Inquiry: What would the best STEM program imaginable and possible look like in 2026 in Metuchen?
STEM Statistics

STEM Careers in the U.S.

80% of the fastest growing careers are in STEM fields.

50% of all STEM jobs are available to workers without 4-year degrees.

Installation, Maintenance & Repair occupations represent 12% of all STEM jobs that require less than a 4-year degree.

20% of all STEM jobs require an advanced 4-year degree or more in engineering.

Science, technology, engineering and mathematics feed innovation and the economy.

A recent Brookings Institute report identifies new information about STEM careers and varying educational needs.

U.S. manufacturing enjoys an 8% wage advantage over all other industries.

STEM jobs for vocational school and community college graduates have a 10% wage advantage over jobs with similar educational requirements in other industries.
What does a STEM classroom look like?

**Teachers**
- Facilitator rather than a lecturer
- Guide students through real-world problems
- Interdisciplinary Lessons

**Students**
- Work collaboratively
- Solve real-world problems
- Engage in inquiry
- Self-motivated

**Classroom Environment**
- Classroom arranged in a way that facilitates group work
- Computers or other instructional technology easily accessible
Florida STEM:

STEM education is the intentional integration of science, technology, engineering, and mathematics, and their associated practices to create a student-centered learning environment in which students investigate and engineer solutions to problems, and construct evidence-based explanations of real-world phenomena with a focus on a student’s social, emotional, physical, and academic needs through shared contributions of schools, families, and community partners.
Quantifying the Range of STEM

- We recognize that STEM may be seen as a range of integration and application.
  - A science class without any of the other STEM components may be seen as STEM.
  - A fully integrated science class with all STEM components may also be seen as STEM.
    - STEM 1.0, 2.0, 3.0, 4.0?
- How do we quantify our program?
### STEM Disciplines 2.0
- Science and Technology
- Science and Engineering
- Science and Math
- Technology and Engineering
- Technology and Math
- Engineering and Math

### STEM Disciplines 3.0
- Science, Technology, and Engineering
- Science, Engineering, and Math
- Technology, Engineering, and Math
- Math, Technology, and Science

### STEM Disciplines 4.0
- Integrated Science, Technology, Engineering, and Math Programs

[www.FLDOE.org](http://www.FLDOE.org)
### Examples: STEM 2.0

#### STEM Disciplines 2.0

<table>
<thead>
<tr>
<th>Disciplines</th>
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<tbody>
<tr>
<td>Science and Technology</td>
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<tr>
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<tr>
<td>Technology and Math</td>
</tr>
<tr>
<td>Engineering and Math</td>
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</tbody>
</table>

#### Integrating two disciplines

- A science class uses computers to research a problem and develop a presentation.
- A science lesson utilizes and embeds algebraic standards to teach a lesson.
- A math class uses an online graphing program to solve problems and collaborate on solutions.

[www.FLDOE.org](http://www.FLDOE.org)

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Examples: STEM 3.0

<table>
<thead>
<tr>
<th>STEM Disciplines 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science, Technology, and Engineering</td>
</tr>
<tr>
<td>Science, Engineering, and Math</td>
</tr>
<tr>
<td>Technology, Engineering, and Math</td>
</tr>
<tr>
<td>Math, Technology, and Science</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integrating three disciplines</th>
</tr>
</thead>
<tbody>
<tr>
<td>A science class uses computers to research a problem and develop a presentation. Groups use engineering processes to develop a solution for a problem, modify the solution based on testing and research, and modify the solution.</td>
</tr>
<tr>
<td>A science lesson utilizes and embeds algebraic standards to teach a lesson, then uses programmable calculators to calculate speed from the slope of the line.</td>
</tr>
</tbody>
</table>
Examples: STEM 4.0

STEM Disciplines 4.0

Integrated Science, Technology, Engineering, and Math Programs

Integrating 4 disciplines:

A Science class examines data using statistics, then uses computers to research a problem and develop a presentation. Groups use engineering processes to develop a solution for a problem, modify the solution based on testing and research, and modify the solution.
Brainstorm Possible Solutions for Metuchen: Chatham?

IMPLEMENTING THE GOAL

Philosophy & Goals:

The essential intent of the Design & Technology Department is to produce citizens that can work collaboratively in creating innovative solutions to problems present in our modern world.

- Authentic Problem Solving
- Problem-Based Learning
- Collaboration
- Innovation
- Critical Thinking
- Perseverance/Grit
Brainstorm Possible Solutions for Metuchen STEM

Curriculum - Chatham Model / Metuchen’s Inquiry-Based Research Process

- Inquiry-Based Research Process
  - ELA
  - Social Studies 2018-2019
- STREAM Design/Engineering Process
- Problem Solving Process
  - K-5 Math
  - K-8 Computer Science Curriculum
  - Social Problem Solving / Peer Mediation - Peace Squad
Brainstorm Possible Solutions for Metuchen: Vernon?

What is CTE?

CTE stands for Career and Technical Education. In Vernon's CTE programs our goal is to prepare our students for careers in high demand fields. In order to best prepare our students, each of our CTE programs is made up of the following key components:

THREE-COURSE SEQUENCE

These three courses all build upon each other to prepare students with the skills and knowledge essential for the career path.

CTSO

CTSO stands for Career and Technical Student Organization. These are organizations approved by the State of NJ to go hand in hand with the CTE program to enrich the curriculum.

COLLEGE ARTICULATION AGREEMENT

For most of our CTE programs this means that students have the opportunity to earn college credits while taking H.S. classes.

STRUCTURED LEARNING EXPERIENCES

Structured Learning Experiences (SLE) are chances for students to see first-hand what it is like to be working in the field. For our students they can be a part of an SLE through an internship or job-shadowing experience.

THIRD-PARTY ASSESSMENT

This is a test intended to assess the students in a way that compares them to other students around the country in similar programs. Often, these assessments are in the form of industry exams that are essential for students entering the career path.
Brainstorm Possible Solutions for Metuchen STEM

**Curriculum & Instruction** - Florida 4.0, Chatham & Vernon Models

- Inquiry-Based Research
- Real World Problem Solving
- Experiential / Internships

**Assessment** - Vernon Model

- Performance Based
- Outside Assessment / Certification
Moss and CES Computer Science Fundamentals (Gr. K-5)

Computer Science Fundamentals for Elementary Schools

For pre-readers in elementary school classrooms

Course A
An introduction to computer science for pre-readers.
Ages: 4-7

Course B
An introduction to computer science for pre-readers. (Similar to Course A, but with more variety for older students.)
Ages: 5-8

For older students in elementary school classrooms

Course C
Learn the basics of computer science and create your own art, stories, and games.
Ages: 6-10

Course D
Quickly cover concepts from Course C, then go further with algorithms, nested loops, conditionals, and more.
Ages: 7-11

Course E
Quickly cover concepts in Course C & D and then go further with functions.
Ages: 8-12

Course F
Learn all the concepts in Computer Science Fundamentals and create your own art, story or game.
Ages: 9-13
## EMS Computer Science Discoveries (Gr. 6-8)

### Curriculum Overview

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Description</th>
<th>View unit</th>
<th>Lesson plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Problem Solving</td>
<td>Explore the problem-solving process and the different ways humans and computers solve problems.</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Web Development</td>
<td>Discover the languages powering the web. Build your own websites in HTML and CSS using Web Lab.</td>
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</tr>
<tr>
<td>3</td>
<td>Animations and Games</td>
<td>Learn the powerful constructs underlying programming languages. Build interactive games in JavaScript using Game Lab.</td>
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<tr>
<td>4</td>
<td>The Design Process</td>
<td>Follow a design process to identify and empathize with problems faced by a target audience. Prototype an app to help solve that problem using App Lab.</td>
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<tr>
<td>5</td>
<td>Data and Society</td>
<td>Develop binary representations of different kinds of information. Collect, analyze, visualize, and make automated decisions using data.</td>
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</tr>
<tr>
<td>6</td>
<td>Physical Computing</td>
<td>Explore the relationship between hardware and software, while building interactive projects on Adafruit’s Circuit Playground.</td>
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</tbody>
</table>
2026 MHS Computer Science
For students who completed Algebra 1 or Exploring Computer Science

- Computer Programming
- Web Programming
- AP Computer Science Principles
- Gaming and Design Thinking

Suggested 4 year sequence:
- AP Computer Science Principles
- Computer Programming
- AP Computer Science A
- Gaming and Design Thinking

= New Course
PLTW Computer Science empowers students to become creators, instead of merely consumers, of the technology all around them. The program engages students in collaborative projects that help them develop in-demand computer science knowledge as well as transportable skills like creative thinking and communication. And whether they’re creating an online art gallery or using automation to process and analyze DNA-sequence data, PLTW Computer Science students are seeing how their learning connects to the real world.

**PLTW Costs**
- **Professional Development**: $2,400 x 4 courses = $9,600
- **Equipment and Supplies** (Based on an enrollment of 25 in each course): $6,500
- **Participation Fee**: $2,000 annually

**Total Cost** if all 4 courses launched in 1 year: $18,100
MHS Career Sequences

Health
- Honors Health Science
- Anatomy/Physiology
- Medical Course

Engineering
- Drafting/CAD
- Woods Design
- Engineering & Technology
- Robotics
- Home Construction/Maintenance
- iSTEM or Project Lead the Way Sequence

Business and Technology
- Digital Graphics I and II
- Digital Marketing and Bus. Info. Mgt.
- Entrepreneurship

Legend:
- Existing Course
- Modified Course
- New Course
- Ideas for growth
STEM at MHS: Elective Courses

1. Capstone for Modern Sequence: All standards covered. Free to design application oriented STEM course. Possible ideas:
   a. Environmental Problem Solving
   b. Engineering Design
   c. Bioethics
   d. Sustainability: manufacturing, energy use, farming, water use, resources, etc…
   e. Curriculum Planning throughout next year.

2. Health Science course: align with Career Cluster to enhance “real world” applications and provide practical art within science. Curriculum planning this summer.

3. AP Options remain.
4. Engineering: new staff being hired.
5. Robotics
6. Waksman Science Scholars Program: DNA Research

As we proceed: investigate iSTEM, Project Lead the Way and programs in other districts through site visits.
Affordable housing design. Biofuel production. App development. These are all hands-on, real-world challenges students face in their PLTW Engineering courses. Throughout the program, students step into the varied roles engineers play in our society, discover new career paths and possibilities, and develop engineering knowledge and skills. In addition, as students work in teams to design and test solutions, they’re empowered develop in-demand, transportable skills like collaboration, critical thinking, and communication.

**PLTW Costs**

**Professional Development**: $2,400/course

**Equipment and Supplies**:  
- Intro: $3,000  
- Principles: $12,500  
- Other: Varies

**Participation Fee**: $3,000 annually for all engineering courses.
We are increasing STEM and NGSS alignment within our classrooms.

Students engage in STEM activities in science in every unit.
In Kindergarten we...

Plant a butterfly garden.
In Grade 1 we... Build terrariums to study insects and plants.

In Grade 2 we design, build and test apple baskets and sailboats.
In Grade 3 we plan to
Design a weather shelter from recycled materials

And in Grade 4 we
Develop safe locations to build houses.
In Grade 5 we

- Build and redesign a car
- Design and build Rube Goldberg devices

In Grade 6 we

- Calculate how to reduce our carbon footprint
In Grade 7 we

Propose ways to limit negative impacts on ecosystems

The Monarch Project: grow and release Monarch butterflies. Study them to learn ways to protect them.

In Grade 8 we

Use chemistry to design a device to release or absorb thermal energy.
In Grade 5-7 G&T we

Engage in design projects (5)

Design Future Cities

Design and build robots
Science STEM at MHS: Meet NGSS in Grades 9-11

1. Biology:
   a. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
   b. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
   c. Evaluate diets in light of learning about biological processes.

2. Chemistry
   a. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
   b. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
   c. Develop a quantitative model for determining carbon footprint.

3. Physics
   a. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimized the force on a macroscopic object during collision.
   b. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
Metuchen’s Proposed 8 Year STEM Action Plan:

**Timeline of Activities for Years 1-4**

*Including all planning for years 5-8 (next slide)*

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM 1.0 Curriculum Development within 1 Discipline: Real World Problems</td>
<td>▲</td>
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<tr>
<td></td>
<td>Science, Computer Science, Engineering, Math</td>
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<td>STEM 2.0 Metuchen Inquiry-Based Research Process and Real World Problem Solving Curriculum Development and Implementation within 2 Disciplines: Science and Math, Computer Science and Engineering</td>
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<td>STEM 4.0 Projects implemented K-12 every year</td>
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Metuchen’s Proposed 8 Year STEM Action Plan:

**Timeline of Activities for Years 5-8**

<table>
<thead>
<tr>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM 4.0, Internships, Course Sequences, Certification Programming, Authentic and Outside Assessment Implementation</td>
<td>STEM Data analysis, STEM Program enhancement</td>
<td>Cultivate Local Experts, University, Community, Business and other Partnerships</td>
<td>Begin Planning next 8 Year STEM Plan for 2034</td>
</tr>
</tbody>
</table>
To be researched for future:
Internships, Career Technical Education
Dual Credit, Certification & Assessment Possibilities

**Computer Science Certifications**
- Adobe Certification
- Computer Programming Job Ready Cert
- **Computer Science Dual Credit (PLTW)**
  - Essentials
  - Principles
- AP Comp Science
- Cyber-Security

**Medical Field Certifications**
- Emergency/Clinical (EMT)
- Internships at sporting events?

**Computer Science Internship:**
- Metuchen Tech Department Senior Interns (IT support & Summer work)

**Outside Assessments:**
- PLTW, iSTEM?