Bartlesville Public Schools

12/16/2019

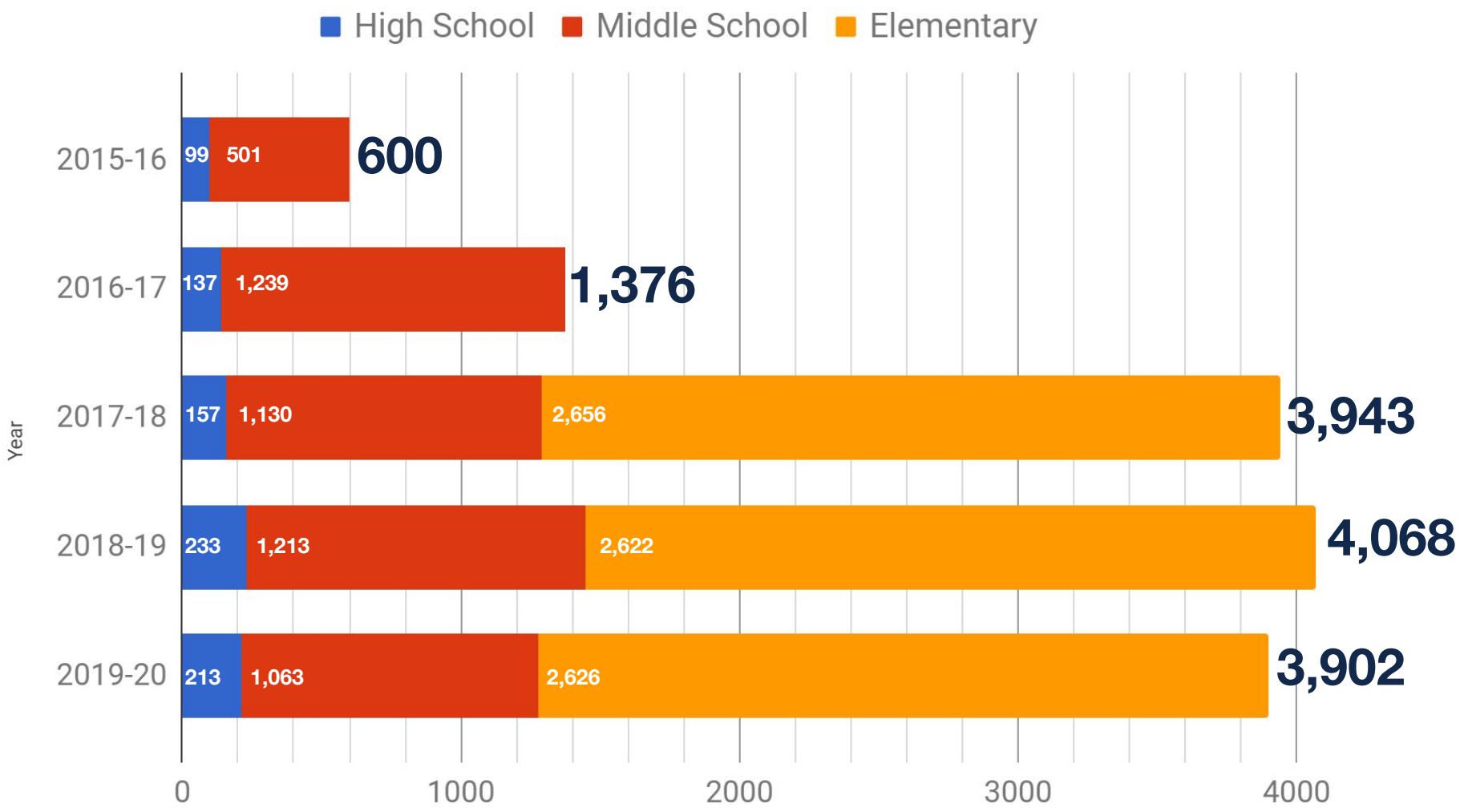
STEM update
for 2023 Strategic Plan

Update of STEM component of 2020 Strategic Plan developed on 11/13/2019 by:

- Granger Meador, Exec. Dir. of Technology & Communications
- Shannon McKinney, 6-12 STEM Chair & Madison STEM Teacher
- Staci Bankston, Asst. Principal, Wayside Elementary
- Kelli Bryant, Teacher Specialist of Student Accountability, Assessment, & Inst. Tech.
- Stephanie Curtis, Exec. Dir. of Personnel & School Support
- Blair Ellis, Exec. Dir. of Bartlesville Public Schools Foundation
- Dianne Martinez, Exec. Dir. of Elementary Schools & Professional Development

STEM Participation in Bartlesville Schools

The district's total PreK-12 enrollment is about 6,000



Elementary STEM

Funded by Industry & Community Partnerships

Project Lead the Way LAUNCH modules in all Kindergarten through 5th grade classrooms

6 Elementary Schools

PROJECT LEAD THE WAY
PLTW Launch

SPONSORED BY:

Bartlesville Public Schools
FOUNDATION
An affiliate of the
Bartlesville Community Foundation

ABB

ConocoPhillips

Elementary STEM Module Rollout

Foundation raised:

- $85,000 in 2017-18
- $115,000 in 2018-19
- $100,000 in 2019-20

ConocoPhillips provided:

- $35,000 in 2017-18
- $22,000 in 2018-19
- $20,000 in 2019-20

to fund iPads,
equipment, and training

Computer Science	Biomedical	Engineering	Biomedical & Engineering	Engineering & Computer Science

Year	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade
2017-2018 	Animals & Algorithms	Animated Storytelling	Grids & Games	Program-ming Patterns	Input/ Output: Computer Systems	Infection: Modeling & Simulation
2018-2019 	**Structure & Function: Human Body**	**Animal Adaptations**	**The Changing Earth**	**Variation of Traits**	**Input/ Output: Human Brain**	**Infection: Detection**
2019-2020 	Structure & Function: Exploring Design	Light & Sound	Materials Science: Properties of Matter	Stability & Motion: Science of Flight	Energy: Collisions	Robotics & Automation
2020-2021	Pushes & Pulls	Light: Observing the Sun, Moon, and Stars	Materials Science: Form & Function	Stability & Motion: Forces & Inter-actions	Energy: Conversion	Robotics & Automation: Challenge
2021-2022 & beyond	All four modules implemented at each grade level					

Elementary STEM Modules' alignment to Next Generation Science Standards

These 24 modules are in our 4-year rollout with our community partners

These 15 new modules are not part of our 4-year rollout with our community partners

					To complete full coverage of NGSS			
Kindergarten	Structure and Function: Exploring Design K-2-ETS1	Pushes and Pulls K-PS2-1 K-PS2-2 K-2-ETS1	Structure and Function: Human Body K-2-ETS1	Animals and Algorithms K-ESS3-1 K-2-ETS1	Sunlight and Weather K-PS3-1 K-PS3-2 K-ESS2-1 K-ESS3-2 K-2-ETS1	Living Things: Needs and Impacts K-LS1-1 K-ESS2-2 K-ESS3-3 K-ESS3-1 K-2-ETS1		
1st Grade	Light and Sound 1-PS4-1 1-PS4-2 1-PS4-3 1-PS4-4 K-2-ETS1	Light: Observing the Sun, Moon, and Stars 1-ESS1-1 1-ESS1-2 K-2-ETS1	Animal Adaptations 1-LS1-1 K-2-ETS1	Animated Storytelling K-2-ETS1	Living Things: Parents and Offspring 1-LS1-2 1-LS3-1 1-LS1-1 K-2-ETS1			
2nd Grade	Materials Science: Properties of Matter 2-PS1-1 2-PS1-2 2-PS1-3 2-PS1-4 K-2-ETS1	Materials Science: Form and Function 2-PS1-2 2-PS1-3 2-LS2-2 K-2-ETS1	Grids and Games K-2-ETS1	The Changing Earth 2-ESS1-1 2-ESS2-1 2-ESS2-2 2-ESS2-3 K-2-ETS1	Living Things: Diversity of Life 2-LS2-1 2-LS4-1 K-2-ETS1			
3rd Grade	Stability and Motion: Science of Flight 3-PS2-1 3-PS2-2 3-5-ETS1	Stability and Motion: Forces and Interactions 3-PS2-1 3-PS2-2 3-PS2-3 3-PS2-4 3-5-ETS1	Variation of Traits 3-LS3-1 3-LS3-2 3-LS4-2 3-5-ETS1	Programming Patterns 3-5-ETS1	Weather: Factors and Hazards 3-ESS2-1 3-ESS2-2 3-ESS3-1 3-5-ETS1	Life Cycles and Survival 3-LS1-1 3-LS2-1 3-5-ETS1	Environmental Changes 3-LS4-1 3-LS4-3 3-5-ETS1	
4th Grade	Energy: Collisions 4-PS3-1 4-PS3-3 3-5-ETS1	Energy: Conversions 4-PS3-2 4-PS3-4 3-5-ETS1	Input/Output: Computer Systems 4-PS4-3 (4.3) 3-5-ETS1	Input/Output: Human Brain 4-LS1-2 3-5-ETS1	Waves and the Properties of Light 4-PS4-1 4-PS4-2 3-5-ETS1	Organisms: Structure and Function 4-LS1-1 4-LS1-2 3-5-ETS1	Earth: Past, Present, and Future 4-ESS1-1 4-ESS2-1 4-ESS2-2 3-5-ETS1	Human Activity: The Impact on Earth 4-ESS3-1 4-ESS3-2 3-5-ETS1
5th Grade	Robotics and Automation 5-ESS3-1 3-5-ETS1	Robotics and Automation: Challenge 3-5-ETS1	Infection: Detection 3-5-ETS1	Infection: Modeling and Simulation 3-5-ETS1	Matter and Its Interactions 5-PS1-1 5-PS1-2 5-PS1-3 5-PS1-4 3-5-ETS1	Ecosystems: Flow of Matter and Energy 5-PS3-1 5-LS1-1 5-LS2-1 3-5-ETS1	Patterns of the Sun and Stars 5-ESS1-1 5-ESS1-2 3-5-ETS1	Earth's Water and Interconnected Systems 5-PS2-1 5-ESS2-1 5-ESS2-2 5-ESS3-1 3-5-ETS1

Elementary STEM

2023 Strategic Plan as we rely more on bond funding to maintain the program

I. Teaching and Learning

BPSD educates and enriches lives by implementing effective 21st-century teaching and learning strategies involving:

B. STEM

Implement a comprehensive STEM program encompassing all elementary, middle, and high schools.

1. Sustain STEM program at each elementary school involving all students
    a. Deployment plan in place for remaining 6 modules by 2020-2021; might be tweaked as modules are revised & added by PLTW
    b. Evaluate new modules with regards to state science standards, assessment, available funding, and available instructional time
    c. Add Pre-Kindergarten modules if needed for Distinguished School eligibility
    d. Clarify expectations for implementation and usage and then provide on-going site and district-level training to help meet them
    e. Explore sending Lead Teachers to PLTW trainings

3-year expansion of Middle School PLTW Gateway Modules

Pilot Year Courses

2015-16

2 teachers
3 modules

1. Design & Modeling
2. Flight & Space
3. Magic of Electrons

501
students

2016-17

4 teachers
6 modules

1. Design & Modeling
2. Flight & Space
3. Magic of Electrons
4. **Automation & Robotics**
5. **Medical Detectives**
6. **Introduction to Computer Science**

1,239
students

2017-18

4 teachers
7 modules

1. Design & Modeling
2. Flight & Space
3. Magic of Electrons
4. Automation & Robotics
5. Medical Detectives

➔ **Replaced** Introduction to Computer Science with:

6. **Computer Science for Innovators & Makers**
7. **App Creators**

1,130
students

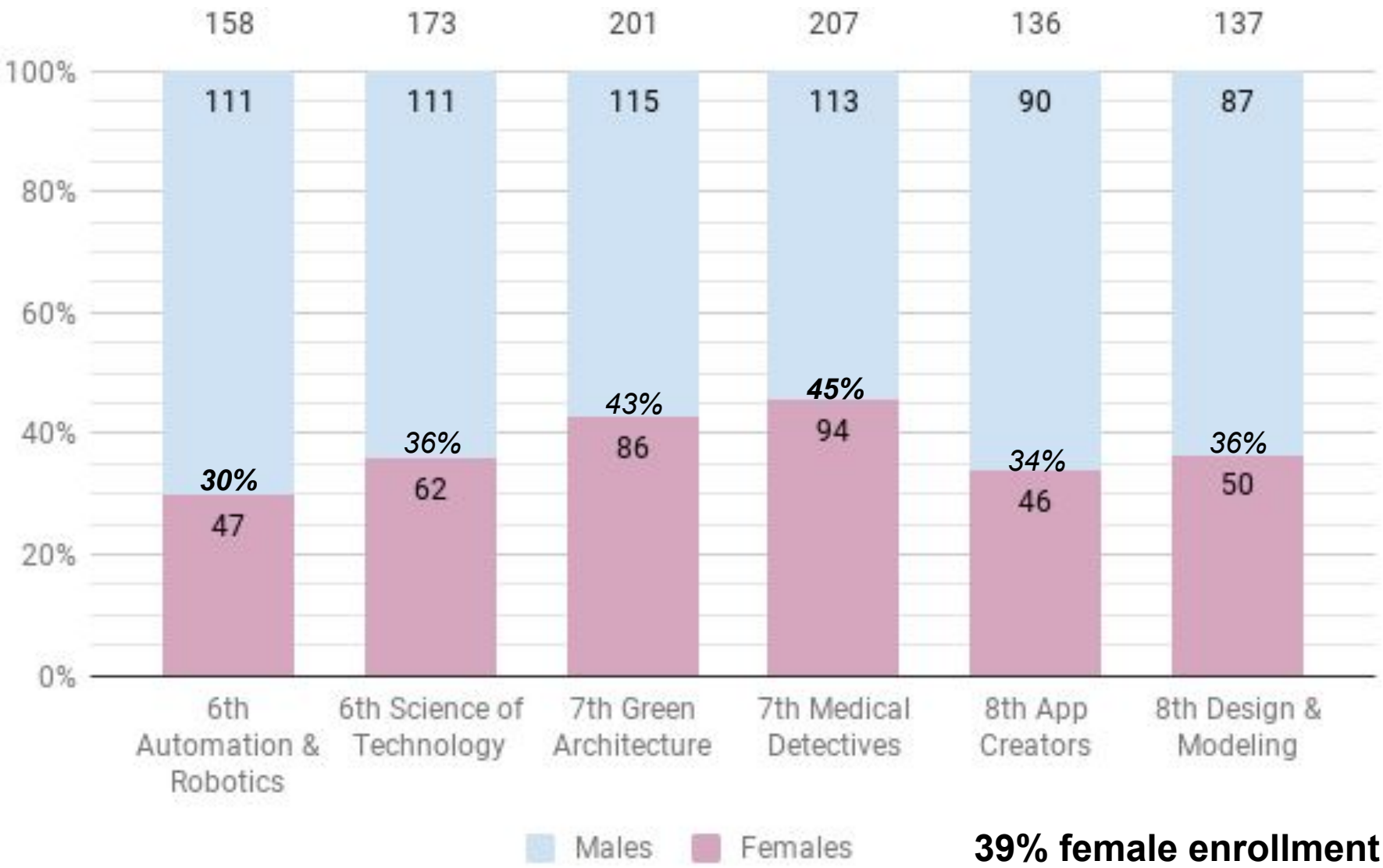
2018-19

4 teachers
8 modules

1. Design & Modeling
2. Flight & Space
3. Magic of Electrons
4. Automation & Robotics
5. Medical Detectives
6. Computer Science for Innovators & Makers
7. App Creators
8. **Green Architecture**

1,213
students

6th–8th PLTW enrollments by gender in 2019–20



39% female enrollment across all 6-8 STEM

versus 49% overall females at school

Math & Science Night

ConocoPhillips has sponsored four annual Hands On, Minds On Bartlesville Math & Science Nights for area middle school students and their parents.

Middle School STEM

2023 Strategic Plan

2. Sustain and enhance a comprehensive middle school STEM program that builds upon elementary STEM exposure while encouraging and supporting student involvement in high school STEM programs.
    a. Routine periodic technology updates with differentiation to go beyond minimum specs in key labs to feed into HS program
    b. Ongoing fundraising for TSA program
    c. Continue to use Federal Title IV funding as appropriate
    d. Continue to designate STEM bond funding for costs not covered by state and federal funding
    e. Continue to provide required training for PLTW courses
    f. Continue to partner with TCTC

High School STEM Courses

Pilot Year Courses

2015-16

Science

1. Science Research

Technology

2. Exploring Computer Science

Engineering

3. Introduction to Engineering Design (PLTW)

Math

4. Advanced Math Applications

99

students

2016-17

1. Science Research
2. Advanced Math Applications

Engineering

3. Introduction to Engineering Design

Computer Science

4. Computer Science Principles

137

students

2017-18

1. Science Research
2. Advanced Math Applications

Engineering

3. Introduction to Engineering Design
4. Principles of Engineering

Computer Science

5. Computer Science Essentials
6. Computer Science Principles
7. Computer Science A

157

students

2018-19

1. Advanced Math Applications

Engineering

2. Introduction to Engineering Design
3. Principles of Engineering

Computer Science

4. Computer Science Essentials
5. Computer Science Principles
6. Computer Science A
7. Cybersecurity

233

students

High School STEM Courses

2019-20

1. Science Research

Engineering

2. Introduction to Engineering Design
3. Principles of Engineering

Computer Science

4. Computer Science Essentials
5. Computer Science Principles
6. Computer Science A
7. Cybersecurity

213

students

2020-21

1. Science Research

Engineering

2. Engineering Essentials

3. Introduction to Engineering Design
4. Principles of Engineering

Computer Science

5. Computer Science Essentials
6. Computer Science Principles
7. Computer Science A
8. Cybersecurity

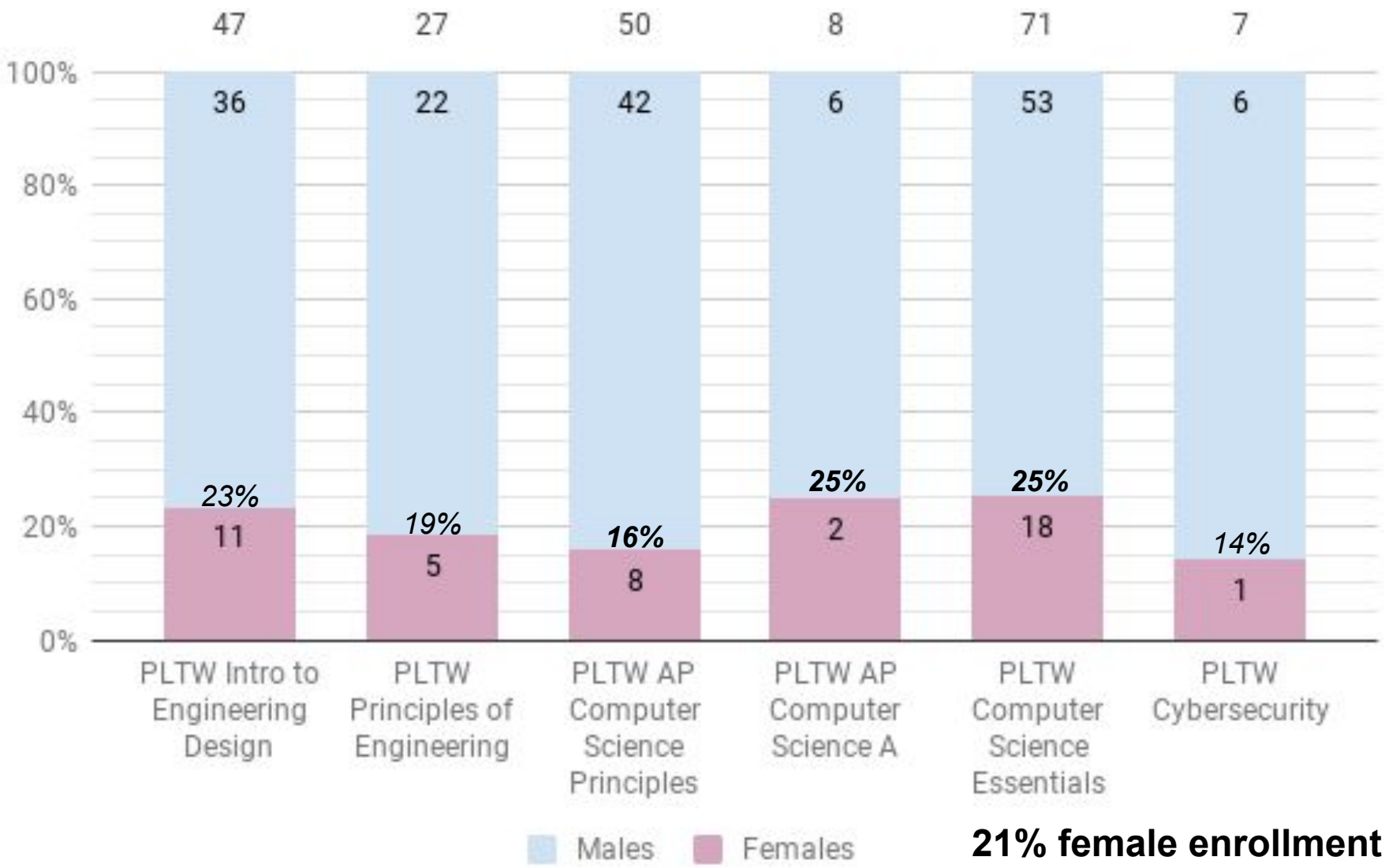
Engineering Essentials

Survey course for 9th graders taking Algebra I with less mechanical engineering emphasis than Introduction to Engineering Design

4 units:

- **Inclined to Design: Systems & Process Solutions** (industrial emphasis)
- **Make it Move: Mechanical Solutions** (mechanical emphasis)
- **Power It Up: Electrical/Electronic Solutions** (EE and EE/CIS and controls)
- **Make a Plan: Infrastructure Solutions** (civil emphasis)

9th–12th PLTW enrollments by gender in 2019–20



21% female enrollment across all 9-12 STEM

versus 51% overall females at school

High School STEM

2023 Strategic Plan

3. Expand and enhance a comprehensive high school STEM program which develops in-demand skills to prepare students for rewarding careers, higher education, and solving tomorrow's challenges.
    a. PLTW Computer Science program
        1. Explore helping teacher(s) secure state Computer Science teacher certification (could include lobbying for PLTW training to qualify)
        2. Routine periodic technology updates to meet recommended specifications
        3. Continue to provide required training for PLTW courses
        4. Encourage community guest speakers, volunteers, etc.
    b. PLTW Pre-Engineering program
        1. Add Engineering Essentials course as part of effort at gender equity and scaffolding students not in accelerated math courses
        2. Encourage community guest speakers, volunteers, etc.
    c. Science Research
        1. Maintain program as enrollment allows to support upperclassmen participation in district and state science fair
    d. Consider partnering in future years with TCTC on PLTW Biomedical Science