THE NEW FACE OF RESEARCH AND EVALUATION IN ITEST PROJECTS

HOSTED BY: STEM LEARNING AND RESEARCH CENTER (STELAR) EDUCATION DEVELOPMENT CENTER, INC.
Agenda

- STELAR Overview

Presenters:
- Carrie Parker
  STELAR Center
- Kirk Knestis
  Digital East St. Louis: An Urban Place-Based Learning Model to Promote Information Technology and Computer Science Career Interests of Minority Youth
- Bradley Barker, Gwen Nugent, Neal Grandgenett
  Nebraska Wearable Technologies (WearTec)
STELAR Overview

- STELAR Partners:
  - EDC, Inc.
  - EdLab Group
  - Goodman Research Group, Inc.
NSF’s Innovative Technology Experiences for Students and Teachers (ITEST) Program

- To build understandings of best practice factors, contexts and processes contributing to K-12 students' motivation and participation in STEM

- Helps students to be aware of STEM careers, and to pursue formal school-based and informal out-of-school educational experiences to prepare for such careers

- 288 current and past projects across 44 states have served 247,700 students, 9600 educators, 3000 parents and caregivers
STEM Learning and Research Center (STELAR) Goals

- Facilitate projects’ success through **technical support** with a focus on synthesis of findings

- Inform and influence the field of STEM stakeholders by **disseminating** project findings nationally

- Deepen the impact and reach of the ITEST program by **broadening participation** in the ITEST portfolio
STELAR Website – http://stelar.edc.org
STEKLAR People Connector

http://stelar.edc.org/opportunities/people-connector-directory

People Connector Form

### STEKLAR People Connector Directory - Add your Information

The purpose of this directory is to connect individuals looking for partners or tools for their I/TEST proposals with those who can provide partnership or tools (e.g., a school district looking for a research methodology). Please complete this form if you are looking for or can provide specific expertise for I/TEST proposals. The information you provide will be publicly available and accessible via the STEKLAR website.

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Note: STEKLAR and NSF do not endorse the credibility or expertise of any specific individuals on the compiled list.

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Monthly Highlights

STELAR
Monthly Highlight
Research in ITEST
read more »

Recent News

ITEST Conference Presentations for 2015
December 11, 2014 | READ MORE »

Program stitches together STEM, fashion design
October 9, 2014 | READ MORE »

Seen in NY: Bridging the Gap at the Central Park Zoo
March 12, 2014 | READ MORE »

The science of learning
July 22, 2014 | READ MORE »

New program aims to bring fitness, fun into the classroom
July 7, 2014 | READ MORE »

VIEW ALL NEWS »

Upcoming Events

Feb 26 2015 - 3:00pm to 4:00pm
STELAR Webinar: The New Face of Research and Evaluation in ITEST Projects
READ MORE »

VIEW ALL EVENTS »

Career Choice from Computational Indicators of Student Engagement within Middle School Mathematics Classes
STELAR recently had the opportunity to interview Ryan Baker about his ITEST Project: Predicting

READ FULL POST »

December 8, 2014
Project Spotlight: GUTS: Growing Up Thinking Scientifically
STELAR recently caught up with Irene Lee about her work on Project GUTS: Growing Up Thinking

READ FULL POST »

VIEW ALL BLOGS »

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Keep up-to-date on STELAR news and activities, and receive ITEST program updates.

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The New Face of Research and Evaluation in ITEST Projects
Little or no mention of research as part of project work

ITEST is designed to increase the opportunities for students and teachers to learn about, experience, and use information technologies within the context of STEM. It is in direct response to the concern about shortages of information technology workers in the United States.
One goal includes producing research

......meet the demand for qualified STEM, including information technology workers; to diversify the workforce since women and minorities are underrepresented in ... ICT and other STEM fields; and to produce research addressing STEM workforce issues.
Research is part of all ITEST projects.

The ITEST program through research and model-building activities seeks to build understandings of best practice factors, contexts and processes contributing to K-12 students' motivation and participation.

The ITEST program funds foundational and applied research projects addressing the development, implementation, and dissemination of innovative strategies, tools, and models for engaging students.
OK – now we know that all ITEST projects are research projects

- What does this mean in practice?
  - Project Design
  - Logic Models and ITEST Guiding Questions
  - External Evaluation
  - Common Guidelines
Project Design

• Project development, research and evaluation activities are coherent and contribute to the whole project
  – Research methods fit the stage of project development and the question to be answered
  – PI/institution implementing the project can do the research or can have an external research partner

• All projects have a research plan. Research questions focus on:
  – improving the innovation
  – impact of the projects on participants
ITEST Project Research Designs (n=68)*

- 56% Quantitative (not experimental or quasi-experimental)
- 19% Experimental or Quasi-Experimental Design
- 18% Mixed methods (any quantitative with qualitative component)
- 7% Qualitative only

*Active projects Fall 2014
ITEST Guiding Questions: STEM Workforce Development

- What coherent sets of experiences effectively and efficiently support **student competency** (e.g. knowledge, skills), **motivation and persistence** for productive participation in the **STEM and STEM cognate workforce** of today or in the future?

- What **instructional and curricular models** can effectively engage teachers to utilize and integrate technologies so as to enhance student understanding of STEM and STEM cognate careers?

- What roles might **business and industry workforce** member's play in motivating students to become aware of, interested in and prepared for careers in the **STEM and STEM cognate workforce**?

- What roles might business and industry play in preparing teachers to support student awareness of the workplace?

- What strategies might **parents, mentors and caregivers** adopt in the modern digital and computer age that develop student understandings of and appreciation for the scientific, technical, mathematical, and engineering basis of technological developments?

- What strategies effectively engage **principals, guidance counselors, and other school system administrative leaders** to promote students' and teachers' adoption and effective use of technologies that support STEM and STEM cognate learning and career awareness?

- Given the shifting demographics reflected in our current classrooms and in our country, what are effective and productive ways to ensure broadening participation by **engaging diverse underrepresented populations in STEM programs and careers**?
Logic Models as a way to pull it all together

- Theoretical framework
- Alignment with guiding questions
- Making research design, implementation, and evaluation coherent
EDC and EdLab Group will leverage our deep knowledge of the ITEST program and the vibrant ITEST Community of Practice to expand ITEST in new directions, develop new partnerships, and broaden outreach to targeted stakeholders.

**STEM Learning and Research Center (STELAR) Logic Model**

**Inputs**
- Partnership between EDC, EdLab Group, NSF
- STELAR Areas of Expertise

**Activities**
- Technical Support
- Broadening Participation
- Dissemination

**Outputs**
- STELAR ACTIVITIES
  - Convenings
  - Webinars
  - Redesigned website
  - MIS
  - Social media
  - Partnerships
  - Conferences and publications

**Outcomes**
- Active community of practice engaged in developing and disseminating STEM learning environments
- New stakeholders engaged in ITEST community
- ITEST dissemination network built on emerging technologies and new partnerships
- Increased visibility of NSF’s ITEST portfolio
- Enhanced NSF program officers’ understanding of ITEST portfolio
- Broadened participation in ITEST community by underrepresented individuals and organizations

**STELAR contributes to long-term outcome of ITEST Program:**
- Ensure high-quality STEM and ICT workforce of the future
Conducted by someone external to the project, with a focus on two overarching questions:

- Did you do what you said you would do?
- How well did you do it?

All DRL projects are subject to a series of *external, critical reviews* of their designs and activities (including their theoretical frameworks, any data collection plans, analysis plans, and reporting plans). A proposal must describe appropriate project-specific external review and feedback processes. These might include an external review panel or advisory board proposed by the project or a third-party evaluator.
Common Guidelines for Education Research and Development

- **Foundational**: Tests, develops or refines theories of teaching or learning
- **Early Stage or Exploratory**: Examines relationships among important constructs in education and learning (usually correlational rather than causal)
- **Design and Development**: Draws on existing theory & evidence to design and iteratively develop interventions or strategies
- **Impact**: Generates reliable estimates of the ability of a fully-developed intervention or strategy to achieve its intended outcomes (efficacy, effectiveness, scale-up)
Useful Links

- Common Guidelines for Education Research and Development:

- NSF FAQs for Common Guidelines
Conclusion – or a few more ideas

- Formative evaluation
- Rigor vs. design-based research and innovation
- Cultural competence? When research design doesn’t fit project implementation
- Multiple ways to meet research and evaluation goals
Digital East St. Louis
Integrated R&D and Program Evaluation in an NSF ITEST Project
Kirk Knestis, PhD – Hezel Associates
Hezel Associates (Syracuse, NY)

Evaluation, Research, and Planning Contractor

• Staff of 11 researchers
• Currently partner on 12 NSF projects in nine programs, three in ITEST
• Working with SIUE on their ITEST Strategies project – *Digital East St. Louis*
• *Unusual because we are both Research Partner and External Evaluator for this work*
Digital East St. Louis

Southern Illinois University Edwardsville (SIUE)

- 2014 ITEST Strategies project award
- An Urban Place-Based Learning Model to Promote Information Technology and Computer Career Interests of Minority Youth
- Outcomes relate to IT and computing skills and awareness of STEM-related careers
- The innovation is an “urban place-based learning model”
Digital East St. Louis

Developing and Researching the DESL Model

- All ITEST projects are research projects, to...
- Conceive, improve, and adopt a model to achieve lasting education outcomes for stakeholders *(Broader Impacts)*
- Advance broader understandings about teaching and learning *(Intellectual Merit)*
- ITEST requires an external evaluation of every project
Research vs. Evaluation

Research

Evaluation
Research vs. Evaluation

**Research & Development**

Framed as Research and Development (R&D)

Study of the DESL innovation in terms of its promise of effectiveness

Internal to the project, working with developers

**Program Evaluation**

Framed as Program Evaluation

Study of implementation and impact of the project’s R&D activities

External to the project, third-party perspective
Research vs. Evaluation

Research & Development

- Design & Development Research (Common Guidelines for Ed R&D)
- Mixed-method design
- Comparison pilot study analysis of outcomes
- Questionnaires, student artifact review, interviews, observations

Program Evaluation

- Assessment of R&D activities and impact in terms of broader impact and intellectual merit
- Theory-based mixed method design
- Interviews, document review, and peer review of research

Data do not overlap!
## Research, by Phase

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<td>2. Analyze data from SIUE, summary to PI</td>
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<td>3. Shift to “critical friend” perspective, focus on</td>
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**Building SIUE and partner research capacity**
Program Evaluation, by Phase

Hezel Associates

1. Collect & analyze data, mid- and year-end formative summaries
2. Collect & analyze data, mid- and year-end formative summaries
3. Mid-year summary, final report, peer review of PI’s findings

SIUE Partners

1. Provide access for data collection, use formative summaries
2. Provide access for data collection, use formative summaries
3. Provide access for data collection, use report for NSF reporting
WearTec Research

BRADLEY BARKER, PI
GWEN NUGENT, COPI RESEARCH
NEAL GRANDGENETT, COPI EVALUATION
WearTec Project

A strategies project to design and test an instructional model using wearable technologies to enhance student interests and capabilities to pursue STEM careers.
Questions From Solicitation

What coherent set of experiences effectively and efficiently support student competency...?

What instructional and curricular models can effectively engage teachers to utilize and integrate technologies so as to enhance student understanding of STEM and STEM cognate careers?

Given the shifting demographics what are effective ways to broaden participation...?
Research Questions and Design

Primary Research Question:

To what extent do the wearable technology experiences promote student a) engineering design knowledge and skills; b) electricity and circuitry knowledge; c) computer programming skills; and d) positive attitudes and motivation toward STEM and STEM careers?

Design: Quasi-experimental examining differences between the WearTec intervention group and a control group participating in an after-school STEM club at the same school (n = 45 informal/formal teaching teams and 900 students).
Research Questions and Design

Secondary Research Questions

1. To what extent does the use of the wearable technologies curriculum broaden the participation of underrepresented groups in STEM programs and careers?

Design: Descriptive with statistical analyses examining any differential effects across subgroups

2. To what extent does this wearable technologies project effectively engage teachers and out-of-school educators to utilize and integrate STEM into the classroom and out-of-school learning to promote student learning and interest in STEM?

Design: Mixed methods with interviews and fidelity of implementation analysis
Evaluation Process

Working collaboratively with the research team, we will follow the:

- Evolving feasibility and usability of the curriculum
  
  (Advisory Panel reviews by from content and curriculum specialists)

- Perceived effectiveness (teachers, informal educators, students)
  
  (Focus groups / surveys / interviews / embedded assessments)

- Use of the curriculum in instruction and classroom implementation
  
  (Rubric-based observation data based from classroom videos)
NSF Common Guidelines

Our team has aligned our research closely with NSF’s Common Guidelines for Education Research and Development and in particular, with the document’s category of Research Type #3 (Design and Development Research). This type of research “develops solutions to achieve a goal related to education or learning, such as improving student engagement or mastery of a set of skills”. We are essentially developing, testing, and refining a “wearable technologies curriculum solution” that has the promise of effectively teaching engineering design and building student interest and motivation in STEM.
Student Oriented Questions

- Are the youth able to successfully complete activities?
- Are they engaged in activities?
- Are there additional changes needed to promote student-desired outcomes?

(Observation data, Short Feedback Surveys, Embedded Assessments)
Teacher Oriented Questions

- Are teachers able to successfully implement activities in their classroom?
- Are there barriers?
- How much support do teachers need and what type and from whom?
- How do teachers perceive the curriculum and activities - what was helpful, what does not work, what changes are needed?

(Surveys, Observation Data, Focus Groups)
Questions?
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