Multiple Instrumental Case Studies of Inclusive STEM-focused High Schools: Opportunity Structures for Preparation and Inspiration (OSPrl)

AERA
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The Research Team

Sharon Lynch  
PI

Barbara Means  
Co-PI

Erin Peters-Burton  
Co-PI

Tara Behrend  
Co-PI

Ann House  
Affiliated Researcher

Kathleen Ross  
Project Manager

Nancy Spillane  
Research Assistant
Opportunity Structures for Preparation and Inspiration (OSPrI)  
(Lynch, Means, Berhend, & Peters Burtons)

- NSF-funded project OSPrI; project is in the planning phase.
- Will conduct cross-case analyses of 12 “exemplar” inclusive STEM-focused high schools.
- Through cross-case analyses, OSPrI will build a theory of action to explain how inclusive STEM-focused high schools work; define their critical features; and, understand the contextual variables that make the models transportable and sustainable.
Defining Inclusive STEM High Schools (ISHSs)

- Have “open” admissions, fewer requirements.
- Provide high quality STEM learning experiences for students, and include special supports for students underserved in STEM education.
- Link local economies, communities, and colleges/universities resulting in community involvement in conception and delivery.
- Goal: Increase minority participation in STEM for college majors and careers.
OSPrl - Importance of study

• Ability of ISHSs to prepare new learners ready for college STEM majors and careers has not been well documented, despite some state-level efforts.
• No published rigorous, on-site comparative studies of ISHSs exist. No umbrella philosophy or organizational structure.
• OSPrl will describe 12 different exemplar”, well-established ISHSs identifying critical components.
• With new STEM-focused schools springing up, it is important to try and sort out how they “work”.

Conceptual Framework

• “Successful” ISHSs do more than focus on STEM or use new technologies, they create **opportunity structures**.

• ISHSs may share common goals but not a single explicit theory of action.

• The research team has developed 10 Critical Components based on the literature that formed working hypotheses from which a theory of action emerge.
Critical Components

1. STEM-focused Curriculum
2. Reform Instructional Strategies and Project-Based Learning
3. Integrated, Innovative Technology Use
4. Blended Formal/Informal Learning beyond the Typical School Day, Week or Year
5. Real-World STEM Partnerships
6. Early College-Level Coursework
7. Well-Prepared STEM Teaching Staff
8. Inclusive STEM Mission
9. Administrative Structure
10. Supports for Underrepresented Students
Conceptual Framework

Design Dimensions

Implementation Practices

Context
Systemic Factors
Unanticipated Side Effects

Student Outcomes
Phase 1 - Research Questions

1. Is there a core set of critical components shared by well-established, promising ISHSs? Do other critical components emerge?

2. How are the critical components implemented in each ISHS?

3. What are the contextual affordances and constraints that influence each ISHS’s design, implementation and student outcomes, within and across ISHSs?

4. How do ISHS student STEM outcomes compare with school district and state averages (e.g., STEM achievement measures, graduation rates, college intentions)?
Phase 2 - Research Questions

1. How are critical components enacted in matched comprehensive high schools in the same school districts (for 4 pairs of schools)?

2. How do educational experiences and opportunity structures of ISHSs and comprehensive schools compare, from students’ points-of-view?

3. How does the student STEM Outcome Dimension (STEM test scores, grades, classroom and school climate indicators, and graduation rates) compare for ISHSs and comprehensive schools?
Progress

• We are about to visit our first school, Manor New Tech High in Manor, Texas in a few weeks.

• Instruments/methods developed and ready for first try.

• Will visit 8-11 more schools next year, write cases, post them on OSPrl website, and link cases to actual ISHSs.
CC1: STEM-Focused Curriculum

Does the ISHS have strong courses in all 4 STEM areas?

Does the ISHS have STEM explicitly, intentionally integrated into throughout courses, including non-STEM subjects?

What is the cognitive load for lessons/assignments?
CC2: Reform Instructional Strategies and

Does the ISHS have active inquiry-based instruction with performance-based assessments?

Does the ISHS focus on project-based learning?
CC3: Integrated, Innovative Technology Use

Does the use of technology at the ISHS connect students with information systems, models, databases, and STEM research?

Does the use of technology at the ISHS connect students, teachers, mentors, and ideas inside and outside of the school day?
CC4: Blended Formal/Informal Learning

What types of opportunities does the ISHS offer regarding clubs, competitions, apprenticeships, mentoring, social networking, and doing STEM in locations in the community?
CC5: Real-World STEM Partnerships

What ways can schools and businesses work together to support student learning and career preparation in STEM?

What types of opportunities does the ISHS offer regarding work via mentorships, internships, or projects that occur within or outside of the school day?

Discussion Question:

Are there particular opportunities regarding public/private partnerships that would be considered exceptionally fruitful prior to undergraduate STEM work or STEM careers?
CC6: Early College-Level Coursework

What types of opportunities does the ISHS offer regarding college-level coursework (Advanced Placement or IHE partnerships)?
CC7: Well-Prepared STEM Teaching Staff

What qualifications, advanced STEM content knowledge, or practical experience in STEM careers do teachers at the ISHS have?

*How are professional development experiences built into these ISHSs?*
CC8: Inclusive STEM Mission

Do the goals of the ISHS emphasize preparing all students for STEM careers, including underrepresented students?

Discussion Question:

How does recruitment occur? How are STEM identities built for the ISHS?
CC9: Administrative Structure

What type of administrative structure (school-within-a-school, charter school, magnet school) does the ISHS have and how does it promote STEM education?
CC10: Supports for Underrepresented Students

What supports such as bridge programs, tutoring, or extended school day exist to strengthen student transition to STEM careers?

Discussion Question:

Do the support programs build confidence and self-efficacy? How do students and parents see these programs? Are they sufficient to launch students into STEM majors?
OSPrI’s Connection to Big Policy Issues in STEM Education

• ISHSs tackle the issue of equity in STEM education. OSPrI study schools offer good (basic) opportunities to learn, as well as additional means to bring under-represented students into STEM careers. They target the demographic groups that are growing at fastest pace in USA.

• Perhaps perfect storm for uniting equity and economic issues; Common good and commonwealth.

• Is there a “New Community” emerging that will support the education system in new ways? Are public private school partnerships a vector for improved education and opportunity for the 21st Century?

• What are the components of the opportunity structures that can launch students into success in the world of STEM? How are these schools going around or breaking down the old barriers? Can these structures be transported to comprehensive high schools?
Next Steps
Stay Tuned for Case Studies

Thank You!