

National Science Foundation

ITEST Program Solicitation Webinar 2: “How to Write a Compelling Proposal”

Monday, May 16, 2022

1 – 2:30 PM ET



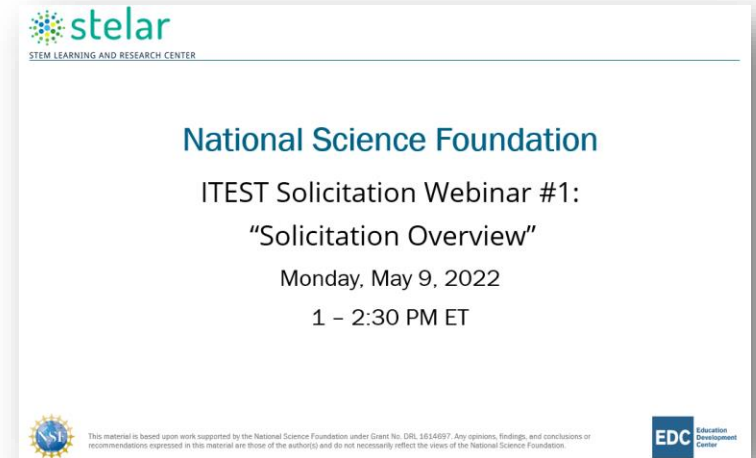
This material is based upon work supported by the National Science Foundation under Grant No. DRL 1614697. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

2022 NSF ITEST Proposal Webinar Series

May 9: ITEST Solicitation Overview

recording available on the STELAR website

stelar.edc.org/videos/nsf-2022-itest-solicitation-webinars-solicitation-overview



2022 NSF ITEST Proposal Webinar Series

June 2:

NSF ITEST Proposal Conceptualization Webinar: Ingredients of a Competitive ITEST Proposal

This webinar will not be recorded.

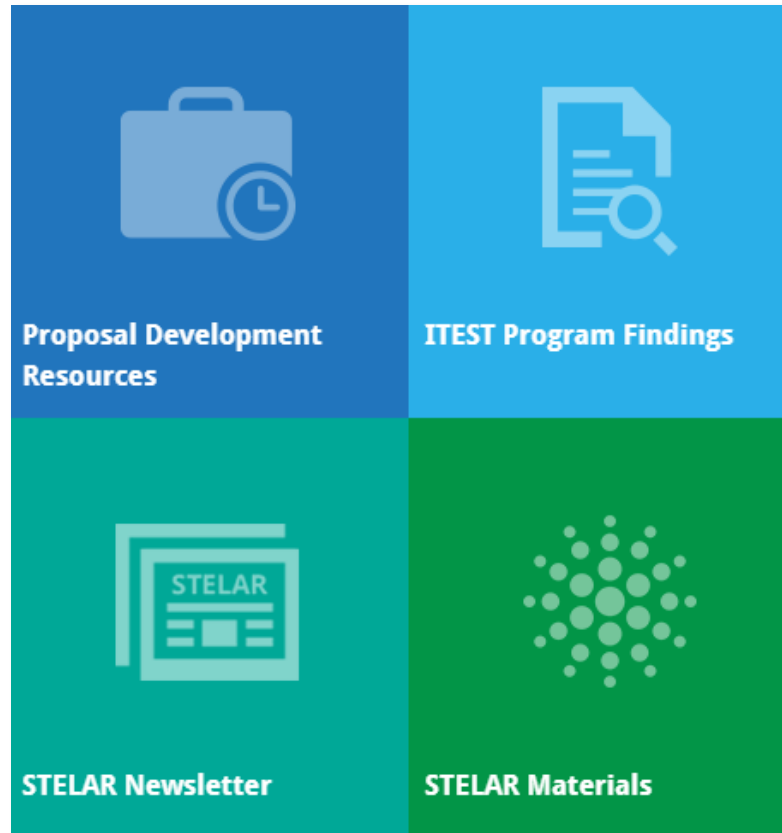
- Overview and Demystifying ITEST
- Major Changes in the Solicitation affecting how proposals will be reviewed
- Scaling, Expanding, and Iterating Innovations (SEI) proposal writing
- Integration of Technology as a Process for innovation of STEM learning
- Disciplinary and Domain Specific Discussions, including:
 - Emerging technologies focus (e.g, AR/VR)
 - Data Science
 - Cybersecurity
 - Quantum Computing
 - Artificial Intelligence
 - Computational Thinking
 - Making
 - Math
 - Engineering
 - Informal Education
- DIEA: Diversity, Inclusion, Equity, Access
- Research and Evaluation:
 - Quantitative
 - Qualitative



STEM Learning & Research (STELAR) Center

- Resource Center for NSF's Innovative Technology Experiences for Students and Teachers (ITEST) Program
- Education Development Center (EDC) has supported the ITEST program since 2003
- STELAR assists both ITEST grantees and those interested in submitting a proposal

What STELAR does:



- Facilitate projects' success through **technical support**
- Inform and influence the field by **disseminating ITEST project findings** through project syntheses
- Deepen the impact and reach of the program by **broadening participation in the ITEST portfolio**

Proposal Development Resources

+ GET TO KNOW ITEST

+ PREPARE YOUR PROPOSAL FOR SUBMISSION

+ DEVELOP A ROBUST RESEARCH DESIGN

+ CREATE AN EFFECTIVE EVALUATION STRATEGY

+ CONNECT WITH PARTNERS

+ REACH UNDERSERVED POPULATIONS

+ DEVELOP THE WORKFORCE OF THE FUTURE



Developing an ITEST Proposal

Welcome to STELAR's ITEST Proposal Development Course. This is a free self-paced online course in which novice NSF proposal writers will develop a full NSF proposal for the ITEST program, to be submitted for the August 12th, 2022 solicitation deadline.

**Innovative Use of
Technologies in
Learning and
Teaching**



Adapted from NSF 22-585
STELAR 2022

**Partnerships for
Career and
Workforce
Preparation**



**Strategies for
Equity in
STEM
Education**



stelar.edc.org/proposal-development

Visit stelar.edc.org

Projects

[+ Share a Resource](#) [Download Results](#)

1 - 3 of 3

Search Results

All Projects A-Z

Bioscience

Computer Science

Engineering

Environmental Science

Mathematics

SEARCH FOR PROJECTS

Multiple criteria within a field is an OR condition. Multiple fields are AND condition.

TEXT SEARCH

+ DISCIPLINE(S)

+ PROJECT PARTICIPANT(S)


+ PROJECT GRADE SPAN(S)


+ PROJECT SETTING(S)


+ STATES WHERE WORK OCCURS

+ PROJECT STATUS

Resources


Publications


Instruments


Curricular Materials

For more information:

- Email the team at STELAR@edc.org
- Join the STELAR mailing list: go.edc.org/STELAR-MailingList
- Follow us on Twitter: [@STELAR_CTR](https://twitter.com/STELAR_CTR)
- Join us on LinkedIn: [STELAR NSF ITEST Community](#)



WHERE DISCOVERIES BEGIN



June 2: NSF ITEST Proposal Conceptualization Webinar: Ingredients of a Competitive ITEST Proposal

This webinar will not be recorded.

Register: stellar.edc.org/node/23906

May 9: ITEST Solicitation Overview

recording available on the STELAR website

Recording: stellar.edc.org/videos/nsf-2022-itest-solicitation-webinars-solicitation-overview

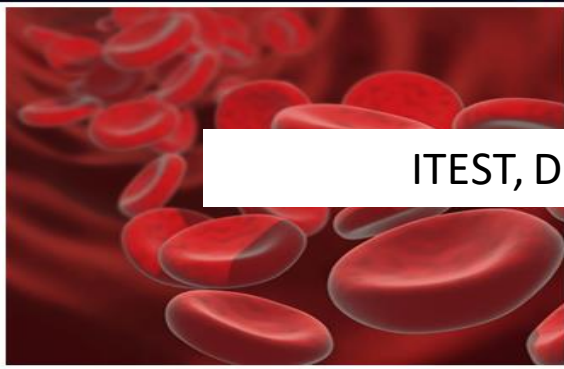


Welcome to...



How to Write a Competitive Proposal For the Innovative Technology Experiences for Students and Teachers (ITEST) Program

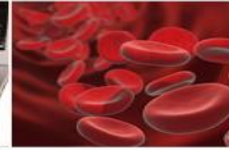
ITEST Program Officers
May 2022



ITEST, Division of Research on Learning, EHR



WHERE DISCOVERIES BEGIN



Webinar At A Glance

- Quick Overview of the ITEST Program
- Reviewers & The Review Process
- How to Present Your Project
- What to Say in 15 pages
- Research & Evaluation
- Avoiding Fatal Flaws
- Q & A



WHERE DISCOVERIES BEGIN



ITEST Program

ITEST is an applied research and development program with goals to advance the equitable and inclusive integration of technology in the learning and teaching of science, technology, engineering, or mathematics (STEM) from pre-kindergarten through high school.

The program's **objective** is to support all students' acquisition of the foundational preparation in STEM disciplines. **Preparation for the current and future workforce is increasingly dependent upon the application and use of technology and computing.**



WHERE DISCOVERIES BEGIN



ITEST Highlights

- ITEST is responsive to societal needs and emerging areas of STEM and related careers.
- Emerging areas may include, but not limited to, quantum computing, artificial intelligence, data science, computational thinking, cybersecurity, environmental science, and STEM entrepreneurship.
- ITEST welcomes proposals with well-designed strategies to integrate these emerging areas into effective learning and pedagogical innovations.



WHERE DISCOVERIES BEGIN



Changes From the Previous ITEST Solicitation

- ITEST Solicitation-Specific Review Criteria are required of all proposals.
- Required components for proposals in Section B of the Program Description are revised.
- Project types are revised.
- Proposals must be submitted via using Research.gov or Grants.gov.
- Proposals must be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 22-1](#)).



WHERE DISCOVERIES BEGIN



ITEST Projects: Overview

- Audience: Public and/or Professional
- Students / PreK-12 learners are required participants
- Projects proposing teacher professional development are required to address relate how student outcomes result from educator learning outcomes or learning processes.
- Project types
 - Exploring Theory & Design Principles (ETD, up to 3 years & \$500,000)
 - Designing and Testing Theory (DTI, up to 4 years, \$1,300,000)
 - Scaling, Expanding & Iterating Innovations (up to 5 years, \$3,500,000)
- ITEST proposal deadline: August 12, 2022:

<https://www.nsf.gov/pubs/2022/nsf22585/nsf22585.pdf>



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Considering Your Reviewers

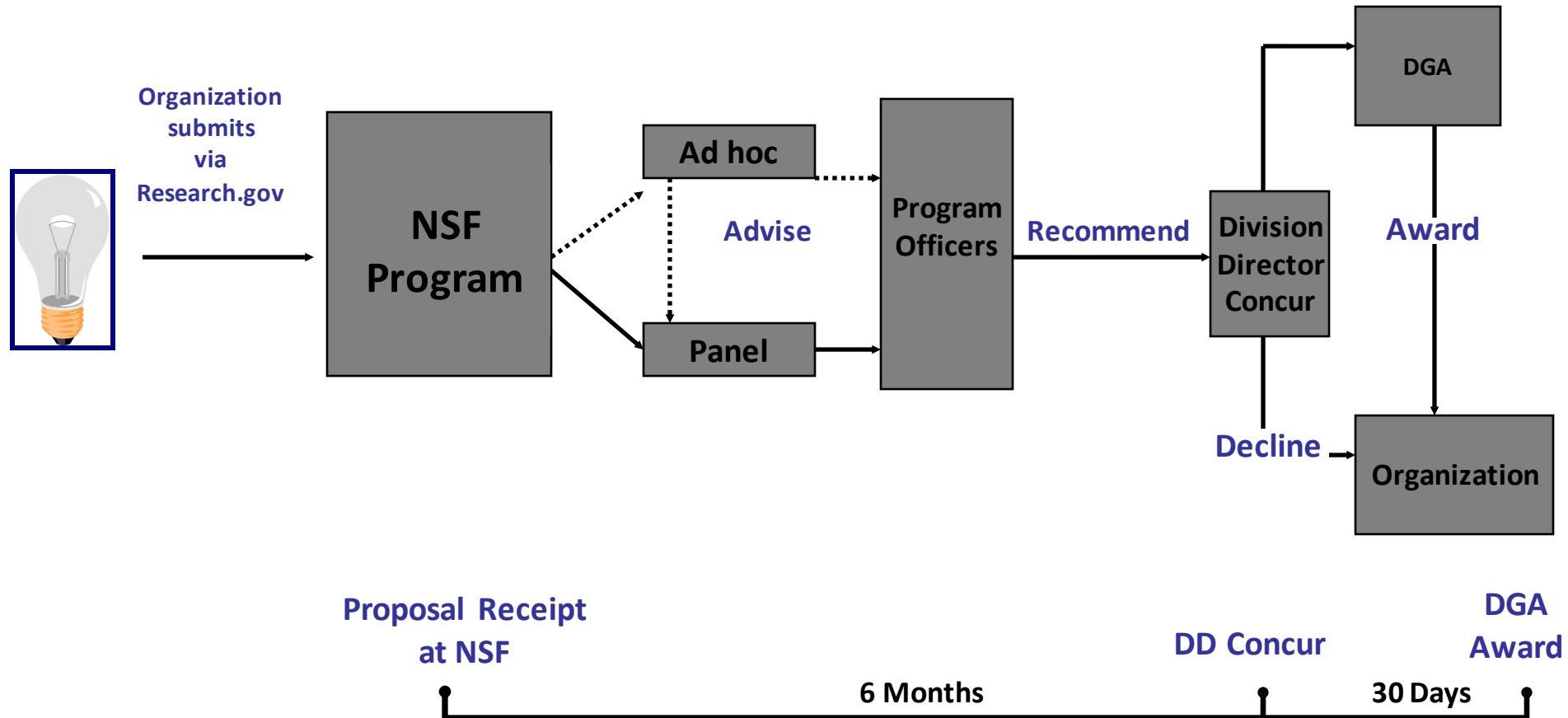
- The Review Process
- Merit Review Criteria
- Who are the reviewers & what do they do?
- How should you present your project?



WHERE DISCOVERIES BEGIN



Proposal Review Process and Timeline





WHERE DISCOVERIES BEGIN



NSB Report on Merit Review Criteria:

Two Review Criteria

When evaluating NSF proposals, reviewers consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits would accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.



WHERE DISCOVERIES BEGIN



Who are the panelists?



Panelists belong to a **wide mix of academic communities:**

- Education & Learning researchers
- Scientists or engineers
- Program developers/designers
- Experts on addressing issues of diversity, equity, access & inclusion in education program design
- Formal/Informal educators, practitioners, school teachers, afterschool/museum educators, science outreach, science outreach programs, etc.)
- University administrators and faculty



WHERE DISCOVERIES BEGIN



How much work does a reviewer do?

- A LOT!!!!
- **No more than 12 proposals** per reviewer.
- Proposals are sent to panelists about **one month** in advance.
- Reviews are entered into Fastlane.



If you aren't submitting, be a reviewer!

- *You see what's going on in the field.*
- *You see examples of effective ways (or not) to present your proposal.*
- *You meet some new colleagues.*
- *You learn more about how the review process works.*
- *If you want to be a reviewer, send a brief overview of your expertise & CV or biosketch to: drl.itest@nsf.gov*



WHERE DISCOVERIES BEGIN

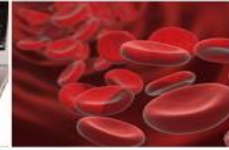


How to Present Your Project

- Proposal writing vs. academic writing
- Terminology
- How to make your proposal reviewer friendly
- Tone & Content



WHERE DISCOVERIES BEGIN



Understand the Genre

EFFECTIVE Academic Writing

- Grant proposals are a very specific genre of academic writing
 - ✓ Specific on required details (e.g., project sites)
 - ✓ More focused (e.g., overview, not detailed review, of relevant research)
- Similar but not the same as research articles (e.g., not simply **blind judgment of intellectual merit**).
- Important Differences:
 - ✓ **Not blinded** (the person behind the proposal does matter)
 - ✓ Relevance **beyond the research world**
 - ✓ Projection of **future research** (not retrospective reporting)



Do not presume shared knowledge/terminology

- Reviewers come from diverse research/ discourse communities.
- Reviewers can feel overwhelmed by the massive amount of information in the proposals.
- Avoid assuming that they share your:
 - specialized knowledge
 - technical vocabulary



Can lead to cognitive overload

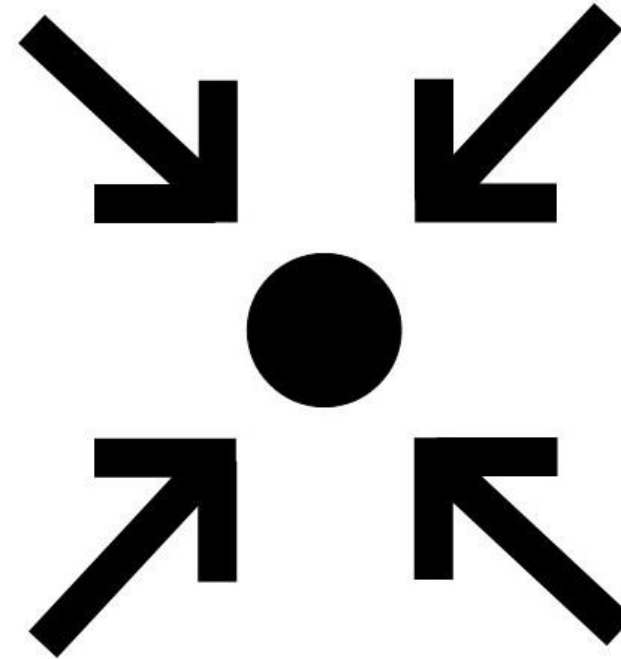


WHERE DISCOVERIES BEGIN



Get to the point!

- Reviewers should be able to easily get a sense of what the proposal is about upfront (project summary and introduction).
- Make what they are looking for easy to find, using the language of the review criteria and headings to highlight the elements of the project description.





WHERE DISCOVERIES BEGIN



Use a Reviewer-Friendly Format

An ***easy-to-follow format*** can go a long way:

- Use same labels as those used in the call.
- Use bold and leave some blank space (indentations).
- Include some figures/diagrams.
- Clearly structured texts are less overwhelming for readers.
- Synthesis, explain.
- Although space is limited (15 pages), an excessive number of words per page does not necessarily make your proposal stronger!

Can lead to cognitive overload





Mind your Tone

“The meek shall not inherit the grants” (ITEST Program Officer)

- Try to **project a positive image** of the intended research, but also a positive “self image” (as a competent/confident yet careful researcher).
- Applicants can come across as **arrogant** and **unrealistic**.
- Understatement and toning down one’s language not to over-claim the importance of the work is recommended. (Your project is probably not “the only” or “the first.”)

**CAUTIOUSLY
OPTIMISTIC.**



WHERE DISCOVERIES BEGIN



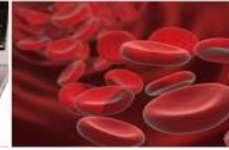
In terms of Content

- Do not just “give lip service” to the issues being raised; explain.
- Explicit statement about how the proposal addresses the goals of the ITEST program.
- Back up assertions with evidence, especially when discussing potential future impacts of proposed research.
- Consider discussing risks or challenges to project and mitigation strategies
- Have a colleague (not involved in your project) give your proposal a critical read.





WHERE DISCOVERIES BEGIN



What to Say in 15 pages



WHERE DISCOVERIES BEGIN



Before You Begin Writing

- Do your homework:
 - Familiarize yourself with the NSF website.
 - Download a copy of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG):
https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg
 - Read the solicitation carefully and multiple times.
 - Check the NSF Awards Search Page for examples.
 - Visit the STELAR website, which is the ITEST program resource center and network.
- Talk to NSF Program Officers about your ideas:
 - Schedule a call with a PO.
 - POs may ask you to send a 1-page summary in advance.
 - Submit inquiries to: DRLITEST@nsf.gov



WHERE DISCOVERIES BEGIN



Project Summary

- **One page maximum**
- **First Sentence**
 - Type of Proposal (Project Type)
- **A general description of the project to be designed, implemented, and evaluated.**
- **Intellectual Merit and Broader Impacts**
 - Must include separate statements on each of these two NSB criteria



WHERE DISCOVERIES BEGIN



Project Description Should Include...

- Project overview and rationale
- Project goals and objectives
- Summary of effectiveness and impact of prior support
- Explanation of principles that guided the project design, informed by the literature [Theoretical Framework]
- Description of Intervention/Learning Environment/Context of Research: outline of key concepts/component/activities, what participants will do and experience
- Anticipated results
- Research questions and plan
- Plan for independent review of project progress and success of implementation [Project Evaluation, formative and summative]
- Discussion of Solicitation Specific Review Criteria
- Dissemination plan [Identify constituencies and how you will communicate findings to them]
- Management, Qualifications of key personnel who will coordinate the project



WHERE DISCOVERIES BEGIN



Overview/Rationale: What Makes This Project Important?

- How is it innovative or potentially transformative?
- How will it advance knowledge and move the field forward?
- What are the anticipated outcomes or products of this project?
- Who will be interested in these outcomes, and how will you target dissemination of findings to them?
- How might these products or findings be useful on a broader scale?



WHERE DISCOVERIES BEGIN



Theoretical Framework: What Have You And Others Done?

- Describe the theoretical and research basis on which the proposal is based.
- How has the prior research influenced this project?
- Discuss how the proposal is innovative and different from similar projects.
- If you have previously been funded by NSF for similar work, provide evidence about the **effectiveness** and **impact** of that work.



WHERE DISCOVERIES BEGIN



Results of Prior Research

- Does this project build on the results of related prior projects by the PI's?
- If yes, is there evidence provided about the intellectual merit and broader impacts of the prior project(s)?
- How has the prior project influenced this project?

REQUIRED! Results from Prior NSF Support

Purchase of Major Equipment (No!)

The ITEST program limits the purchase of equipment to software, probes, and specialized equipment needed to implement a specific project. General purpose equipment, such as computers, notepads, and cellphones are not supported.

See PAPPG-1 for details on Prior Research, Equipment Purchase
& all other proposal requirements:

https://www.nsf.gov/pubs/policydocs/pappg22_1/index.jsp



Description of Intervention/Learning Environment

- Provide an overview and concrete details of the learning environment such as content, standards, experiences, and related participant experience.
- The learning environment can be experiences that might include an exhibit, game, media production, field experience, professional development approach and activities (for teachers), or other STEM learning experiences that provides the opportunity for the project's research.
- An overview of the learning environment helps reviewers understand how and why the project has the potential for researching the experiences, learning processes, and impacts hypothesized in your proposal.



WHERE DISCOVERIES BEGIN



Dissemination of Findings

A creative communication strategy for reaching broad audiences with project findings.

- Elements of the communication plan
 - Target audiences
 - Channels
 - Technologies/aspects of the innovation
- Dissemination appropriate to the partnership audience
 - Publications
 - Presentations
 - Materials
 - Social media, videos (Video Showcase)



WHERE DISCOVERIES BEGIN



Staffing/Management: Who Will Do the Work?

- Briefly describe the expertise of the persons included on the proposal and why they are needed:
 - Education/Learning researchers and evaluators
 - Teachers and/or practitioners
 - Community and/or industry
 - STEM-related content experts
- How will the project team & collaborating organizations work together
- Upload two-page NSF-format biosketches for all senior personnel
- Include the mentoring plan if Post-Docs are involved.



Research & Evaluation

- Research & Evaluation in ITEST proposals emphasize knowledge building capacity.
- The Merit Review elements require that proposals include mechanisms: 1) for iterative improvement, and 2) to assess success.
- Both research and evaluation can be used to support these purposes.



Research & Plan Elements

- **ITEST supports research that advances knowledge and the evidence base for practices, assumptions, broadening participation, or emerging educational arrangements related to STEM career learning: Contextualize the research in prior work.**
 - State clear, focused research questions & hypotheses that the project will investigate.
 - Describe the theoretical framework, research methods, including data sources, sampling, analyses, and assessments.
 - Describe the plan for developing, modifying, or implementing the proposed innovation.
 - Describe the work plan and timeline.
 - Strong research/practice collaborations



WHERE DISCOVERIES BEGIN



Common Guidelines for Education Research & Development

- You are encouraged to be familiar with the Common Guidelines for Educational Research and Development—specifically the NSF FAQs—in the preparation of proposals.
<https://www.nsf.gov/pubs/2013/nsf13127/nsf13127.jsp>
- The Guidelines describe research types that are most relevant for ITEST projects, including: Foundational, Early Stage or Exploratory, and Design and Development Studies.



WHERE DISCOVERIES BEGIN



Evaluation in ITEST Proposals

ITEST evaluations should provide formative feedback to allow for mid-course corrections, and summative evaluation to document the extent to which: the project objectives were carried out as intended and achieved document project objectives.

All ITEST project proposals are asked to:

1. Articulate evaluation questions that define what the project needs to learn to define success.
2. Discuss activities and data that will generate evidence addressing the questions, including who will provide independent oversight (e.g, independent, third-party evaluator or external advisory committee.)
3. Describe how the project will use the evaluation evidence and for what purpose.



WHERE DISCOVERIES BEGIN



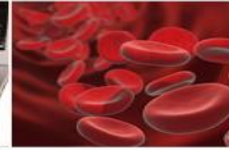
What Evaluation is About

The objectives of the evaluation include:

- Recommending evidenced-based adjustments to project plans.
- Determining the effectiveness and impact of the products or processes.
- Attesting to the integrity of outcomes reported by the project.
- Assessing whether the project is making satisfactory progress toward its goals.



WHERE DISCOVERIES BEGIN

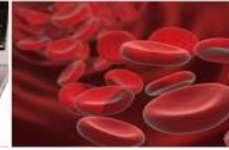


Project Evaluation Elements

- Proposals should describe critical features of the evaluation design:
 - Evaluation questions
 - Data to be gathered & Sampling methods
 - Data analysis plans
 - Expertise of those responsible for evaluation.
- Proposals should ***distinguish*** evaluation from other critical research components. This does not mean that research & evaluation have no relationship.



WHERE DISCOVERIES BEGIN



Avoiding Potentially Fatal Flaws



WHERE DISCOVERIES BEGIN



Common Reasons for Return Without Review

- Violation of formatting rules of the PAPPG (e.g. font, page length etc.).
https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pap
pg
- Failure to address specifically intellectual merit and broader impact in the project summary and description.
- Failure to include Data Management Plan or Post-Doc mentoring plan (if budget includes post-doc)
- Including unauthorized appendix or other supplementary material.
- Including URL's/website links.



Common Reasons Proposals are Rated Non-Competitive

Importance

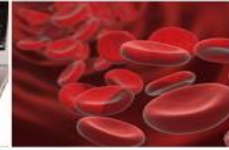
- Proposed problem not seen as nationally important.
- Weak, vague, or no connection to STEM content.
- Relevant literatures not cited, weak or no theoretical framework.
- Do not address the solicitation specific review criteria.

Methods

- Inadequate or inappropriate research design.
- Vague or inappropriate data collection & analyses.
- Too much data being collected.
- Appropriate expertise not represented on team.
- Cost at small scale prohibitive when scaled up.



WHERE DISCOVERIES BEGIN



Address Broader Impacts

- Do not discount the importance of Broader Impacts as a review criterion.
- Means more than having diversity among participants.
- Means more than locating a project in an area where there are diverse populations.
- Don't forget other underrepresented groups, including those with disabilities and English Language Learners.
- In addressing Broader Impacts, make sure to address the Solicitation Specific Review Criteria (details on next slide).



WHERE DISCOVERIES BEGIN



Solicitation-Specific Review Criteria

REQUIRED IN PROPOSAL NARRATIVE!

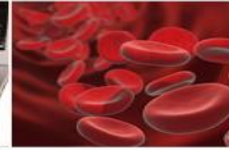
To what extent does the proposal:

1. Include explicit and adequate strategies for recruiting and selecting participants
2. Describe approaches to address diversity, access, equity, and inclusion
3. Describe research-informed instructional approaches to build on strengths and challenges
4. Explain how innovations with technology are developmentally and age-appropriate

Note: Make it clear in the proposal how are addressing these issues.



WHERE DISCOVERIES BEGIN



ITEST Pillars

Required in proposal narrative!

- **Pillar 1: Innovative Use of Technologies in Learning and Teaching**
- **Pillar 2: Partnerships for Career and Workforce Preparation**
- **Pillar 3: Strategies for Equity in STEM Education**



WHERE DISCOVERIES BEGIN



Some Things POs Suggest You Avoid

- Ignoring requirements stated in the solicitation or the PAPPG
- The “Trust Me” approach. Provide citations or evidence for critical assertions made.
- The “Oversell” of yourself or your project; take a neutral tone and let the evidence speak.
- Pages of general, vague, or rambling narrative without precision and details.
- Overemphasis of rationale for the project at the expense of methodology and details of what will be implemented.



Online Resources

- NSF Advanced Award Search:
www.nsf.gov/awardsearch/advancedSearch.jsp
- Element Codes (use to narrow search)
 - ECR: 7980
 - DRK-12: 7645
 - ITEST: 7227
 - STEM+C: 005Y
 - AISL: 7259
- STEM Video Showcase:
<https://stemforall2022.videohall.com/pages/about/about-event>



WHERE DISCOVERIES BEGIN



Resource Centers

- **AISL:** Center for Advancement of Informal Science Education (CAISE)
informalscience.org/community
- **DRK-12:** Community for Advancing Discovery Research in Education (CADRE) cadrek12.org
- **ITEST:** STEM Learning and Research Center (STELAR) stelar.edc.org
- **CIRCL:** <http://circlcenter.org>



WHERE DISCOVERIES BEGIN



NSF Important Notice: Research.gov is now required for submission of ITEST proposals

Resources to guide you through proposal submission via research.gov:

Research.gov Video Tutorial:

<https://www.research.gov/common/attachment/Desktop/psmvideo1.html>

How a PI Initiates a New Proposal in research.gov:

https://www.research.gov/common/attachment/Desktop/How_PIs_Initiate_New_Rgov_Proposals_Final_508.pdf

Full library of NSF Proposal Preparation Resources:

https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html

Proposals must be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 22-1](#)).



WHERE DISCOVERIES BEGIN



General inquiries regarding this program and program solicitation should be made to:

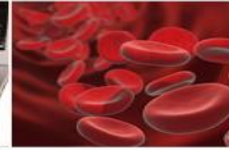
DRLITEST@nsf.gov

What should you do if you have a specific inquiry regarding your project or proposal?

Using the email address above, in the body of the email or as in attachment, send a brief (max 2 pages) summary of the research or R&D you are planning to conduct. The synopsis should include a very brief rationale for the work, how it will contribute to the knowledge base on informal learning, and what you believe the broader impacts to be. Be sure to also include your specific questions.



WHERE DISCOVERIES BEGIN





WHERE DISCOVERIES BEGIN



Thanks for Participating!

We look forward to receiving your proposals.

Solicitation:

<https://www.nsf.gov/pubs/2022/nsf22585/nsf22585.pdf>

Full Proposal Deadline: August 12, 2022

(due by 5 p.m. submitter's local time):