



# STEM

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How are OUSD schools increasing learning in science, technology, engineering and mathematics?

# STEM in Oakland will...

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1. Improve instruction in four key areas S-T-E-M
2. Increase opportunities for student learning
3. Provide students with enrichment and 21<sup>st</sup> century skills
4. Prepare students for college and career
5. Develop partnerships in STEM fields to provide internships and work-based experiences



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# Science

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Caleb Cheung, Science Manager

# Challenges

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- Elementary
  - Limited science instruction time
  - Teacher content knowledge confidence and experience teaching science
- Secondary
  - Teacher retention/experience
  - Pedagogical practices
- Overall
  - New National Science Framework and Standards

# Strategies

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- Elementary
  - Principal and Differentiated Site-Based PD
  - Teacher Leadership
  - Science Focus Schools
- Secondary
  - TeamScience
  - Project-Based Learning Initiative
  - Monthly Professional Development Series

# Strategies

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- Events
  - Two Science Fairs
  - Four Dinner with a Scientist Events
- Partnerships
  - Organizations – Chabot Space and Science Center, Oakland Zoo
  - Universities – UC Berkeley, CSU East Bay
  - Businesses and foundations – Chevron, Hewlett Foundation, S.D. Bechtel Jr. Foundation

# Outcomes

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- **Increased Teacher Retention**
  - Reduced the number of new secondary science teachers from 31% to 15% over four years
- **Increased CST proficiency in science over the past five years**
  - Fifth grade - 20% to 45%, Eighth grade - 22% to 51%, Tenth Grade – 16 % to 31%
- **Increased science funding from grants and foundations**
  - \$4.7 million over the past five years
- **Increase the quantity of science instruction**
  - 2010 Board policy on elementary science instruction
- **Improve the quality of inquiry-based classroom instruction in science**
- **Stronger science courses and pathways**
  - Environmental Science, Biotechnology, and Health Academies
  - Project Lead the Way



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# Mathematics

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Phil Tucher, Mathematics Manager



# Challenges

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- Building the culture for the Common Core State Standards, system-wide
- Providing high quality experiences in mathematics for all secondary students

# Common Core State Standards Standards for Mathematical Practice

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1. **Make sense** of problems and **persevere** in solving them.
2. **Reason** abstractly and quantitatively.
3. **Construct** viable arguments and **critique** the reasoning of others.
4. **Model** with mathematics.
5. **Use** appropriate **tools** strategically.
6. **Attend** to precision.
7. **Look for** and **make use** of structure.
8. **Look for** and **express** regularity in repeated reasoning

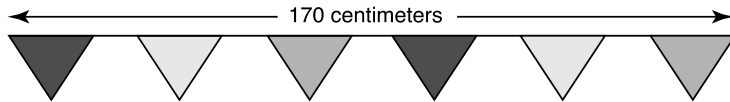
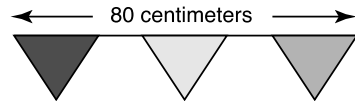
# Sample Performance Task

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## Party Flags

This problem gives you the chance to:

- find sizes by interpreting a diagram
  - express a function by a formula
- 



Erica is putting up lines of colored flags for a party.  
The flags are all the same size and are spaced equally along the line.

1. Calculate the length of the sides of each flag, and the space between flags.  
Show all your work clearly.

The sides of each flag measure \_\_\_\_\_ cm.

The space between flags measures \_\_\_\_\_ cm.

2. How long will a line of  $n$  flags be?  
Write down a formula to show how long a line of  $n$  flags would be.

# What is a “Core Curriculum”?

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**A core curriculum is ...**

- A coherent **set of learning experiences** that develops in students particular knowledge, skills, dispositions and capacities;
- The **course of study** (informed by standards, and dependent on instructional practice) that guides teachers as they design, teach, and assess instruction for students.

# Core Curriculum Guide Components

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- **1<sup>st</sup> section: Course Overview**

  - Guiding Principals for Curriculum

  - Syllabus with prerequisites, “exits”, and shared assignments

  - Scope and Sequence of the learning, including standards

- **2<sup>nd</sup> section: Curricular and Instructional Tools**

  - Instructional Strategies Guide

  - Assessment Guide

  - Unit Design and Lesson Plan Templates

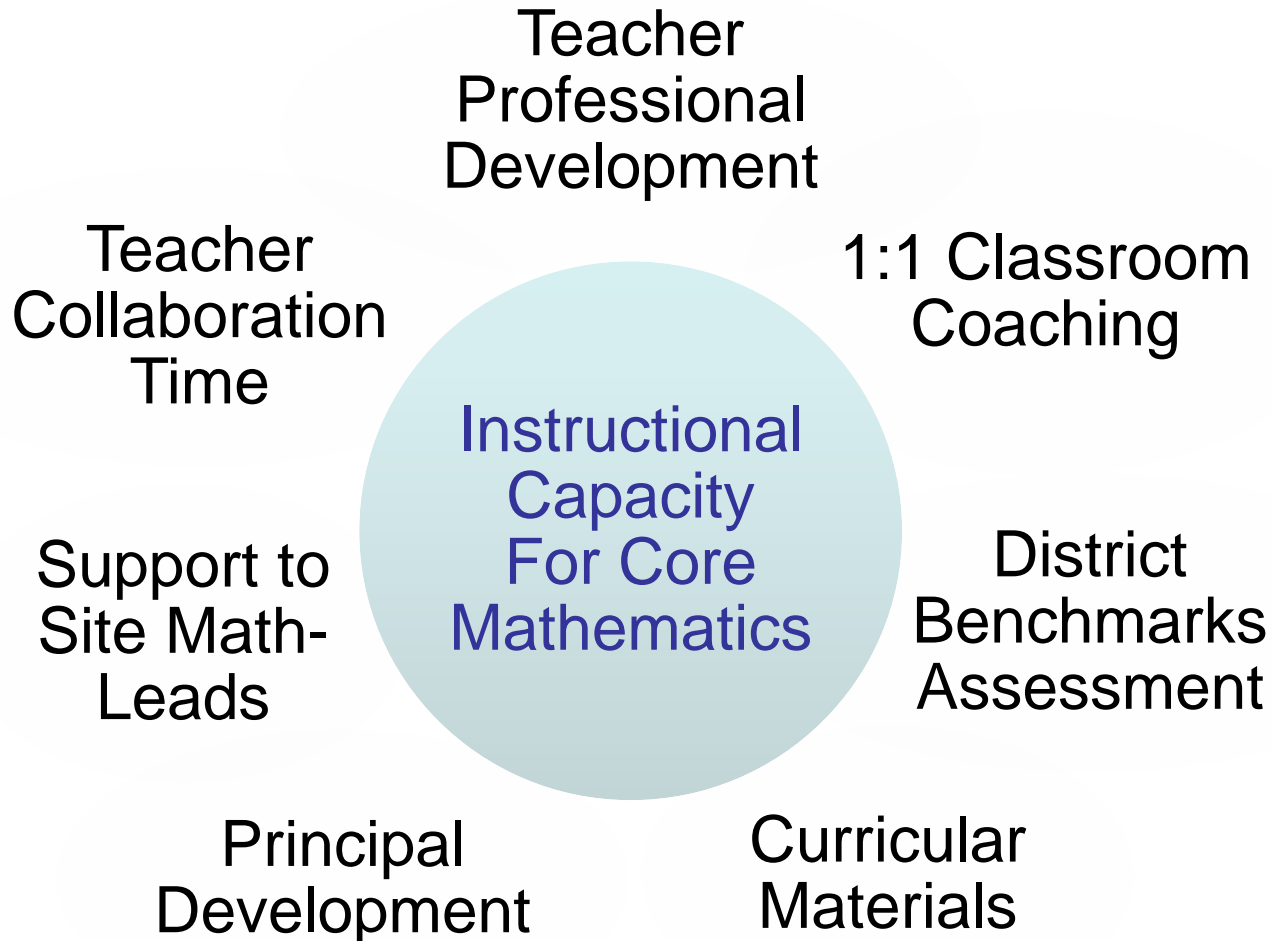
- **3<sup>rd</sup> section: Samples**

  - Grade-level Units with implementation support for diverse student populations (e.g. EL’s, GATE, African-American Males, SpEd students)

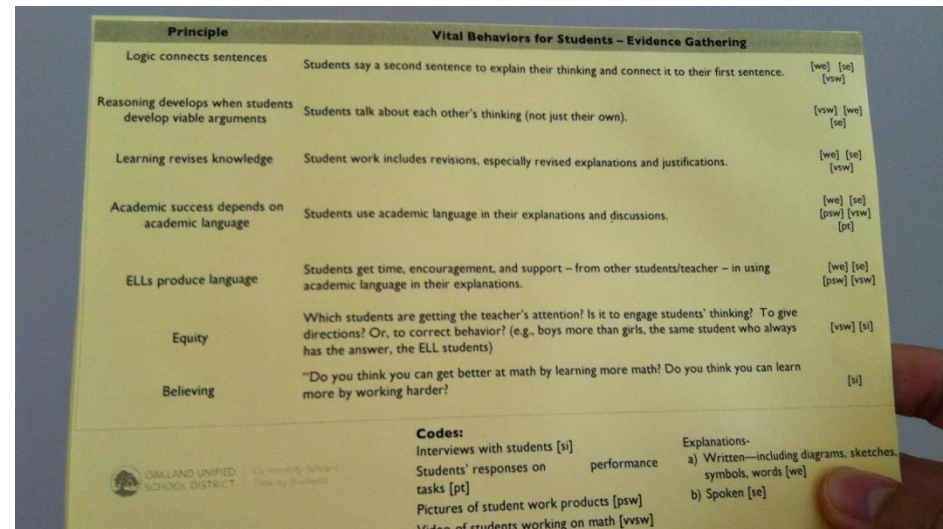
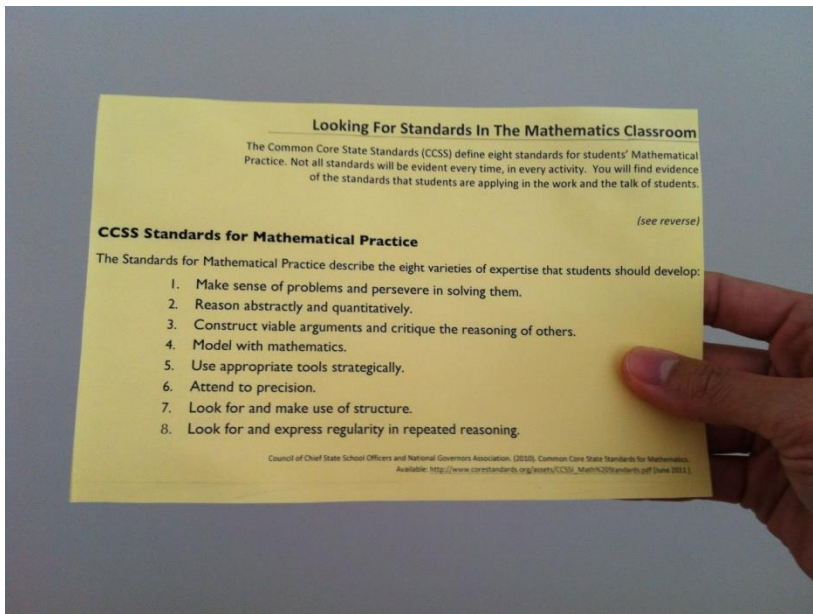
  - Lessons and Assessments (with accommodations and scaffolding, breakdowns of instructional day, recommended texts and materials)

# Strategies

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# A 5x8 Card for Evidence Gathering



# Strategies

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## Middle School Mathematics Initiative

- Teacher collaboration and development
- Principal collaboration and development
- Site coaching
- Teacher leadership development
- New teacher mentoring
- Curriculum development aligned to Common Core State Standards
- Next generation benchmark assessment system



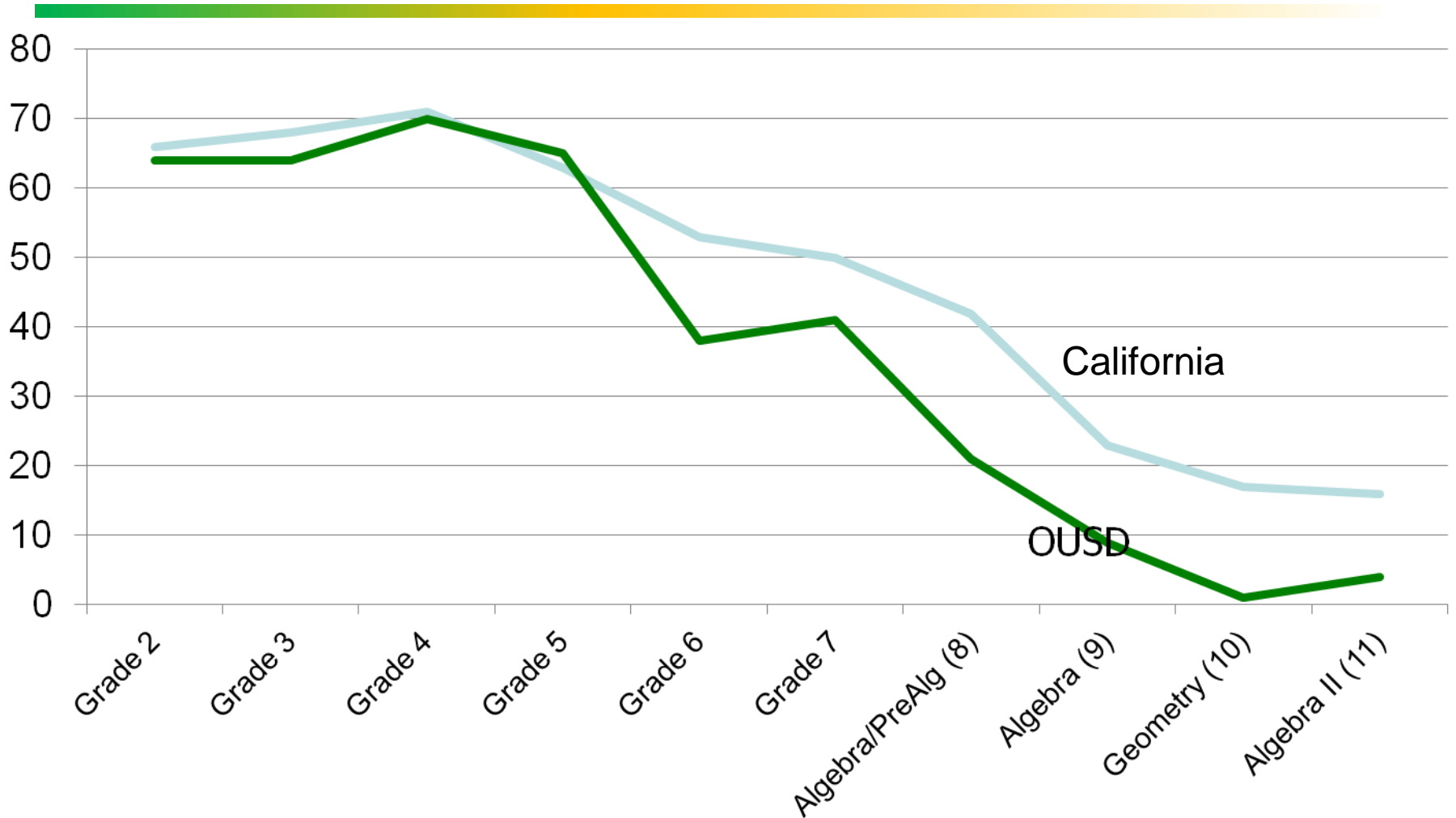
# Strategies

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- High School Course Development
  - High school math course sequence with agreed upon “entrance” assessments to inform supports and “exit” expectations to evidence competencies and skills
  - Curriculum development aligned to Common Core State Standards
  - Next generation benchmark assessment system

# 2011 CST Math Proficiency (%)

-- California & OUSD --



# Outcomes

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- Improved quality of standards-aligned classroom instruction in mathematics
- Increased CST Scores in mathematics
- Baseline performance measurement using new performance task items
- Stronger mathematics courses and pathways
- Increased teacher collaboration and teacher retention
- Increased funding from grants and foundations



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# STEM Pathways

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Jeannie Johnson

Director, College and Career Readiness

# STEM Pathways in OUSD

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- 15 STEM-related pathways (5 new or emerging this year)
- Focus on health, engineering and architecture, computer science, and environmental science/green energy industry sectors
- New and innovative courses:
  - Engineering and Physics (a-g approved)
  - Sustainability I, II, and III (a-g approval pending )
  - AP Computer Science (a-g approved)

# STEM Pathway Strategies

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- Workforce and Economic Development Coordinator
- Oakland Education Cabinet Subcommittee on School and Workplace Connections focuses support on two STEM pathways
- Pathways developing industry-related outcomes with industry partners
- Teachers developing performance assessments to measure pathway outcomes

# Major STEM Partnerships

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- UC Berkeley Public Health
- UC Berkeley Lawrence Hall of Science
- Stanford University Public Health
- Alameda County Public Health
- Alameda County Medical Center-Highland Hospital
- Children's Hospital of Oakland
- East Bay Green Corridor
- Kaiser
- Chevron
- Project Lead the Way
- S.D. Bechtel, Jr. Foundation

# Outcomes

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- Shift to more integrated, engaging and applied learning
- Increased student readiness for college success in STEM majors (more STEM units; courses)
- Increased student readiness for STEM careers
- Improved partnerships with STEM-based businesses and postsecondary institutions
- Developing data tracking system to show pathway outcomes: attendance, CAHSEE pass rate, graduation and postsecondary enrollment compared with non-pathway students





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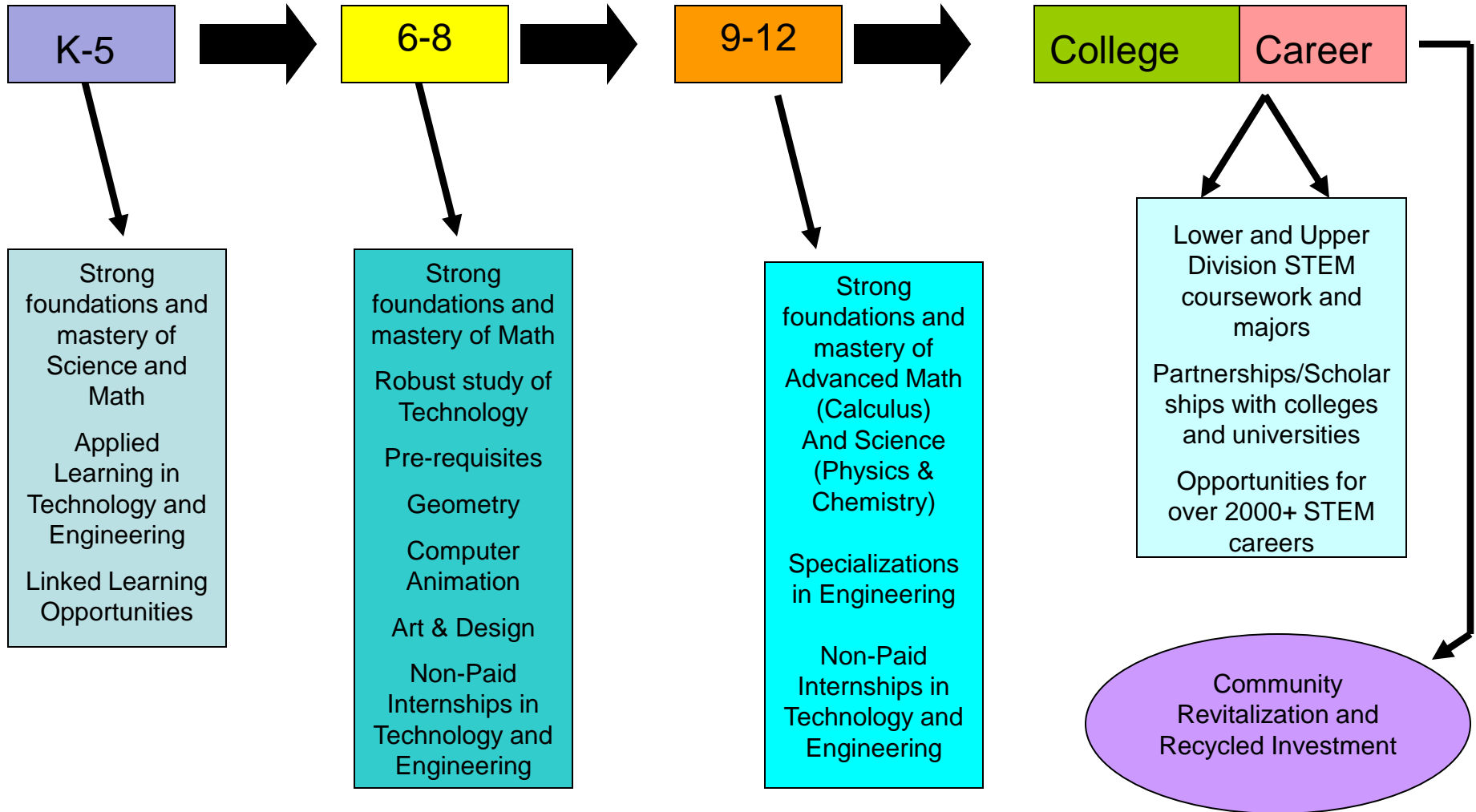
# STEM Corridor

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Mia Settles

Region 1 Executive Officer

# West Oakland S.T.E.M. Corridor Articulation K-12



**Continuous, Intensifies, and differentiates**

# Why STEM Corridor in West Oakland?

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- Geographic Opportunity (4 surrounding elementary schools, one middle, and one high school)
- STEM opportunities with Port of Oakland, Caltran, local businesses, and community based organizations
- Projecting and preparing students for the rapidly growing STEM careers that are available
- Launch of the summer SEEK program gave us a glimpse into the future; students were engaged and attendance in the program was 100%
- Investment in our high need communities; could link to revitalization of the area

# Challenges We Face...

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- Preparing current teaching staff/developing capacity of teachers to understand integrated STEM lesson planning and delivery
- Redesigning school facilities to meet the organizational and structural needs of STEM schools (State of the art technology labs, creation of science labs etc.)
- Educating the community about STEM: what does it mean for their children and the future
- Urgency, Time, and Resources

# Strategy

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- Grass-root planning efforts that include community at the outset of the work
- Obtain Funding to support our research about existing STEM schools; visit STEM schools with similar and different context to West Oakland
- Research the foundations of STEM education
- Build strong relationships with local CBOs, Businesses, and Professionals who have STEM backgrounds
- Create an academic pathway that builds on foundational Science and Math skills at the elementary school level; that leads to secondary school success in advanced Math, Science, and Technology

# Outcomes

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- Improved Academic performance and opportunities for students
- Introduce students, teachers, and staff to an integrated model of teaching and learning/ performance based assessments
- Strengthen local partnerships with CBOs and local experts in the field of STEM
- Intentional and focused teaching on the development of critical thinking skills with explicit use of Academic Language and literacies
- Improved student engagement through project-based learning as a foundation for engineering skills development
- Strengthen learning pathways K-12 and beyond
- Reduced absences
- Parent and community engagement
- Build college and career aspirations

## In Summary:

# What will be Different for our Students?

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- High quality science and math instruction for all students
- Stronger relationships between pathways and business/community partners
- New and innovative STEM courses
- A corridor of articulated STEM pathways in schools