

STEM Learning and Research (STELAR) Center @ Education Development Center

Stories from ITEST: Culturally Competent Projects that Inspire Young People to Pursue STEM Careers



Tuesday, February 28, 2016

Who We Are

- Innovative Technology Experiences for Students and Teachers (ITEST) Program
- STEM Learning & Research Center (STELAR)
- Located at Education Development Center
- Supporting the ITEST program and its grantees since 2003
- Available to assist those considering submitting an ITEST proposal

What We Do

- 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



Some of Our Activities

- **Webinars:** Effective Dissemination, Designing Research for ITEST Projects, Mentoring Models
- **Monthly Newsletter:** Information to stay updated on all things STEM and ITEST
- **Project Specialists:** A STELAR staffer who works directly with each project to provide resources and make connections
- **Regional and Thematic Meetings:** A way for current projects to network with each other
- **Management Information System (MIS):** Annual collection of project information about what projects do, who they work with, what they have achieved

Find Resources on STELAR Website



 [Log in OR Join](#) | [Contact Us](#)

[Home](#) [About](#) [News](#) [Events](#) [Opportunities](#) [Projects](#) [Resources](#)

FEATURED POST

ITEST PROJECTS ADDRESS NSF PRIORITIES ON YOUTH PARTICIPATION, TEACHER PD & BROADENING PARTICIPATION

Read about the new ITEST syntheses!

[Learn More »](#)



Helping prepare a diverse, skilled, and innovative STEM workforce.

TEXT SEARCH



[ADVANCED SEARCH](#)



How STELAR Can Help You



ITEST Program Findings



ITEST Proposal Development



STELAR Materials



Join Our Mailing List

Get Ideas for Designing ITEST Proposals

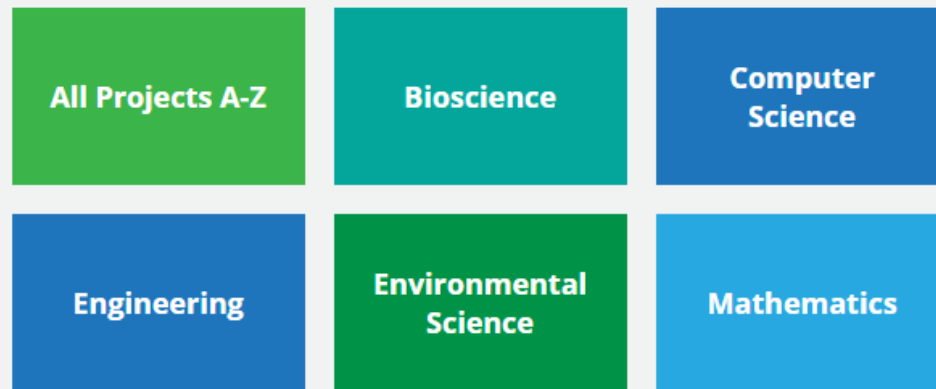
ITEST Proposal Development: <http://stelar.edc.org/proposal-development>

- + 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

Explore Project Profiles

1 - 8 of 312

[Download Results](#)



Opportunities to Learn: Creative Science Through Inquiry, a Middle Grades Teaming Framework

2016 - 2019

This project will develop opportunities for students to learn creatively in science through inquiry. The project will prepare 72 middle school teachers to work with approximately 1800 students from economically disadvantaged schools who have had...

SEARCH FOR PROJECTS

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

- + DISCIPLINE(S)
- + PROJECT PARTICIPANT(S)
- + PROJECT GRADE SPAN(S)
- + PROJECT SETTING(S)
- + STATES WHERE WORK OCCURS
- + PROJECT STATUS

Apply Filters

Resource Library – Publications, Curricular Materials & Instruments

1 - 8 of 629

[Download Results](#)

Events

News

Instruments

Publications

Opportunities

Curricular Materials

STELAR ITEST PI & Evaluator Summit 2017 - Save the Date

Thursday, June 15, 2017 - 8:00am to Friday, June 16, 2017 - 5:00pm

Event at Westin Arlington Gateway

Save the date for the 2017 STELAR ITEST PI & Evaluator Summit! The summit is an opportunity for ITEST Principal Investigators (PIs) and evaluators to come together and share successes, challenges, and lessons learned from the ITEST...

[READ MORE »](#)

SEARCH FOR RESOURCES

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



RESOURCE TYPE



DISCIPLINE(S)



TOPIC(S)

Apply Filters

Clear Filters

Connect with others via the People Connector

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

People Connector Form


People Connector Directory

STELAR People Connector Directory - Add your Information

The purpose of this directory is to connect individuals looking for partners or tools for their ITEST proposals with those who can provide partnership or tools (e.g., a school district looking for a research methodologist, a community-based organization looking for an external evaluator).

Please complete this form if you are looking for or can provide specific expertise for ITEST proposals. The information you provide will be publicly available and accessible via the STELAR website.

* Required



STEM Learning and Research Center

First name *

Last name *

Email *

Organization / Institution *

City *

State *

Website

Listing Type *

Select one listing type for this submission. If you are both LOOKING FOR and PROVIDING expertise, please complete this form for one, and then submit an additional form for the second.

I am LOOKING FOR expertise

I can PROVIDE expertise

STELAR People Connector Directory

File Edit View Insert Format Data Tools Form Add-ons Help All changes saved in Drive

Comments Share

fx

The purpose of the People Connector Directory is to connect individuals looking for partners or tools for their ITEST proposals with those who can provide partnership or tools (e.g., a school district looking for a research methodologist, a community-based organization looking for an external evaluator). The information provided is publicly available and accessible via the STELAR website. You can get notified of additions to the Directory by clicking on 'Tools' and 'Notification Opportunities' above (you must sign in to a google account in order to access the Tools).

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

Timestamp	First name	Last name	Email	Organization / Institution	City	State	Website	Listing Type	Type of Expertise	Expertise Details	
14	9/8/2014 16:42:48	Anita	Krishnamurthi	akrishnamurthi@afterschool	Afterschool Allian	Washington	DC	http://www.afterschool	I can PROVIDE expertise	Researcher, Informal ed	Please reach out if you're looking f
15	9/9/2014 9:07:53	Bonnie	Swan	bonnie.swan@ucf.edu	University of Cent	Orlando	Florida	http://education.u	I can PROVIDE expertise	Evaluator, Researcher	Program Evaluation and Education
16	9/9/2014 9:19:45	Cynthia	Tanaris	tanaris@pitt.edu	University of Pitts	Pittsburgh	PA	http://www.ceac.p	I can PROVIDE expertise	Evaluator, Researcher, E	Cynthia A. Tanaris, Ed.D., founde
17	9/9/2014 12:09:42	Amy	Grack Nelson	agnelson@smm.org	Science Museum	St Paul	MN		I can PROVIDE expertise	Evaluator, Evaluation ins	Expertise in the development and v
18	9/9/2014 17:00:08	Troy	Sadler	sadlet@missouri.edu	University of Miss	Columbia	MO	http://education.m	I can PROVIDE expertise	Evaluator	The ReSTEM Institute: Reimagin
19	9/10/2014 18:56:16	Vega	Vanessa	vanessa@rockman.com	Rockman et al.	San Francisco	CA	www.rockman.com	I can PROVIDE expertise	Evaluator, Researcher, F	Can provide expertise on: evaluatio
20	9/16/2014 10:00:21	Kevin	Glass	glass@educationconnect	Center for Resear	Litchfield	CT	www.educationcon	I can PROVIDE expertise	Evaluator	We can provide both internal and e
21	9/16/2014 13:14:04	Juan	Concepcion	rubricsolution@gmail.com	Concepcion-Card	Manati	Puert	www.rubric-solutio	I am LOOKING FOR expertise	Evaluator, Informal educ	Proven educational STEM practice
22	9/17/2014 15:21:28	Kristin	Bass	kristin@rockman.com	Rockman et al	San Francisco	CA	www.rockman.com	I can PROVIDE expertise	Evaluator, Evaluation ins	Rockman et al is an independent r
23	9/17/2014 10:39:14	Karen	Yanowitz	kyanowitz@astate.edu	Arkansas State U	Jonesboro	AR		I can PROVIDE expertise	Evaluator, Researcher	I have two ITEST grants and am ve
24	9/18/2014 16:41:00	Jared	Ozga	jozga@wvcs.org	Wildlife Conservat	New York	NY	wvcs.org	I am LOOKING FOR expertise	Informal education site,	Looking to forge partnerships with
25	9/22/2014 15:26:32	Robinson	Robinson	ronrobinson@lewislatimer	Lewis H. Latimer	Chelsea	Mass	www.lewislatimer	I can PROVIDE expertise	Informal education site	I can provide information on how to
26	10/22/2014 16:12:12	Teresa	Reagan	treagan@ncat.edu	NC A&T State Uni	Greensboro	NC		I am LOOKING FOR expertise	Evaluator	We are searching for an external e
27	11/12/2014 21:47:15	Aaron	Parker	Aaron.T.Parker@gmail.c	University of Guan	ASAN	Guam		I am LOOKING FOR expertise	Evaluator, Formal educa	Looking for help putting together a
28	2/17/2015 12:30:42	Jana	Craig-Hare	janach@ku.edu	University of Kans	Lawrence	KS	www.alt.ec.org	I can PROVIDE expertise	Evaluator, Researcher, Evaluation instrument	
29	2/17/2015 16:23:36	Jaclyn	Ocuppaugh	jo2424@tc.columbia.edu	Teachers College,	New York	New York		I can PROVIDE expertise	Evaluator, Researcher, Evaluation instrument	

Stay in Touch!

Contact us: stelar@edc.org

Facebook: <https://www.facebook.com/stelarctr>

Twitter: https://twitter.com/STELAR_CTR

LinkedIn: <https://www.linkedin.com/groups/STELAR-Center>

Find resources: <http://stelar.edc.org/>

Today's Presenters:

- **Carrie Parker**, Co-PI of STELAR at EDC
- **Sheron L. Mark**, Assistant Professor of Science Education at University of Louisville
- **Sally Stevens**, Executive Director, Southwest Institute for Research on Women, University of Arizona
- **Melissa Koch**, Author Innovator Educator

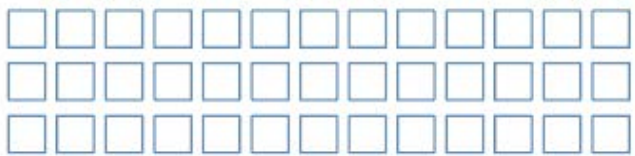
Joining us in the chat:

- **Kristin Bass**, Senior Researcher, Rockman et al
- **Andrea Gomoll**, Graduate Research Assistant, Center for Research on Learning and Technology at Indiana University
- **Kirk Knestis**, CEO of Hezel Associates
- **Karen L. Yanowitz**, Professor of Psychology, Arkansas State University

Volume 25, Issue 6, December 2016



Journal of Science Education and Technology

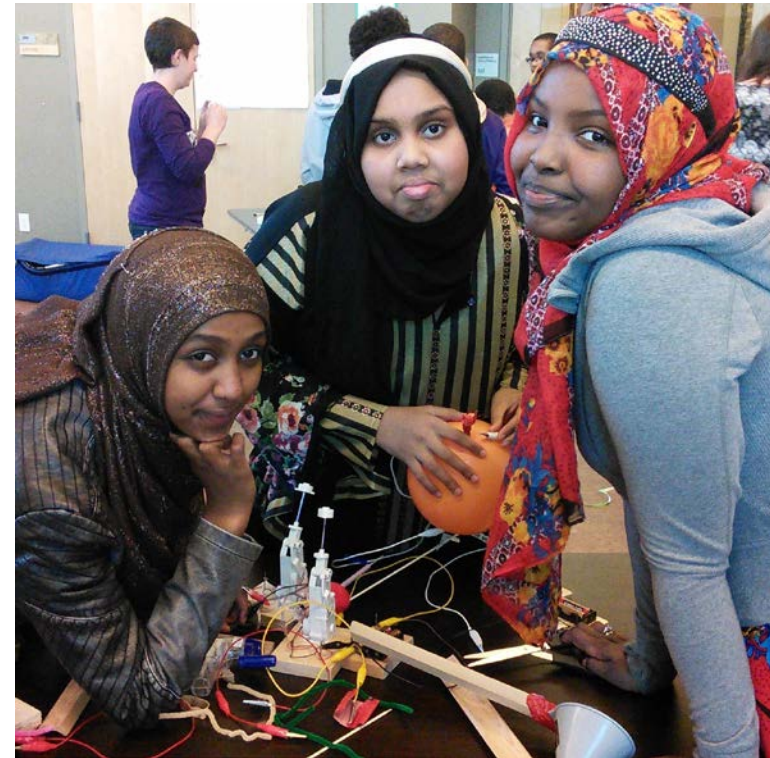


 Springer



Why this special issue? ITEST projects contribute to the field

- Motivation and interest of *underrepresented populations* in the pursuit of STEM careers
- Role of *gender, race, and ethnicity* in youth's pursuit of STEM careers
- Role of *technology-enhanced STEM educational experiences* on aspirations to pursue STEM careers
- *Design and implementation* of youth-based STEM career development projects
- *Teacher education* for technology-enhanced STEM career development education
- *Theoretical models* to explain youth STEM career development processes



ITEST projects speak to NSF Big Ideas

NSF Ten Big Ideas

- Work at the Human-Technology Frontier
- NSF INCLUDES: Enhancing Science and Engineering Through Diversity
- Harnessing Data for 21st Century Science and Engineering

Directorate for Education and Human Resources (EHR) Four Pillars

- STEM learning
- STEM learning environments
- Workforce development
- Broadening participation

Theoretical Frameworks and Measurement



2. Measuring Student Career Interest within the Context of Technology-Enhanced STEM Projects: A Cross-Project Comparison Study Based on the Career Interest Questionnaire

Authors: Karen Peterman, Ruth Kermish-Allen, Gerald Knezek, Rhonda Christensen, Tandra Tyler-Wood

3. Workforce Education Models for K-12 STEM Education Programs: Reflections on, and Implications for, the NSF ITEST Program

Authors: David Reider, Kirk Knestis, Joyce Malyn-Smith

Work at the Human-Technology Frontier/ Workforce development

4. Using Robotics and Game Design to Enhance Children's Self-Efficacy, STEM Attitudes, and Computational Thinking Skills

Authors: Jacqueline Leonard, Alan Buss, Ruben Gamboa, Monica Mitchell, Olatokunbo S. Fashola, Tarcia Hubert, Sultan Almughyirah

6. Preparing Students for Middle School Through After-School STEM Activities

Authors: Nancy P. Moreno, Barbara Z. Tharp, Gregory Vogt, Alana D. Newell, Christopher A. Burnett

7. Dragons, Ladybugs, and Softballs: Girls' STEM Engagement with Human-Centered Robotics

Authors: Andrea Gomoll, Cindy E. Hmelo-Silver, Selma Šabanović, Matthew Francisco

8. Students' Perceptions of the Long-Term Impact of Attending a "CSI Science Camp"

Authors: Karen Yanowitz

INCLUDES/Broadening Participation

13. Urban High School Student Engagement Through CincySTEM iTEST Projects

Authors: Gulbahar H. Beckett, Annette Hemmings, Catherine Maltbie, Kathy Wright, Melissa Sherman, Brian Sersion

14. Designing the Game: How a Project-Based Media Production Program Approaches STEAM Career Readiness for Underrepresented Young Adults

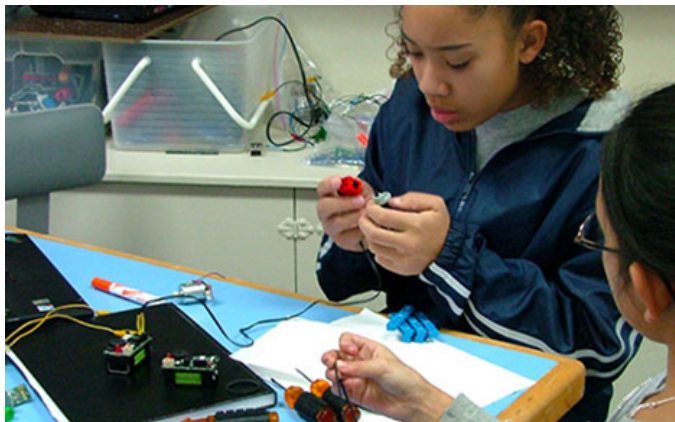
Authors: Kristin M. Bass, Ingrid Hu Dahl, Shirin Panahandeh

15. Opting in and Creating Demand: Why Young People Choose to Teach Mathematics to Each Other

Authors: Eli Tucker-Raymond, Naama Lewis, Maisha Moses, Chad Milner



STEM learning and STEM learning environments



5. Middle School Engagement with Mathematics Software and Later Interest and Self-Efficacy for STEM Careers

Authors: Jaclyn Ocumpaugh, Maria Ofelia San Pedro, Huei-yi Lai, Ryan S. Baker, Fred Borgen

9. Preparing Teachers to Use GIS: The Impact of a Hybrid Professional Development Program on Teachers' Use of GIS

Authors: Steven Moore, Don Haviland, William Moore, Michael Tran

11. STEM Pathways: Examining Persistence in Rigorous Math and Science Course Taking

Authors: Shetay N. Ashford, Rheta E. Lanehart, Gladis K. Kersaint, Reginald S. Lee, Jeffrey D. Kromrey

Today's Papers

12. Psychology of Working Narratives of STEM Career Exploration for Non-dominant Youth

Authors: Sheron L. Mark

10. Motivating Young Native American Students to Pursue STEM Learning Through a Culturally Relevant Science Program

Authors: Sally Stevens, Rosi Andrade, Melissa Page

16. Curricular Influences on Female Afterschool Facilitators' Computer Science Interests and Career Choices

Authors: Melissa Koch, Torie Gorges

Today's Papers

- **Theoretical frameworks**
 - Psychology of Working
 - Funds of Knowledge
- **Broadening participation**
 - Youth from non-dominant groups (urban students of color)
 - Native American youth
 - Young women in transition
- **Workforce development/mentoring**
 - Social connectedness
 - Mentoring
 - Workforce development across the life span





Psychology of Working Narratives of STEM Career Exploration from Non- dominant Youth

Sheron L. Mark, Ph.D.

sheron.mark@louisville.edu

Department of Middle and Secondary Education

College of Education and Human Development

University of Louisville

Louisville, KY, USA

Acknowledgements

- **Dr. Mike Barnett** (Boston College): ITEST & HP Teaching with Technology Grants Award Recipient
- Peter J. Sharp Foundation
- Lynch School of Education, Boston College

Statement of Purpose

- To investigate:
 - *the unique and diverse ways in which **non-dominant youth explored STEM careers**;*
 - ***the impact of the ITEST program** on the youth's STEM career exploration.*

Target Population/Program Enrollment

- ~ **60 high school youth** in 3 local area schools from 2009 – 2012.
- **Predominantly:**
 - *Low-income students*
 - *Students of color*
 - *Immigrant youth*
- **The qualitative study focused on 11 youth.**



College Bound - Boston College

Overview of the ITEST Intervention

- **A year-round, out-of-school STEM program**
 - *Bi-monthly, all-day Saturday meetings*
 - *School vacation institutes (Winter, Spring, and Summer)*
- **Resources provided:**
 - *Stipends for participating as “STEM research interns”*
 - *Bus transportation*
 - *Breakfast and lunch*

ITEST Intervention Student Experiences

Positionality between youth and mentors optimized by:

- *Selecting diverse mentors;*
- *Designing small-scale (roundtable) interactions*
- *Rotating the mentors (vs the youth) from table to table*

• **Explicit STEM career connections and development support:**

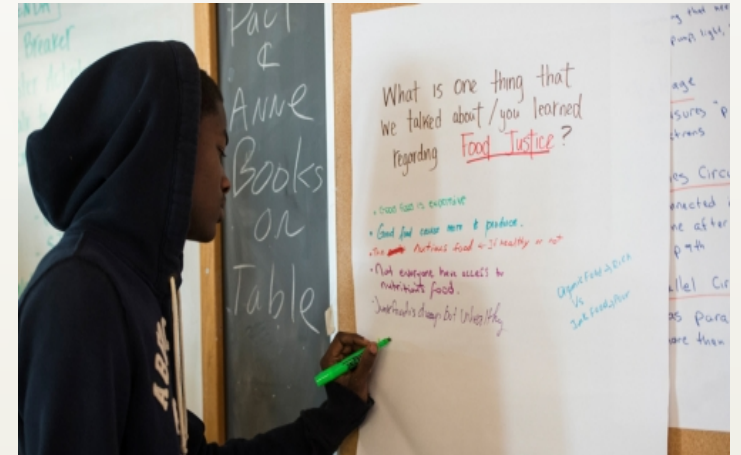
- *STEM career mentors*
- *“Transferable skills” (connecting STEM projects to STEM careers)*
- *Guidance and career counseling and “Tools for Tomorrow” (Solberg et al. 2002)*

Qualitative Study Design: Theoretical Framework Psychology of Working (PoW; Blustein 2006)

Human Needs Met Through Working	Definitions
Survival	Access to financial and other resources to support safe and healthy living
Social Connectedness	<ul style="list-style-type: none"> • Nurturing and supportive career network • Participation in the larger economy • Identity development
Self-determination	Control over one's life and future
Value Congruence	Furthering one's beliefs, principles, and passions through work
Power	Social and cultural capital
Access To The Opportunity Structure	Access to means to mobilize upward in society

Necessary Modifications to the PoW Framework

1. Focused on **youth's future career expectations** as opposed to current work experiences.
2. Focused on **youth's pre-work contexts** as opposed to career professionals situated in the workplace, primarily.
 - **Pre-work contexts:**
 - *the ITEST program;*
 - *formal school;*
 - *other out-of-school experiences*
(home; after-school; & community settings).



College Bound – Boston College

A decorative horizontal line consisting of many small, red, slanted rectangular dashes.

Impact of social connectedness through STEM career mentors

- STEM career mentorship supported youth both in and out of the STEM career pipeline, i.e.
 - *those youth newly considering and*
 - *already considering STEM careers.*
- Findings of STEM career mentors affirming in light of Valla & Williams' (2012) later findings:
 - *Effective STEM programs include **individuals** (such as STEM mentors and guidance counselors) who monitor and guide students, as a group as well as individually, over an extended period of time.*



College Bound – Boston College

STEM mentorship afforded instrumental support

- **New STEM career knowledge and career expectations**
 - *Vanessa, an Afro-Caribbean female from Haiti:*
 - “. . . listening to the people [the STEM mentors] talking about the majors and [the career] roundtable... **helped me know more about what I want to major in. . . . [I was] inspired by... hearing people talk about how exciting their jobs are.**” (Sep 2011)



College Bound – Boston College

STEM mentorship afforded instrumental support

- **New knowledge of educational requirements**

- *Dominique, an English-Spanish bilingual, Latina freshman:*

Question to the STEM career panel:

- “. . . **how much college education do you need to become like a forensic analyst?**” (July 2011)
- *Mr. Ken, a STEM mentor*
 - “Well, most of those people are called pathologists . . . [and] are **medical doctors**. . . 4 years of college, 4 years of **medical school** . . .

Interview response:

- “[I plan on] **going to college . . . go to medical school** ‘cause I want to continue on to the forensics.” (July 2011)



College Bound - Boston College

STEM mentorship afforded relational support

- Youth responded to mentors' stories of struggle and career experience
 - *Stefania, an English-Spanish bilingual, Latina freshman (recounts Martin's story months after hearing him speak)*
 - “[Martin was] was dyslexic When I was younger, I thought I was dyslexic. I hated all the subjects.... [Martin] is very successful.... [Now,] I want to make a difference in life.... **like be a doctor....**
 - Everyone I know, they don't have big jobs.... [Like,] oh, I'm a scientist, I'm a doctor.... [at the STEM program], **I started meeting... new people... And that's how I started thinking. Like, I don't think small now, I think big.**” (September 2011).



College Bound – Boston College

Conclusion

- As part of the ITEST program, STEM career **mentors provided nurturing and supportive career networks** for non-dominant youth in diverse and valuable ways.
- **STEM career mentors may** potentially serve to **affirm youth's** budding STEM career interests – **“narrated identities”**
 - *Important in closing the “STEM identity [career] gap”*
(Tan et al., 2013)



College Bound – Boston College

References

- Blustein, David L. 2006. *The psychology of working: A new perspective for career development, counseling, and public policy*. Edited by Bruce E. Wampold. Mahwah, New Jersey and London, England: Lawrence Erlbaum Associates.
- Solberg, V. Scott, Kimberly A. Howard, David L. Blustein, and Wendy Close. 2002. "Career Development in the Schools." *The Counseling Psychologist* 30 (5):705-725. doi: doi:10.1177/0011000002305003.
- Valla, Jeffrey M. , and Wendy M. Williams. 2012. "Increasing achievement and higher education representation of under-represented groups in science, technology, engineering, and mathematics fields: a review of current K-12 intervention programs. ." *Journal of Women and Minorities in Science and Engineering* 18 (1):21-53. doi: 10.1615/JWomenMinorScienEng.2012002908.
- Tan, Edna, Angela Calabrese Barton, Hosun Kang, and Tara O'Neill. 2013. "Desiring a career in STEM-related fields: How middle school girls articulate and negotiate identities-in-practice in science." *Journal of Research in Science Teaching* 50 (10):1143-1179. doi: 10.1002/tea.21123.

A horizontal decorative line consisting of many small, red, slanted rectangular dashes.

Thank You.
sheron.mark@louisville.edu

A horizontal line composed of many small, red, slanted rectangular dashes spans across the top of the slide, positioned below the header information.

Additional Slides

Qualitative Data Collection and Analysis

- Eleven student participants
- Longitudinal qualitative data collection:
 - *July 2010 – September 2011*
 - *Interviews and participant observation*
 - *Across STEM program activities*
- Data coded according to:
 - *the domains of the PoW framework*
 - e.g. social connectedness
 - *pre-work contexts*
 - e.g. STEM program, formal school



STEM mentorship: Growth in STEM career knowledge

Vanessa, an Afro-Caribbean female from Haiti:

. . . listening to the people [the STEM mentors] talking about the majors and [the career] roundtable[s]... helped me know more about what I want to major in. . . . In [the STEM program], I learned about the different types of engineering – chemical, civil, mechanical. I got to talk to some engineers and was captivated by how an engineer talked so passionately about what he does. [I was] **inspired by... hearing people talk about how exciting their jobs are**

(September 2011)

STEM mentorship: Knowledge of educational requirements

STEM
Career
Panel

Dominique, an English–Spanish bilingual, Latina freshman:

“ . . . how much college education do you need to become like a forensic analyst? . . . Like, the bodies and stuff in crime scenes.”

Mr. Ken, a STEM mentor and STEM program instructor:

“Well, most of those people are called pathologists . . . [and] are **medical doctors**. So, you have to go to 4 years of college, 4 years of **medical school**, 1 year of internship and residency . . . [in] pathology is about 3 or 4 years.”

Interview

Dominique:

- [I plan on] **going to college . . . go to medical school** 'cause I want to continue on to the forensics.

(July 2011).

Response to mentors' stories of struggle & career experience

Stefania continued:

I want to make a difference in life.... **I will graduate high school and college.**
[Martin was] was dyslexic [.... I have....] a lot of friends [who are]
And now, I want to do things to help people, like be a doctor.... Before....
dyslexic.... When I was younger, I thought I was dyslexic. I hated all
the subjects.... [the STEM program], I always thought that I couldn't be.... somebody big
because everyone I know, they don't have big jobs.... [Like,] oh, I'm a
scientist, I'm a doctor.... So, basically.... [at the STEM program], I started
meeting... new people... wanted to go to college doing one thing, and
then they came out doing another thing, making more money or more
professional. And that's how I started thinking. Like, I don't think small now, I
think big. (September 2011).

A decorative horizontal line consisting of many small, slanted red dashes.

Scale of impact of STEM career mentorship varied

- STEM mentors supported STEM career exploration for youth:
 - *newly considering*
 - *already considering STEM careers.*

Scale of impact of STEM career mentorship varied

- ***Sandra, an Afro-Caribbean female senior:***

*“Yea. We had [the STEM career roundtable]. There was that doctor and... he told me... how many years you have to spend in college, what kind of classes you have to take to be a pediatrician”
(October 2010)*

- ***Andrew, a Nigerian male freshman:***

“... you can pretty much write your own pay check [as a computer engineer]” (September 2010)”

Less
substantial
scale of
impact

Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

Sally Stevens PhD

Executive Director - Southwest Institute for Research on Women

Distinguished Outreach Professor - Gender & Women's Studies

University of Arizona

sstevens@email.arizona.edu

STELAR Webinar:

February 28, 2017

Project website: <http://istemtucson.weebly.com>

Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

- **Goals of iSTEM Project:**
 - Test a hybrid model (mentoring & informal science experiences) for engaging 3rd - 8th grade Native American students in STEM
 - Examine the differential effectiveness of four mentor types (Professional STEM; University students; Tribal community members; STEM guides)
 - Use a culturally relevant framework “Funds of Knowledge” for STEM activities
- **iSTEM Location and Participants**
 - Three rurally located schools in southern Arizona
 - Mentees: Mostly Native American girls



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

- **Hybrid Program Model**

- **Mentoring:**

- Once a week at lunch hour plus 5 field trips per year
 - STEM activities along with non-STEM activities

- **Informal Science Activities:**

- Pre-package “flash STEM activities” for lunchtime mentor/mentee engagement – with staff support
 - Field trips to University of Arizona, museums, parks, and other places

- **Science-based Thematic Modules:**

- Thematic modules facilitated over a 6 to 8 week period (solar energy; water & soil; health, air & space; ecology, etc)



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

■ Cultural Foundation

- Funds of Knowledge (culturally relevant framework for guiding the project)
 - Include historical and empowering Native American cultural facts within STEM activities
 - Include Native American stories
 - Build upon what participants know and experience
 - Address STEM topics that are close to home and relevant
- Tribal commitment and oversight
- Partnership team
- Provide opportunities for mentees to teach (the mentor, family members, each other)



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

- **Thematic Modules**

- **Solar Energy**

- Flash STEM activities (temperature taking; solar ovens; solar bracelets)
 - Field trip (solar robots at U of A)
 - Cultural relevance (adobe homes; clothing)

- **Air and Space**

- Flash STEM activities (paper airplanes; star drawings)
 - Field trip (Air & Space Museum)
 - Cultural relevance (star gazing and Native American stories)



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

- **Thematic Modules**
 - Water and Soil
 - Flash STEM Activities (eatable soil, watershed constructions)
 - Field Trip (Pima Wetlands)
 - Cultural Relevance (history of Native American irrigation; Native plants and foods)



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students

- **Lessons learned**
 - Working within a collaboration that includes tribes, schools, community-based agencies, University and community members is complex and takes time to develop and succeed
 - Mentor engagement was not as successful as planned – having STEM guides (part-time staff or student interns) working with the youth improved consistency and outcomes
 - Each mentor type (Professional STEM; University students; Tribal community members; STEM guides) brings strengths and challenges to mentoring and they need different types of program support



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students


- **Lessons learned**
 - Mentoring programs can be perceived as being for at-risk youth and thus strategies must convey the program as unique and exceptional
 - Grade/age differences (3rd - 8th grade) is too great. Narrow to 3 grade levels
 - Pre-packaged flash STEM activities with on-site assistance is important
 - Having STEM experts leading hands-on activities during field trips animates and inspires students (versus non-STEM project staff)



Broadening Participation in STEM: A Hybrid Program for Engaging Young Native American Students



"It's a fun program...they help you out with school...keep your future good"



Curricular Influences on Female Afterschool Facilitators' Computer Science Interests and Career Choices

Melissa Koch

February 28, 2017

NSF grant (Grant No.1339181)

Background

- During the scale-up of Build IT (2012)—an afterschool computer science curriculum for middle school girls from underrepresented populations—more than 50% of **Build IT facilitators** said they were interested in or were actively pursuing their own STEM careers and/or education, often citing Build as the reason.
- These Build IT facilitators were women, primarily women of color in their 20s and 30s.
- These unexpected findings led us to design a study that focused on the workforce development of **afterschool facilitators**.



We investigated:

1. Under what conditions do **Build IT facilitators** pursue computer science learning and careers?
2. What types of computer science learning and careers do **Build IT facilitators** indicate interest in and pursue?

Findings Summary

From a qualitative interview-based study of nine participants
(Build IT Facilitators)

- Seven of these nine participants pursued further STEM or computer science learning or modified their career paths to include more of a computer science or STEM focus
- Five of these seven participants attributed their STEM career pursuits at least in part to Build IT
- All seven cited one or more of the following influences on their STEM learning and career goals: (a) learning from the Build IT curriculum materials themselves, (b) enacting the Build IT curriculum with girls, and (c) working in the supportive context of Girls Incorporated

Three Profiles

Cristina, a Latina in her late 20s, was an afterschool facilitator. “I told [my manager] I liked computers and she said to try Build IT. When I ran it, it was so fun for me...the things the girls were learning, I was telling them about women and STEM careers... [those discussions] helped me a lot, so I decided to quit and just go to school.”

“After running Build IT I was inspired. What I was preaching to the girls, I wanted to follow.” Christina was pursuing a computer science degree at the time of the interviews.

Heather, a White woman in her 40s, said, “I have been so inspired working with this curriculum and with the whole Build IT team that I have applied to a graduate program...in learning, media and technology.” She took a job as a manager of a university-based program working to increase interest in computer science education among diverse populations

Sue, a White woman in her 50s, said, “It’s all because of Build IT that I’m doing robotics. When I first started Build IT, I knew nothing about the computer. I was learning as the girls were learning. Build IT gave me the confidence to do [robotics]. I told the girls I was trying to be strong, smart, and bold so [they] have to be, too.” Sue plans to retire in a few years, but to continue volunteering in afterschool and furthering her technology knowledge.

Why These Findings Matter

- This study is not about the Build IT curriculum and its impact. (Well, it's a little bit about the curriculum...)
- This is a study about an untapped source of potential future STEM workforce professionals: afterschool facilitators who can be activated or re-activated to pursue STEM careers.

Afterschool Facilitators



- Not teachers
- Transitioning in their careers
 - may lead to a career in community-based organizations
 - or something else

Theory

Four bodies of literature informed our study:

1. STEM and computer science career pathways,
2. stereotypes and belonging in computer science fields,
3. the role of afterschool environments in STEM and computer science learning,
4. the role of curricular materials as a tool for educators' learning

Theory

Four bodies of literature informed our study:

1. STEM and computer science career pathways,
2. stereotypes and belonging in computer science fields,
3. the role of afterschool environments in STEM and computer science learning,
4. the role of curricular materials as a tool for educators' learning

STEM & CS Career Pathways Disrupted

- Underrepresented populations such as women, African Americans, and Latinas often come to STEM careers by less traditional paths later in life more often than White and Asian males (Harris, Greenwald, & Cannady, 2012; Turner, Bernt, & Pecora, 2002).
- Pathways for those who come to STEM careers later in life reflect experiences in formal and informal settings that led them to turn away from STEM in their youth (Harris et al., 2012; Turner et al., 2002).
- Those who are dissuaded at a young age from technology careers may find their way back to a STEM path in adulthood through learning experiences that bring them in touch with elements that counter stereotypes and encourage their sense of belonging in the field.

Curriculum's Influence

- Educative Curriculum Materials. Materials designed to educate educators and provide them with the support they need for their learning, their teaching, and youths' learning (Ball & Cohen, 1996; Davis & Krajcik, 2005).
 - Build IT curriculum developers specifically designed Build IT to teach the afterschool facilitators as well as the youth (Koch et al., 2012).
- Curriculum Enactment. Remillard and Heck (2014) documented the complex, interactive nature of curriculum enactment and how... [it] provides learning opportunities for educators as well as students.



Several interviewees commented about “learning alongside the girls” when they enacted the curriculum.

Methodology

- This study focused on facilitators who indicated an interest in following a STEM pathway given their experiences with Build IT. Although what deters underrepresented populations from pursuing STEM has a rich literature, detailed information on what reactivates a STEM pathway, specifically a computer science pathway, is limited.
- Interviewees were one African American woman, three Latinas, four White women, and one woman who identified as White and Native American. At the time of the interviews, three were between 25 and 29 years of age, two were between 30 and 34, two were between 40 and 49, one was over 50, and one did not provide her age. One has earned a master's degree, five have college degrees, two have completed some college, and one has a high school education.
- The interview protocol asked afterschool facilitators about their
 - experience implementing Build IT;
 - current work and goals for the future;
 - informal learning/hobbies in STEM;
 - career/education challenges and supports; and
 - career/educational path influences.
- We conducted the interview as a followup to learn about their current career and future plans, STEM or otherwise, allowing each interviewee to describe her path. We also asked whether Build IT had played a role in their career or educational path; we asked this question the end of the interview and only if the interviewee herself had not brought up the topic earlier. .

Next Steps

A mixed-methods study, under the same NSF grant (Grant No.1339181) as this qualitative study, compared Build IT with other STEM curricula in both the Girls Inc. network of affiliates throughout the United States and the California School-Age Consortium (CalSAC) network of afterschool programs to understand

1. under what conditions Build IT facilitators pursue computer science learning and careers
2. under what conditions STEM facilitators pursue STEM learning and careers
3. what types of computer science learning and careers Build IT facilitators indicate interest in and pursue,
4. to what extent a relationship exists between facilitators' computing interests and pursuits and youth outcomes for Build IT.

Data collection challenges hindered findings. Further research is needed to explore these questions.

This work, together with that of others in the field, opens the possibility of computer science and technology careers to a group of women who may in the words of one study participant “realize that [they] missed [their] prior love for all things STEM.”

Thank you!!

- Carrie Parker, cparker@edc.org
- Sheron Mark, sheron.mark@louisville.edu
- Sally Stevens, sstevens@email.arizona.edu
- Melissa Koch, mel@melissakoch.com
- Kristin Bass, kristin@rockman.com
- Andrea Gomoll, agomoll@indiana.edu
- Kirk Knestis, Kirk@hezel.com
- Karen Yanowitz, kyanowitz@astate.edu