks (with associated tiers) and conference funding provide support for a variety of projects described below

Engaged Student Learning
Within the Engaged Student Learning track, funds will be granted for projects focused on design, development, and research studies that involve the creation, exploration, or implementation of tools, resources, and models that show promise to increase engagement of undergraduate students in their STEM learning and lead to measurable and lasting learning gains. Projects are encouraged to form collaborations among STEM disciplinary researchers, education researchers, and cognitive scientists so that their projects can best leverage what is known about how people learn and/or contribute to the growth of that body of knowledge. Recognizing disciplinary differences and priorities, NSF's investment encompasses a range of approaches including:

- assessment/metrics of learning and practice
- education research
- faculty learning through professional development

- learning environments, and
- the use and impact of co-curricular activities that increase student motivation and persistence, both in their STEM learning and undergraduate disciplinary research.

Institutional and Community Transformation

This track supports projects that use innovative approaches to increase the widespread use of highly effective, evidence-based STEM teaching and learning, curricular, and co-curricular practices. These projects may be proposed by an institution or set of institutions; alternatively, community proposals may be submitted through professional communities, including discipline-based professional societies and networks or organizations that represent institutions of higher education. Projects are expected to be both knowledge-based and knowledge-generating. Competitive proposals will include a description of the theory of change that guides the work proposed and will test hypotheses about transforming undergraduate teaching and learning in STEM by examining the impact of deliberate processes of change. It is expected that in presenting a theory of change, proposals will be informed by research literature and theoretical perspectives concerning change relevant to the goals and context presented in the proposal.

While proposed projects will vary in approach and theories of change, promising proposals will also recognize that STEM higher education is a complex system, and that achieving change goals involves analyzing and addressing the relevance and impact of critical organizational factors (e.g., faculty reward systems, opportunities for professional growth, and institutional policies and processes) that could impede or facilitate progress toward the stated goals. Support from key administrative leaders, ranging from presidents and provost, to deans and department chairs, is often a particularly important factor in affecting the development, impact, and sustainability of change efforts at the institutional level.

Applicants may apply for a grant to begin institutional or community transformation planning efforts, to support implementation efforts for effective teaching and learning practices, or to conduct research on how to increase the importance placed on evidence-based practices within institutional processes (such as in strategic planning or faculty reward systems). Projects may focus on whole institutions or on large departments or colleges within an institution, or on networks or groups of institutions. For example, projects may seek to transform high-enrollment, lower-division courses, or may implement efforts in multiple courses within a department or a college or in a single disciplinary area. Projects may use technology and distance education methods (or hybrid designs) when supported by evidence of potential effectiveness. Faculty learning through professional development or leadership development for pedagogical and curricular innovation could also be important considerations for this track. Community Transformation projects should be similarly organized as appropriate for the discipline(s) involved. The development of instruments and metrics to assess institutional or community shifts toward evidence-based practices is encouraged.

Conferences

Proposals for conferences addressing critical challenges in undergraduate STEM education may be submitted at any time following consultation with a program officer.

For all IUSE grants, transferability and propagation are critical aspects. These should be addressed throughout a project's term by ensuring attention to designing for use in a variety of institutions.

PROGRAM GOALS

New knowledge about learning and implementation will be developed across all funded IUSE grants. Discrete programmatic goals of IUSE include:

- **Improve STEM Learning & Learning Environments:** Improve the knowledge base for defining, identifying, and innovating effective undergraduate STEM education teaching and learning for all NSF-supported disciplines, and foster widespread use of evidence-based resources and pedagogies in undergraduate STEM education.
- **Broaden Participation & Institutional Capacity for STEM Learning:** Increase the number and diversity of undergraduate students recruited and retained in STEM education and career pathways through improving the evidence base for successful strategies to broaden participation and implementation of the results of this research.
- **Build the Professional STEM Workforce for Tomorrow:** Improve the preparation of undergraduate students so they can succeed as productive members of the future STEM workforce, regardless of career path, and be engaged as members of a STEM-literate society.

FY16 IUSE programs call for proposals to:

- use and build evidence about improved STEM instructional practices
- design and study innovative learning opportunities, including cyberlearning
- create, implement, and test program, curricular, course, and technology-driven models
- develop, implement, and test creative approaches for adoption of education research into disciplinary teachings
- develop and validate assessments/metrics for undergraduate STEM learning and instructional practice, and
- conduct fundamental research on issues of undergraduate STEM teaching and learning.

MERIT REVIEW CRITERIA

All proposals will be judged on the following criteria:

- **Intellectual Merit:** What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields?
- **Broader Impacts:** What is the potential for the proposed activity to benefit society or advance desired societal outcomes?
- To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale (i.e. is there literature or data to support your proposal)?

- Does the plan incorporate a mechanism to assess success?
- How well qualified is the individual, team, or organization that will conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?

IUSE PROJECT AND PLANNING CONSIDERATIONS

- XULA wishes to submit a proposal to the NSF's Improving Undergraduate STEM Education: Education and Human Resources (IUSE:EHR) grant program.
- XULA will need to confirm an appropriate tier AND track as soon as possible.
- XULA intends to design and develop the project during the summer semester, then turn to writing the proposal primarily in fall 2017.
- XULA has established or will establish a project planning committee that includes key stakeholders and participants necessary to successfully design, develop, budget, implement and evaluate the proposed project, including a STEM faculty researcher and a social, educational, or cognitive scientist to develop and implement the underlying research study required for a competitive IUSE:EHR proposal.
- Hanover has prepared this document to assist XULA as it develops a competitive grant application.
- In addition to this document, XULA has reviewed the existing Program Solicitation, and will review the new IUSE:HER solicitation when it becomes available, as well as the NSF PAPPG to prepare for the proposal development and submission process.
- XULA wishes to submit this proposal via the NSF FastLane system.
- XULA has previous experience submitting applications via FastLane, or XULA intends to prepare itself to do so via FastLane registration at least two months in advance of the application deadline.
- XULA is prepared to enter all proposal information into the FastLane system and submit the proposal once the application components are assembled.

SUGGESTED PROPOSAL OUTLINE

A. **Introduction**
    a. Summarize in a few paragraphs the project, including:
        i. Funding requested and proposed grant term
        ii. Targeted learners and partners involved in project
        iii. The work that will be performed if funded
        iv. The vision, goals, and expected outcomes
        v. The major methods to be employed
        vi. Significance: Intellectual Merit and Broader Impacts

      vii.   Results of Prior NSF Support (of any co-PIs with prior NSF support within the past five years; of otherwise, include statement that no NSF funding has been received)

B. Background and Evidence Base for Proposed Intervention
   a. Discuss current state of XULA STEM (or discipline) programs with quantitative evidence
   b. Discuss pertinent knowledge about STEM education
   c. Expected contribution to knowledge about STEM education
   d. Relation to longer-term goals of the institution
   e. Relation to present state of knowledge in the field

C. Plan of Work
   a. Theory of Change (logic model)
   b. Target population of students or teachers to be served/researched
   c. Description of proposed activities/interventions
   d. Workplan and timeline, including identified milestones
   e. Why is success likely?

D. Expected Measurable Outcomes
   a. Relationship of proposed methods to the theory of change/logic model
   b. Assessment and data collection
   c. Data analysis
   d. Data management

E. Project Management Plan
   a. Who will lead the project?
   b. What are the qualifications of the project team? Has the team led similar projects?
   c. How will team members be held accountable for performance?
   d. What systems or processes will be put in place to make sure the project succeeds?
   e. Formative project evaluation plan
   f. Summative evaluation
   g. Reporting

F. Sustainability
   a. Describes steps that will be taken to integrate the methods and learnings of the work into the fabric of XULA.

G. Recruitment, Outreach and Dissemination Plan
   a. Describe plan for recruiting participants
   b. Describe plan for publication and presentation of research findings to national audiences

RESOURCES AND LINKS TO FUNDED PROPOSALS

Review of previous IUSE award abstracts may also be helpful to help understand the focus and scope of recent IUSE:EHR awards. The NSF Awards search engine allows for keyword searches, including by program and discipline. A search using the keywords, HBCU IUSE:EHR Chemistry, reveals dozens of IUSE awards to HBCU institutions.

RECENT IUSE:EHR AWARDS SIMILAR TO THE WORK XULA PROPOSES

XULA is developing a program intended to address the national need for well-prepared underrepresented minority students for careers as a chemical laboratory technician. A search of recent IUSE:EHR abstracts returned numerous abstracts of awarded projects with similar goals. A small sampling of these recent awards is provided here:

Award Abstract #1525673: Redesigning General Chemistry- Implementation of Emporium Learning for Enhancing Basic General Chemistry Skills. North Carolina Agricultural & Technical State University

To address the national need to improve student learning in chemistry, this IUSE: EHR project will adapt the Emporium Learning model, which has led to increased retention for students through early mathematics courses and first-year chemistry courses. This pedagogy replaces the traditional classroom with a learning center featuring interactive software and on-site, personalized assistance from instructors.

Award Abstract #1525032: Investigating Student Learning and Metacognition in Flipped Classroom and Interactive Lecture Environments in General Chemistry. CUNY Herbert H. Lehman College

This Improving Undergraduate STEM Education (IUSE) project at Lehman College and Hunter College of the City University of New York (CUNY) will investigate chemistry students' learning in two different active-learning environments: a flipped classroom format and an interactive lecture format.

Award Abstract #1611988: Polymer Chemistry: Cross-linking the Curriculum (PC3). Armstrong Atlantic State University.

The Department of Chemistry at Armstrong Atlantic State University will develop "Polymer Chemistry: Crosslinking the Curriculum" (PC3) to allow students to experience the interconnectedness of chemistry in the context of studying polymers. It will develop new polymer-themed materials for existing courses and laboratories, and develop new introductory and advanced polymer courses for chemistry majors. Together, these efforts will intertwine a polymer paradigm across multiple chemistry sub-disciplines and strengthen students' foundations in polymer chemistry.

Award Abstract #1712477: Students Understanding Chemistry Concepts to Enhance STEM Skills (SUCCESS). Jackson State University.

The Students Understanding Chemistry Concepts to Enhance STEM Skills (SUCCESS) project at Jackson State University will target at-risk and underrepresented students, with a focus on biology majors, and will enable them to successfully complete general and organic chemistry. The SUCCESS project will provide three-day Chemistry Readiness Workshops prior to the start of a course, and an additional two-hour SUCCESS Session during each week of the semester. Enabling at-risk and underrepresented students to succeed in their chosen major will support diversification of the STEM workforce. How these interventions promote student success will be documented, and the knowledge gained will complement successful approaches to undergraduate instruction across multiple STEM disciplines.

PROPOSAL DEVELOPMENT CHECKLIST

The following information is derived from the PAPPG, starting on Page II-6.

- Cover Sheet
- Project Summary (1-page with Intellectual Merit and Broader Impacts described, on Page II-9)
- Table of Contents (autogenerated by FastLane)
- Project Description (15-page narrative including all tables/charts/graphics; URLs and headers/footers prohibited)
- References Cited (begins on page 16 of the Project Description)
- Biographical Sketch(es) (two-pages, must follow format in PAPPG,
- Budget and Budget Justification
- Current and Pending Support
- Facilities, Equipment and Other Resources
- Special Information and Supplementary Documentation
    - Data Management Plan (does not need to be exhaustive for this type of project)
    - Postdoctoral Mentoring Plan (only if applicable)

PROJECT DESCRIPTION FORMAT
- Use one-inch margins, R-L-T-B.
- Number pages.
- Use Arial, Courier New, or Palatino Linotype at a font size of 10 points or larger; or
    - Times New Roman at a font size of 11 points or larger; or
    - Computer Modern family of fonts at a font size of 11 points or larger.
    - Use Times New Roman for the Project Summary to determine accurate single-page length.
    - Smaller than 10-point font may be used for mathematical formulas or equations, figures, table or diagram captions and when using a Symbol font to insert Greek letters or special characters. PIs are cautioned, however, that the text must still be readable.
- Do not use a two-column format.

NOTE: These formatting requirements apply to all uploaded sections of the proposal, including supplementary documentation.

ASSUMPTIONS

Please review the following assumptions and discuss any questions or concerns with your Content Director as soon as possible.

ROLES AND RESPONSIBILITIES

XULA will support the development of a competitive proposal by completing the following activities:

- Identify and convene regular meetings of a suitable project planning committee.
- Program planning that develops a tool, technique or model to improve STEM education at XULA and research the effects with the assistance of a cognitive scientist, social science researcher or other similar research practitioner.
- Provision of data, information and guidance to Hanover in timely fashion such that Hanover can produce outputs associated with the partner's requested level of support.
- Produce the supplementary materials (Cover Sheet, Bio Sketches, etc. – see Pages 4-5 below).
- XULA will also perform a final review of the complete application materials and will submit the application via FastLane ahead of the due date.

Hanover will support the development of a competitive proposal by providing the following at XULA's request:

- Review and analysis of IUSE:EHR guidelines.
- Literature review during the project planning process, if needed.
- Project management and facilitation of project planning calls
- Service as lead grant writer of the Project Summary and Project Description during the proposal development effort.

KEY DATES

Submission Deadline: To Be Determined (likely January 2018)
Development and Implementation Tier for Engaged Student Learning