MENTORING MODELS IN ITEST PROJECTS

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

stelar
STEM Learning and Research Center

NSF

EDC Learning transforms lives.

EdLab Group

Agenda

- STELAR Overview
- Presenters:
  - Kimberly Gordon Biddle

    Game Design with Mentoring for Computer Science and Math Achievement for Educationally Disadvantaged Students
  - Emily Stoeth

    Bridging the Gap
  - Gary Mayer

    Maximizing Mentor Effectiveness in Increasing Student Interest and Success in STEM

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**

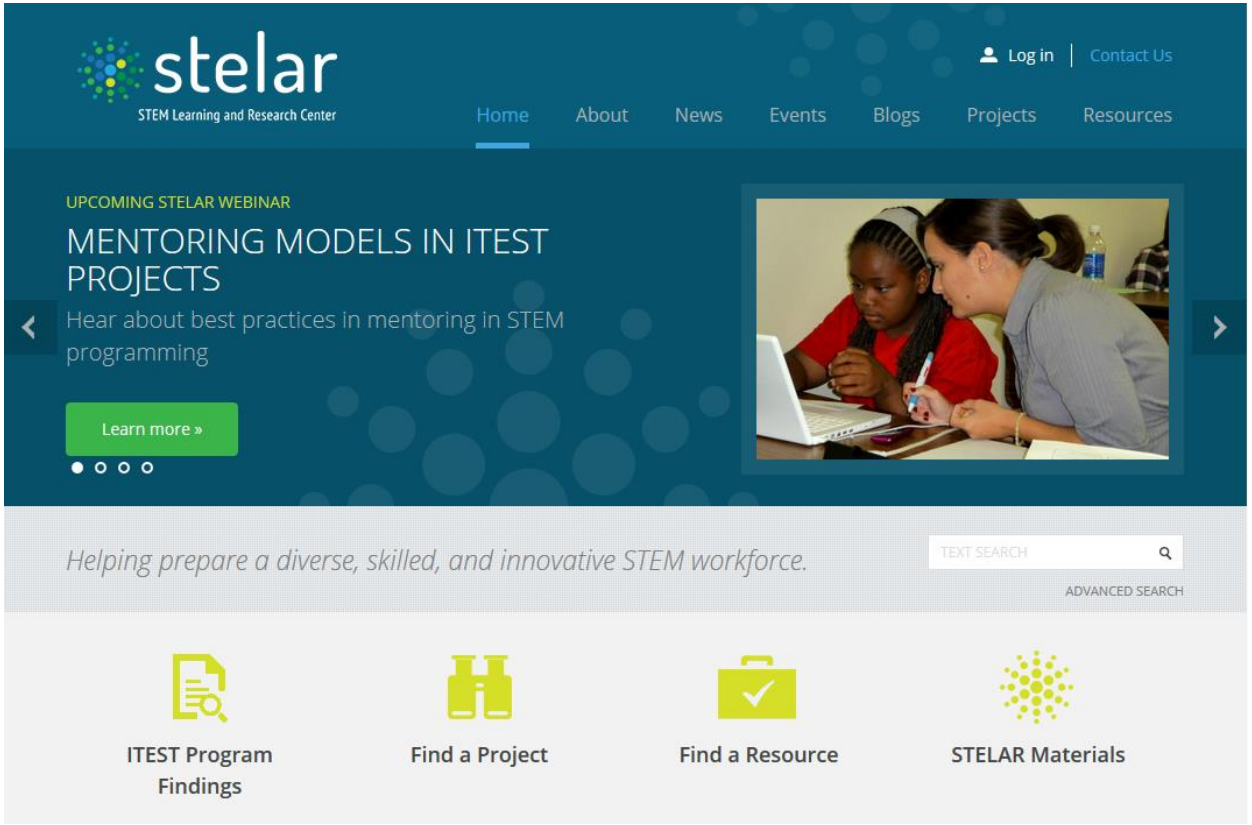
STEM Learning and Research Center (STELAR) Goals

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

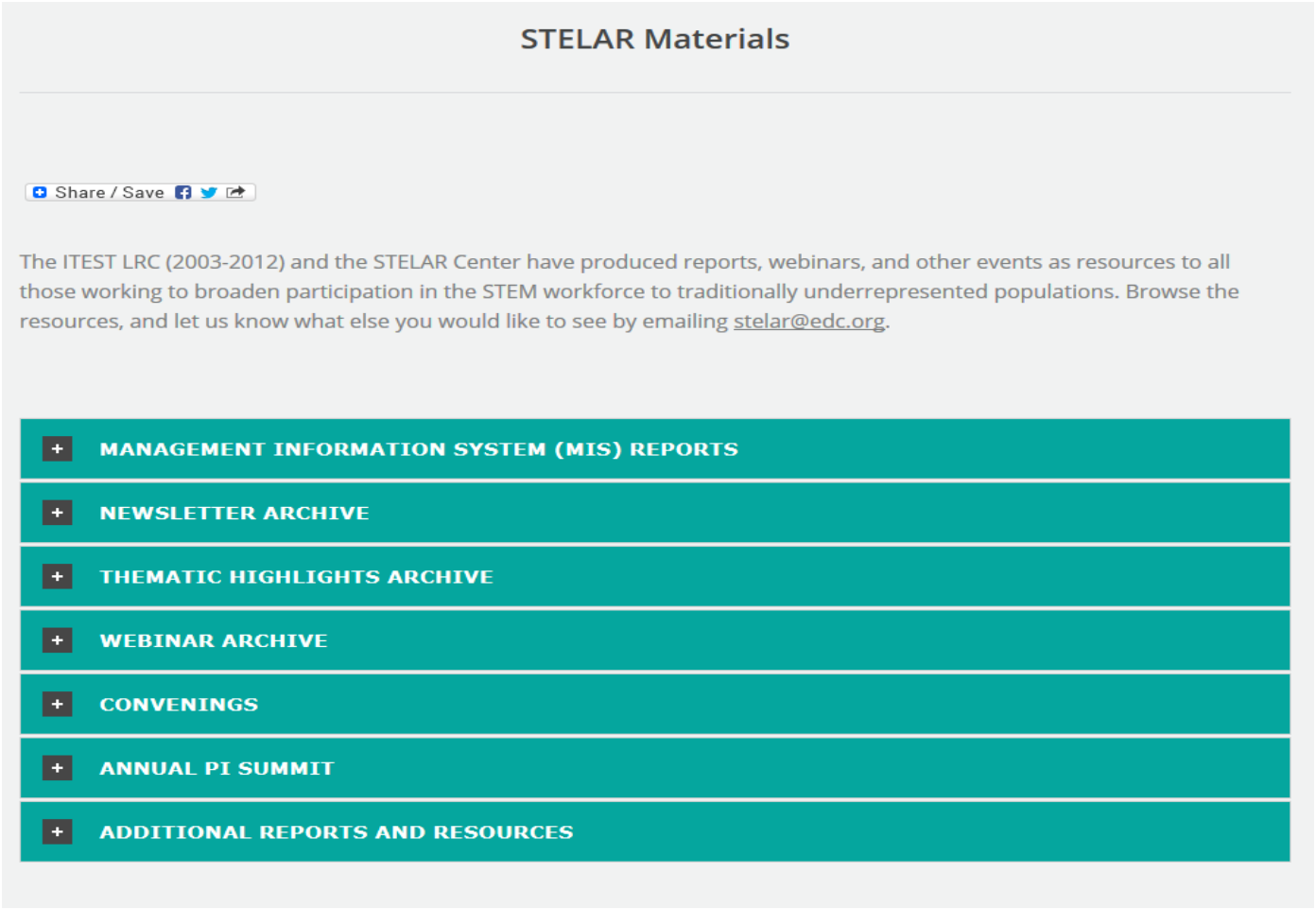
- Inform and influence the field of STEM stakeholders by **disseminating** project findings nationally

- Deepen the impact and reach of the ITEST program by **broadening participation** in the ITEST portfolio

STELAR Website – http://stelar.edc.org



STELAR Website – http://stelar.edc.org



stelar
STEM Learning and Research Center

NSF

EDC Learning transforms lives.

EdLab Group

STELAR Website – http://stelar.edc.org

Upcoming Opportunities

Journal of Science Education and Technology - ITEST Special Issue Call for Papers
Due by Monday, June 15, 2015 | READ MORE »

Interaction Design & Children Conference - Call for Participation
Due by Monday, January 26, 2015 | READ MORE »

National Science Foundation - EHR Core Research Program Solicitation
Due by Tuesday, February 3, 2015 | READ MORE »

International Conference on Computer Supported Collaborative Learning - Call for Participation
Due by Friday, February 13, 2015 | READ MORE »

Science Education And Civic Engagement - Call for Manuscript Submissions
Due by Monday, February 16, 2015 | READ MORE »

STELAR

Monthly Highlight

Mentoring

read more »

Recent News

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

Program stitches together STEM, fashion design

Upcoming Events

Jan 22 2015 - 3:00pm to 4:00pm

STELAR Webinar: Mentoring Models in ITEST Projects

READ MORE »

STELAR Newsletter

News from ITEST, current events, and more.

Current Newsletter »

Newsletter Archives »

Blog

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 »

December 4, 2014
Project Spotlight: Bits-2-Bites
STELAR recently had the opportunity to interview Anika Ward and Joseph Adamji (in

READ FULL POST »

VIEW ALL BLOGS »

stelar
STEM Learning and Research Center

NSF

EDC Learning transforms lives.

EdLab Group

stelar
STEM Learning and Research Center

NSF

EDC Learning transforms lives.

EdLab Group

Game Design with Mentoring for Computer Science and Math Achievement for Educationally Disadvantaged Students

V. Scott Gordon
Kimberly Biddle
Jean Crowder

California State Univ. Sacramento
January 22, 2015

This ITEST project is made possible by grant #1031926 from the National Science Foundation.

Viewpoints expressed in this presentation are not necessarily representative of the NSF or any other agency.

The Project

1 cohort = 2 years

High school students:

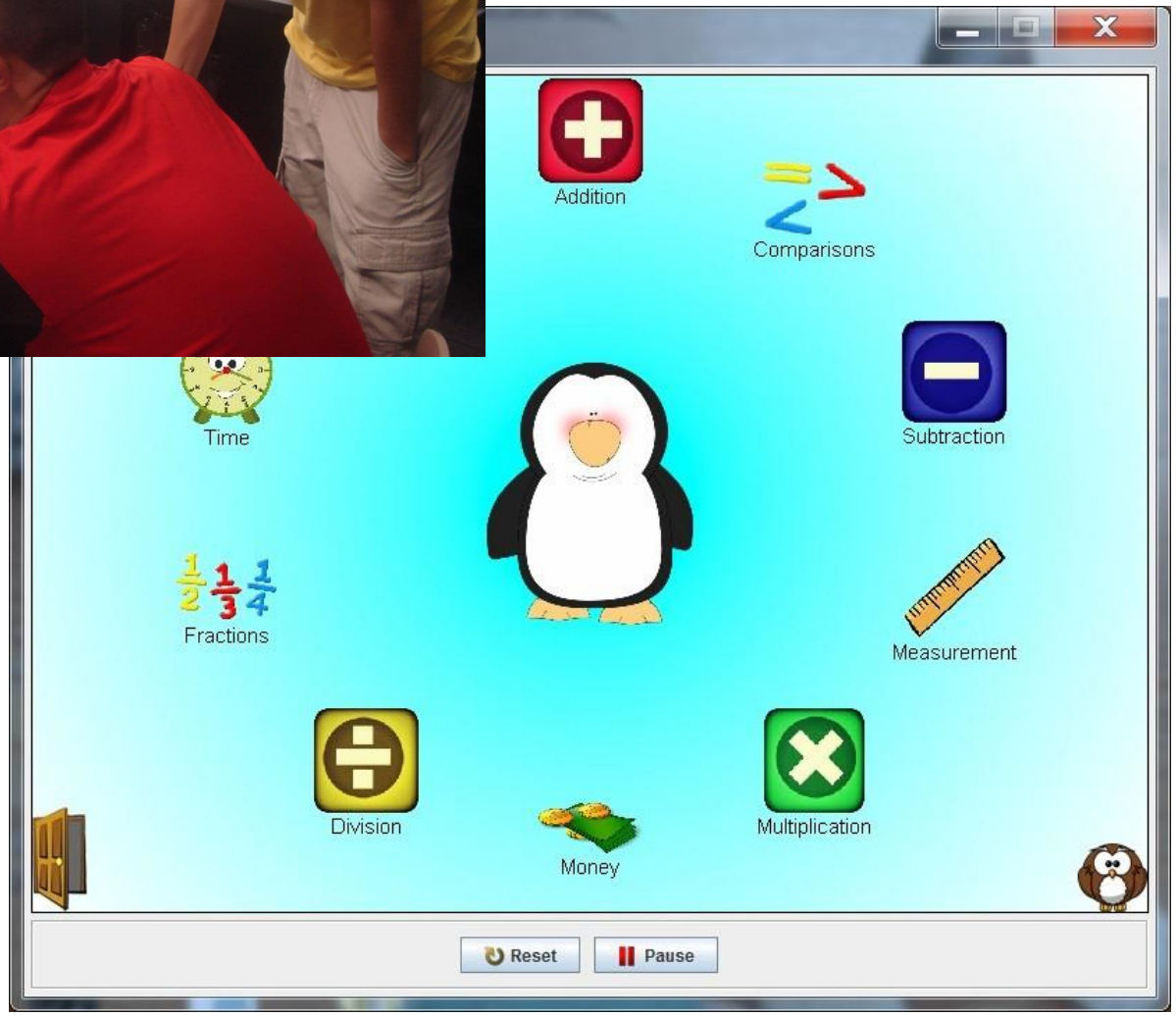
- *40 per cohort*
- programmed math-based game for elementary students
- 54% female, 44% Latino, 46% ESL, 77% 1st gen college

College students:

- 10 per cohort
- mentored the high school students
- 30% female, 40% African American

Middle school students:

- 10 per cohort
- tested the game during development
- delivered the game to the elementary students


Addition
Comparisons
Time
Subtraction
Fractions
Measurement
Division
Money
Multiplication
Reset
Pause

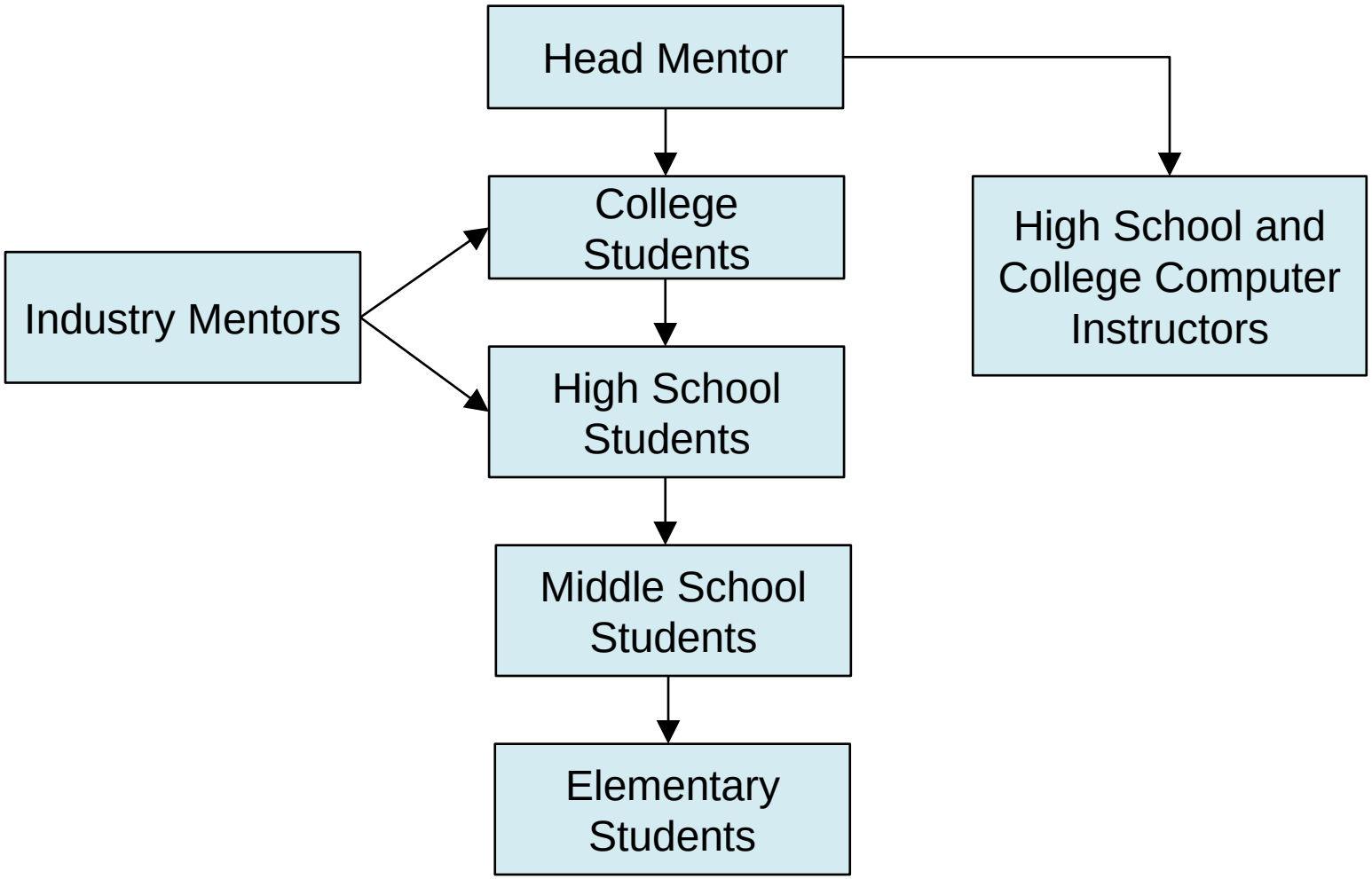
Mentoring Theory

We used *mutual mentoring:*

- Bi-directional mentoring relationship where mentor and mentee learn from each other
- Mentees have a network of more than one mentor
- Goal: both parties grow, learn, and develop because of the relationship.

We chose this theory and a multi-level structure because we have a number of participants in this project with multiple roles, ages, and developmental levels. All mentors support, advise, and share information.

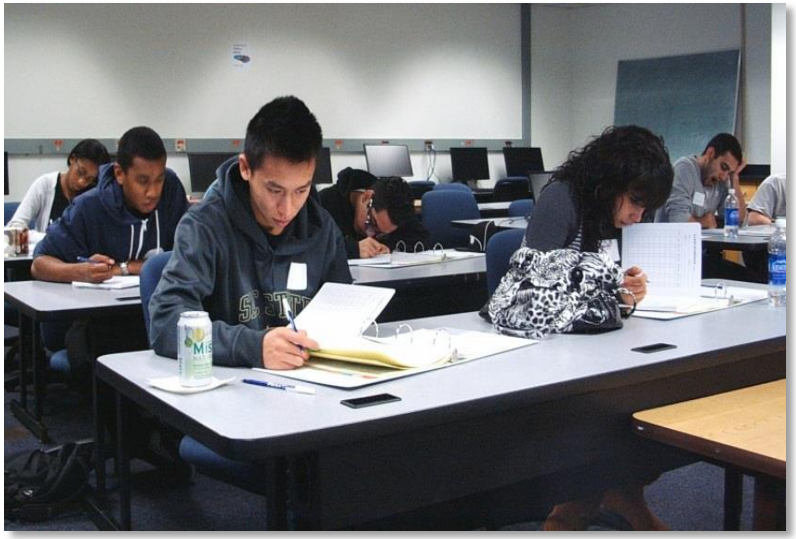
Mentoring Structure



Head & College Mentors

Mentor Training

a. *College Mentor Training* – 2-day summer session
b. *High School Mentor Training* – 1/2 day session
c. *Middle School Training* – 1 hour session



Mentoring Process and Relationships

a. *Bonding Event* - Head Mentor and other program staff (other PI's, Instructors, College Mentors, Student Assistants) come together in summer with High School Mentees and their families for a ½ day bonding event with getting to know you and team building exercises.

b. *Mentor Sessions and Learning Circles* - Head Mentor and College Mentors visit High School students and Instructors regularly during academic year to provide support, advice, and information sharing

c. *Industry Mentors* – special all-day summer event for College and High School students

d. *Enrichment Activities* – such as SAT prep, field trips, budgeting workshop, etc.

Successes

a. *Participants increased appreciation of Computer Science and STEM fields*
   - 93.8% of College Mentors,
   - 62.9% of High School Mentees

   "I have seen the value of computer science field early"

   "It's made me think of doing something in the computer/engineering fields"

b. *College Student Mentors and High School Mentees made Industry Contacts*

c. *High School students learn about college, college admissions, and college financing*
   - 60% of participants reported this

Successes (cont.)

d. *College admissions,* with several in the STEM fields & Computer Science
   - 77.2% who applied to CSU

* The project overall had other successes; we are focusing on mentoring

Lessons Learned (Challenges)

a. Building a process for making mentor matches
b. Communicating that *mentors are not tutors*
c. Increasing frequency of mentor visits
d. *Structuring the Industry Mentor Day*
e. Defining the role of Middle School students
f. Adding a grad student mentoring assistant
g. Budgeting and Planning for the mentors' legal requirements at local schools *(TB test and Fingerprinting/Background Check)*
h. Managing all paperwork
i. Managing entire project

Recommendations (what we did that worked)

a. Recruit College Mentors through Computer Science and Engineering student groups such as (SHPE, ACM-W/WICS, ACM, and NASBE)
b. Have Mentors sign a contract (during training) about appropriate behavior and attitudes
c. Include College Mentor on the Advisory Board
d. Explain mentoring theory to mentors/mentees to give them knowledge and empowerment
e. Have T-shirts to enhance project identification and bonding (in our project, each role had a different color of t-shirt)

Delivery!

Bridging the Gap

The Effects of a School to Career Approach To Promoting Wildlife Science Careers Among Minority Students

Emily Stoeth—Conservation Educator and Interim Project Coordinator, Bridging the Gap

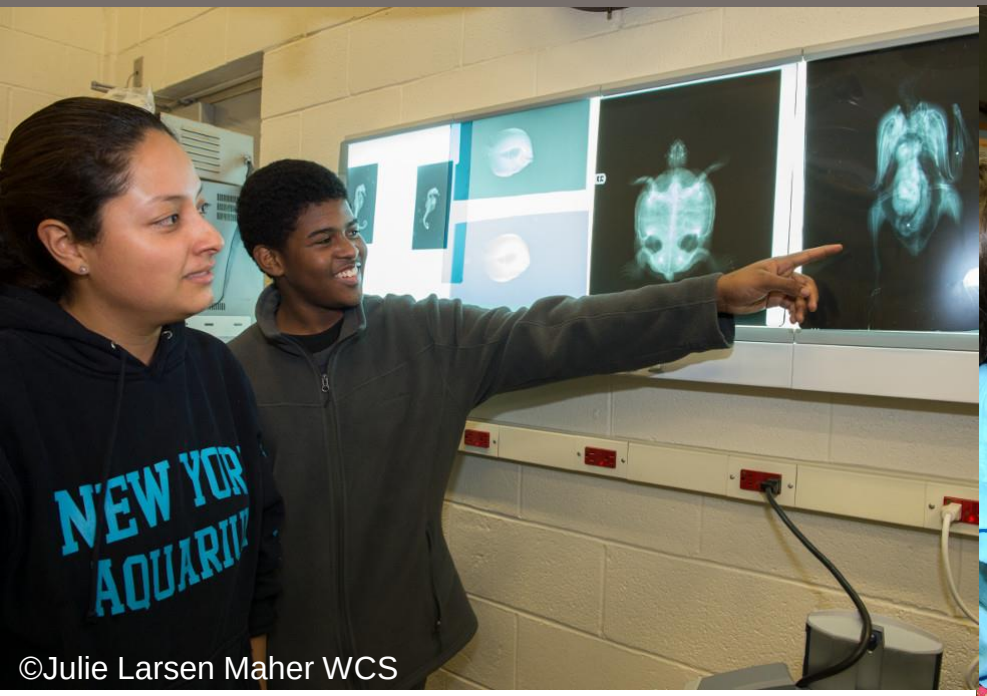
School-to-Career Institute

- 54 hours of hands-on education focused on STEM careers in zoos and aquariums

Career Building Institute

- 12 hours college prep
  - Partner with Good Shepherd Services
  - Choosing schools
  - College applications and essays
  - Financial aid
  - On campus life
  - Session for parents

Internships



- 40-80 hours
  - Extended hands-on experience

Mentoring

- Build relationships
- Provide support in pursuing STEM careers
- Zoo & aquarium staff in STEM fields serve as mentors

Bridging The Gap Mentoring: An Evolving Process

Cohort 1- One-to-one model

Cohort 2- Community Mentoring

Cohort 3- Community Mentoring with focus on small group discussion

Mentoring: Cohort 1
1:1 model

- **Development Process:**
  - Matches based on commonality of answers in interest survey as well as staff recommendations
  - Training for mentors
- **Successes:**
  - Some great matches
  - Positive results on student evaluation:

"Overall the mentorship assistance was helpful" *mean rating*- **4.2 out of 5**
"My mentor(s) are willing to give me advice and answer my questions" *mean rating*- **4.4 out of 5**

- **Challenges:**
  - Forced matches
  - No training provided for mentees
  - Too free-form

What Next?

Transition to a Community Mentoring Model

Mentoring: Cohort 2 Community Based

- **Development Process:**
  - Training for both mentors and mentees
  - No formal matches
  - Invite past cohorts- peer mentoring
- **Successes:**
  - Relationships develop organically
  - Students rated experience very favorably

"Overall the mentorship assistance was helpful" mean rating **4.5 out of 5**
"My mentor(s) are willing to give me advice and answer my questions" mean rating- **4.6 out of 5**

- **Challenges:**
  - Sessions were over planned
  - Absences

Mentoring: Cohort 3
Community Based- Increased Dialogue

- **Development Process:**
  - No formal matches
  - Training for both mentors and mentees
  - Redevelop curriculum for increased dialogue
- **Successes:**
  - Relationships develop organically
  - Peer-mentoring from past cohorts
- **Challenges:**
  - New curriculum for returning students
  - Absences

Community Mentoring Session: Interview Skills

- Welcome and Icebreaker (10 min)
- Small group discussion- "My best and worst interview" (15 min)
- Small group activity- Interview do's and don'ts (25 min)
- Small group activity- Practice Interviews (25)
- Debrief (10)
- Wrap up- questions and final thoughts (5)

WILDLIFE CONSERVATION SOCIETY

For more information about Bridging the Gap please visit:
http://bronxzoo.com/teens/bridging-the-gap.aspx

Supported by NSF

Resources

- Center for Applied Research Solutions. (April 2006). Mentoring tactics: Designing and implementing a group mentoring program. Folsom, CA: J. Sherk.
- Overcoming Obstacles, Life Skills Education http://www.overcomingobstacles.org/

NSF ITEST: Collaborative Research: Maximizing Mentor Effectiveness in Increasing Student Interest and Success in STEM: An Empirical Approach Employing Robotics Competitions

Gary R. Mayer

22 January 2015

SOUTHERN ILLINOIS UNIVERSITY EDWARDSVILLE

USC University of Southern California

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball www.botball.org

Team

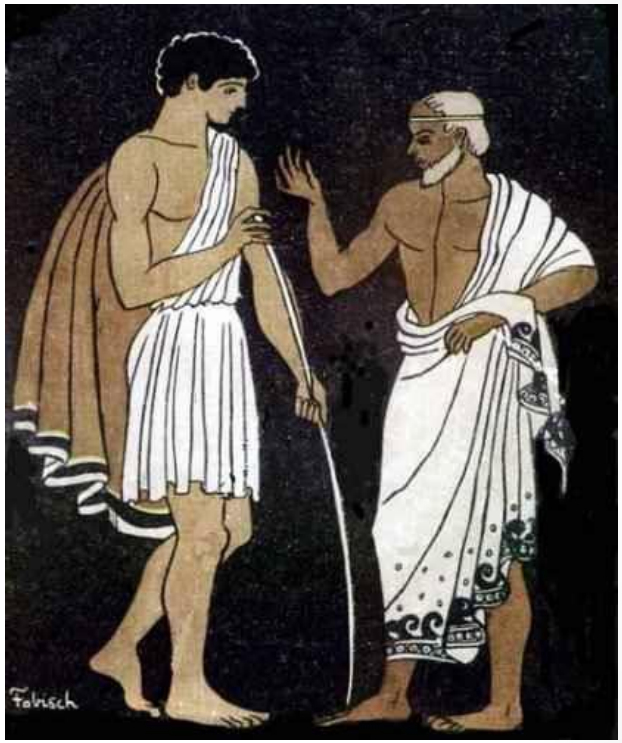
- Partnering Institutions
  - Southern Illinois University Edwardsville
  - University of Southern California
  - KISS Institute for Practical Robotics

- Interdisciplinary Expertise
  - Computer Science
  - Education
  - Psychology
  - STEM Center

Goals

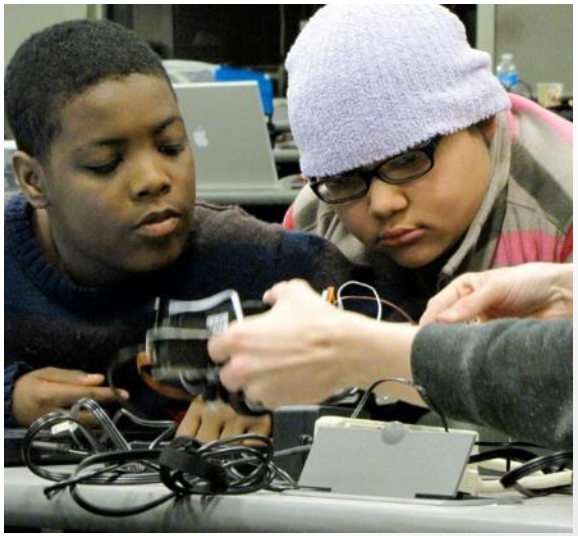
- Determine if mentoring approach significantly impacts STEM self-efficacy, achievement-related choices, or efficacy for science-related careers

- Evaluate impact of race and ethnicity on impact of mentoring



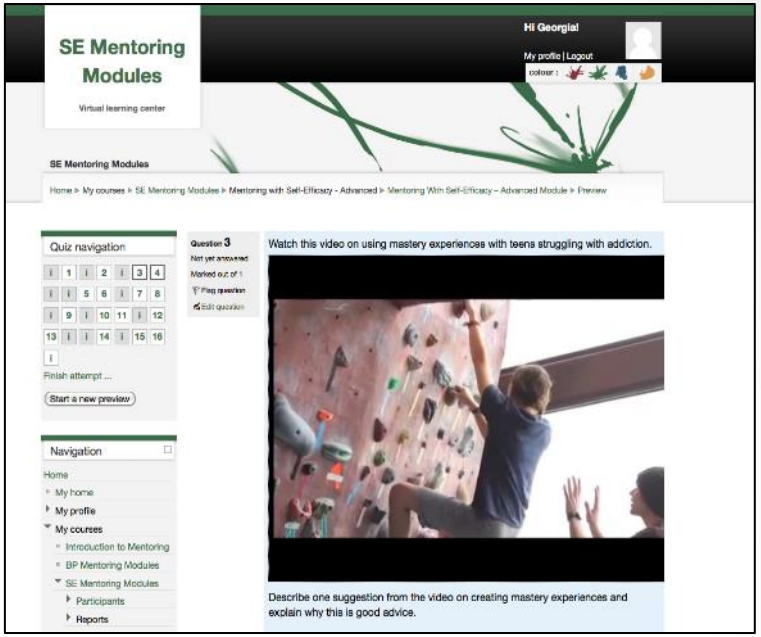
Participants

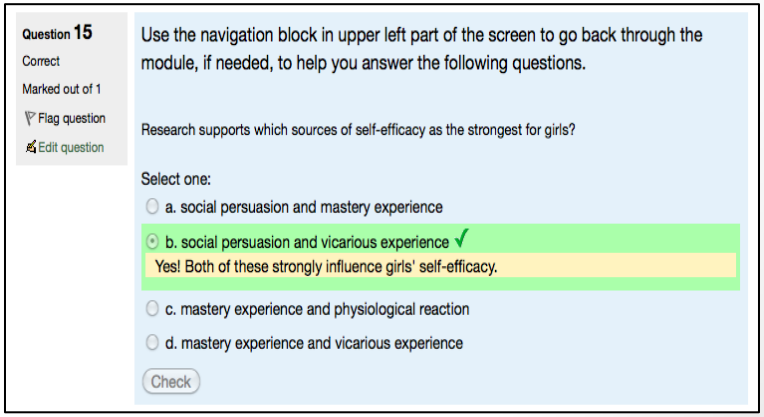
- Recruited 45 mentors and 435 students
- Students were 7th and 8th grade; African-American (30%), Caucasian (36%), Latino/Latina (34%)
- 8 – 10 students per team
  - One mentor per team



Approach

- Botball Educational Robotics Competition
- Four mentor training groups
  - Best Practices, Self-Efficacy, Best-Practices & Self-Efficacy, No Training
- Webinars, face-to-face, and online training sessions
- Used validated survey instruments for mentors and students before and after competition





Successes

- Large recruitment of mentors and students
  - Greater St. Louis and greater Los Angeles areas
- Developed mentor training materials
- Delivered mentor training as planned
- Collected and analyzed data as planned

Challenges

- Maintaining minority student involvement
- Keeping mentors engaged
- Experimental inclusion/exclusion criteria based on race/ethnicity
- Conflicting school resources
  - Including students participating in extracurricular activities

Analysis

- Confound:
  - MENTORS USING TECHNIQUES OUTSIDE OF THEIR TRAINING GROUP
- Modified Analysis Approach:
  - Mentoring approaches classified (unique activities)
    - "best practices" or "self-efficacy"
  - Used student-reported mentoring approach and student-reported impacts to assess mentoring approach effectiveness

Results

- **Overall group effect was significantly related to STEM achievement-related choices (p = 0.038), and to STEM self-efficacy (p = 0.046).**

- Overall group effect was not significantly related to STEM expectations for success (p = 0.143).
  - Not using mentor practices reported lower outcomes than the other three groups.
  - Considering *only* mentoring practices, there **was** a significant relation.

Results (continued)

- No significant effects involving gender ($p > 0.05$)
- No significant effects for minority status or the interaction of minority status and student-reported mentor activities ($p > 0.05$)
  - Significant interaction of minority status with the pre-measure for STEM self-efficacy ($p < 0.043$)
  - Caucasians had more strongly-related pre- and post-measures of self-efficacy
  - Overall effect of minority status approached significance for self-efficacy, controlling for pre-measure ($p = 0.05$)
    - Caucasians had a slightly higher adjusted mean when compared to minorities (5.96 versus 5.94)

Any questions regarding the Maximizing Mentor Effectiveness project?

SOUTHERN ILLINOIS UNIVERSITY EDWARDSVILLE

USC University of Southern California

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball
www.botball.org

Questions?

Stay Connected

STELAR Contact Information

stelar@edc.org

https://www.facebook.com/stelarctr

https://twitter.com/STELAR_CTR