MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Acknowledgements

The STEM committee was established to review and update the STEM plan for Manassas City Public Schools (MCPS). The MCPS STEM mission, vision, and strategic plan was a collaborative effort by the STEM committee, which consists of the following educators from Manassas City Public Schools:

Kimberley Ainsworth, STEM Coach, Weems Elementary School

Alexandra Anderson, STEM Teacher, Baldwin Intermediate School

Annette Bruner, Instructional Technology Training Specialist, Weems Elementary School

Suzy Cornicelli, STEM Teacher, Mayfield Intermediate School

Bernard, Davis "Trey", Supervisor of Career and Technical Education

Katherine Green, Instructional Technology Training Specialist, Dean Elementary

Carey Hancey-Shier, STEM and Integrated Math and Science Teacher, Metz Middle School

Kristine Heaver, Physics Teacher, Osbourn High School

Pedro Hernandez, Supervisor of Digital Learning and Innovation

Leslie Jones, Science Specialist

Susan Mayo, Project Lead the Way Coach

Jennifer Metcalfe, Math Coach, Weems Elementary

Leonard Newman, Math Teacher, Metz Middle School

Erika Redler, Instructional and Technology Specialist, Osbourn High School

Ray Singletary, Math Specialist

Paul Steiner, Administrator of Career and Technical Education, Osbourn High School

Muffin Wilcoski, Instructional Technology Training Specialist, Osbourn High School

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Executive Summary

In the United States, STEM education has been evolving from a set of overlapping disciplines to an integrated approach to learning and skill development. This approach to education emphasizes the teaching of concepts through authentic, real-world applications in partnership with communities, businesses, and higher education. The federal STEM strategic plan emphasizes the need to introduce STEM concepts at an early age to develop critical thinking, problem solving, and soft skills, such as collaboration (Charting A Course for Success: America's Strategy for STEM Education. 2018).

Manassas City Public Schools created a STEM plan in 2015 with the primary goal to purposely integrate math, science, technology, and engineering into the K-12 curriculum, of all disciplines, to provide all students with STEM experiences. The STEM committee reviewed the 2015-2018 STEM plan and identified many successes. MCPS upgraded the technology infrastructure, in all schools, to support technology STEM initiatives. At Osbourn High School, every student receives a personal technology device. To support STEM curriculum and instruction, every elementary school has a STEM coach who facilitates integration of science, technology, engineering, and math. Baldwin Elementary School has a Project Lead the Way (PLTW) coach that oversees PLTW, a program that combines STEM with project based learning (PBL). Many elementary schools host s STEM night for community members and families to showcase the work of students. Baldwin Intermediate, Mayfield Intermediate, and Metz Middle School have STEM teachers that provide authentic STEM experiences to every child, grades 5-8. Osbourn High School students can apply to the Governor's STEM academy and choose between three pathways: automotic, networking, and engineering. Robotics club is offered for grades 4*12: First Lego League (FLL) in 4th grade, VEX IQ/VEX in 5-8th grade and First Robotics for grades 9-12. Many of our educators have attended and/or presented at PBL world, PLTW summit, VAST (Virginia Academy of Science Teachers) conference, and The Children's Engineering Conference. During the summer, MCPS teachers offer a children's engineering camp and a coding camp, both of which provide students with real-world STEM experiences. MCPS has also explored and expanded university and business partnerships who support of STEM education.

Manassas City Public Schools (MCPS) serves almost 8,000 students in five elementary schools (K-4), two intermediate schools (5-6), one middle school (7-8) and one high school (9-12). MCPS student population is, on average, 75% minority, 47% English Language Learners, 63.38% economically disadvantaged, and 51% female. Currently underserved in STEM are students of minority race or ethnicity, low income (combined parent income of 36,000 or less), and first generation to college. This provides tremendous opportunities for growth of the STEM program at MCPS.

MCPS benefits from a high minority population as well as a balanced gender population, offering leadership opportunities in preparing minority students for STEM careers and STEM college readiness. To facilitate, a STEM proficient workforce, and future STEM experts, MCPS must focus on:

1. Preparing all students, including girls and minorities who are underrepresented in these fields, to be proficient in STEM subjects.

2. Exposing all students to STEM, and, in the process, motivating them to pursue STEM careers (PCAST, 2010).

In order to create the strongest STEM plan for MCPS, the STEM committee felt it necessary to align MCPS STEM vision, mission, and goals with federal and state goals, as well as the instructional vision and mission of MCPS. The MCPS STEM vision is to empower lifelong learners through dynamic instruction. The MCPS STEM mission is to facilitate intentional, authentic, inclusive, and collaborative learning opportunities for every student in every classroom every day. Our short and long term goals are as follows:

Short Term Goals

- Create STEM framework K-8 with interdisciplinary connections
- Create student learning maps, K-8, based on the STEM framework, with specific learning outcomes
- Vertical representation of learning outcomes in curriculum framework
- Unit of study-topical, skills-based, and thematic

Long Term Goals

- Increase in STEM literacy for all students, including those who do not pursue STEM-related careers or additional study in STEM disciplines
- Broaden the participation of female students and minorities in STEM
- Expand the opportunities for students who want to pursue degrees and careers in STEM fields

To achieve these goals, the MCPS STEM committee has identified the following measurable criteria:

- Through STEM curriculum and instruction, create STEM student learning maps that integrate the new science standards, STEM framework on science, math and technology, and engineering processes.
- Through consistent PLTW and STEM module implementation, ensure that every MCPS student is provided quality STEM experiences, K-12.
- Through professional learning communities, coaches, teachers, and community partners collaborate to build and support strong foundations in STEM literacy and increase diversity, equity, and inclusion for STEM, to support all MCPS students for the STEM workforce.
- Through professional development and community outreach, provide teachers with continuous STEM education and skills needed to prepare students for a STEM world.
- Through robotics clubs and engineering camps, continue to provide students with STEM experiences outside of the classroom.

The mission, vision, goals and criteria for success outlined in this document detail the STEM committee's plan to provide MCPS students with a transdisciplinary approach to learning to cultivate innovation and entrepreneurship.

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

MCPS STEM Plan

Research and Statistics on STEM

Research and Statistics: Global

The U.S. Bureau of Labor Statistics projects that during the period 2010-2020, employment in STEM occupations will grow by 18.7%, compared to 14.3% for all occupations (www.nsf.gov).

Projected employment growth (PGR) includes the following:

- Computer/mathematical scientist: 23.1%
- Biological/agricultural/environmental/life scientists: 20.4%
- Social scientists/psychologists: 18.5%
- Engineers: 10.6%
- Physical Scientists: 12.7%
- Health care practitioners and technicians, a non-S&E occupational category that contains significant numbers of S&E-trained people: 25.9%

Despite growing demand, the percentage of students earning STEM degrees has not substantially changed in recent years (US Department of Education, 2012). Today's college freshmen too often require remediation (ACT, 2015) and today's entry-level employees lack basic work skills (SHRM, 2006).

Research and Statistics: Local

Manassas City Public Schools (MCPS) serves almost 8,000 students in five elementary schools (K-4), two intermediate schools (5-6), one middle school (7-8) and one high school (9-12). MCPS student population is, on average, 75% minority, 47% English Language Learners, 63.38% economically disadvantaged, and 51% female. In collaboration with community members, MCPS offers learning opportunities not found in typical classrooms. In the MCPS PK-12 science curriculum, elementary students are exposed to exciting enrichment programs, such as Project Lead the Way, Talents and Gifts enrichment clusters, and project-based learning. Integrated math and science programs are offered to grades 7-10 and STEM programs are offered in all schools, with a strong focus at Osbourn High School (www.mcpsva.org). Through strong community partnerships, students grow academically, socially, vocationally, and civically. The benefits of such collaboration increase academic achievement through real world experiences and workplace/college readiness (Decker, 2000). The benefits of community outreach and collaboration are apparent in the many awards to schools and students. Osbourn High School students competed at the International Sustainable World Energy, Engineering, and Environment Project (SWEEP) Olympiad in Texas. The team won second place with their project on enzymatic biofuel cells. This type of award illustrates the commitment of great teachers and staff to authentic scientific research, providing

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Osbourn students with experiences that not only prepare for higher education but also make them extremely competitive.

Currently underserved in STEM are students of minority race or ethnicity, low income (combined parent income of 36,000 or less), and first generation to college. Nearly half of the 2014 ACT test takers that expressed interest in STEM were from these underserved groups (ACT, 2014). Enrollment trend for women in STEM has increased from 30% in 2008 to 46% in 2014, but there is still a troubling gender gap in physics, engineering, and computer science (ACT, 2014). Conversely, males are underserved in nursing, accounting, middle school teachers, and veterinary sciences (Elkins, 2015). This provides tremendous opportunities for growth of the STEM program at MCPS.

MCPS benefits from a high minority population as well as a balanced gender population, offering leadership opportunities in preparing minority students for STEM careers and STEM college readiness. To facilitate, a STEM proficient workforce, and future STEM experts, MCPS must focus on:

1. Preparing all students, including girls and minorities who are underrepresented in these fields, to be proficient in STEM subjects.
2. Exposing all students to STEM, and, in the process, motivating them to pursue STEM careers (PCAST, 2010).

In order to create the strongest STEM plan for MCPS, the STEM committee felt it necessary to align MCPS STEM vision, mission, and goals with federal and state goals, as well as the instructional vision and mission of MCPS.

Federal STEM Plan

This information is taken directly from:

https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

Federal STEM Vision: All Americans will have lifelong access to high-quality STEM education and the United States will be the global leader in STEM literacy, innovation, and employment.

The vision will be achieved by pursuing three goals:

1. Build Strong Foundations for STEM Literacy
2. Increase Diversity, Equity, and Inclusion for STEM
3. Prepare the STEM Workforce for the Future

Pathways to Success:

1. Develop and Enrich Strategic Partnerships

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

2. Engage Students where Disciplines Converge
3. Build Computational Literacy
4. Operate with Transparency and Accountability

Virginia STEM Plan

This information is taken directly from:

www.doe.virginia.gov/instructions/stem

Virginia STEM Definition: Science, Technology, Engineering and Mathematics (STEM) education entails authentic learning experiences for all students with an interdisciplinary and applied approach where all fields connect in complex relationships. In today's economy, problems are not solved in isolation of a specific discipline, but are solved through multiple approaches and perspectives. A strong STEM educational foundation helps to prepare our students for tomorrow's world by emphasizing collaborative, innovative, quantitative and logical analysis rooted in a solid understanding of the interdisciplinary nature of science, technology, engineering and mathematics.

How is STEM Education being refocused

Recently there has been a shift in beliefs about the purpose of STEM education. Traditionally, STEM education focused on creating a pipeline of students whose educational backgrounds prepared them for a STEM-specific workforce. Today, the focus is on developing STEM-literate citizens necessary for success in any 21st century profession. STEM literacy is the ability to identify and acknowledge science, technology, engineering and mathematics concepts and processes in everyday life.

STEM literacy comes from an understanding that it takes

- a scientific approach to observe and interpret the world;
- technology to serve as a tool to solve problems or reach a goal;
- engineering to design, test and solve a problem through the creation of products or processes; and
- mathematics to help quantify, comprehend and evaluate the problem and solution success.

As students become STEM literate citizens, they have the foundational content and the discipline processes to allow them to make informed decisions and to participate in public/civil discourse concerning future STEM issues and technologies.

How does STEM align with the Profile of a Graduate

The Virginia Department of Education has aligned the vision for STEM education with the Profile of a Virginia Graduate. The Profile describes the knowledge, skills, experiences, and attributes that students must attain to be successful in college and/or the work force and to be life-ready in an economy and a world characterized by rapid change. Knowing facts and figures is not enough to prepare students for tomorrow's

future. Today's economy requires people to be critical and creative thinkers, excellent communicators, collaborators and community-minded citizens. Developing well-rounded and prepared graduates starts early and must be a part of the learning environment in kindergarten through high school. The Virginia Department of Education will ensure that these vital skills are part of every student's education.

Virginia STEM Vision(adapted from Oregon-August 2018): Reimagine and transform how we educate learners in order to enhance their life prospects, empower their communities, and build an inclusive, sustainable, innovation-based economy. Virginians of all backgrounds, economic status, and locations will develop the fundamental STEM-enabled skills and mindsets necessary to:

- Improve the prosperity of all individuals and communities across the state
- Become creative, life-long learners who can adapt to changing social and economic conditions
- Fully contribute to an increasingly complex and technologically-advanced global society
- Address high-demand, competitive workforce and industry needs.

Virginia STEM Mission (adapted from the Science Museum of Virginia): To inspire Virginians to enrich their lives through STEM.

Virginia STEM Goals

1. Inspire and empower our students to develop the knowledge, skills, and mindsets necessary to thrive in a rapidly changing, technologically-advanced global society.
2. Ensure equitable opportunities and access for every Virginian to become a vital part of a robust STEM ecosystem.
3. Continuously improve the awareness, effectiveness, support, and the quality of partnerships among educational entities, employers, and nonprofits.
4. Create sustainable and supportive conditions to achieve STEM outcomes aligned to Virginia's economic, education and community goals.

MCPS Instructional Vision and Mission

MCPS Instructional Vision: To empower lifelong learners through dynamic instruction.

MCPS Instructional Mission: To facilitate intentional, authentic, inclusive, and collaborative learning opportunities for every student in every classroom every day.

MCPS STEM Vision and Mission

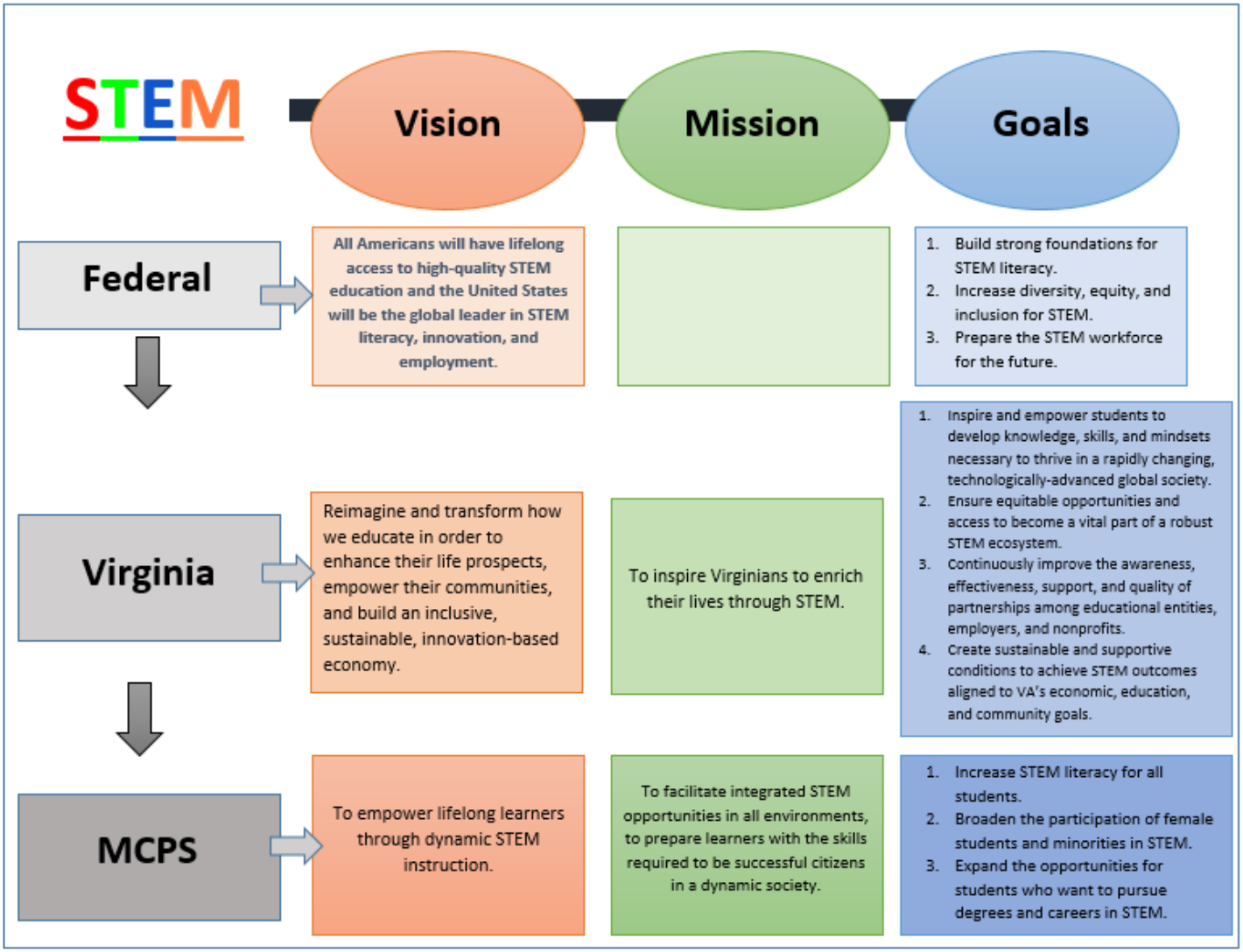
The MCPS STEM vision and mission was created by the STEM committee through combined research on mission and vision statements, STEM national and local data, and in support of the mission and vision of Manassas City Public Schools.

MANASSAS CITY PUBLIC SCHOOLS STEM PLAN

MCPS STEM definition (*adopted from the state*): authentic learning experiences for all students, with an interdisciplinary and applied approach where all fields connect in complex relationships

MCPS STEM Vision: To empower lifelong learners through dynamic STEM instruction.

MCPS STEM Mission: To facilitate integrated STEM opportunities, in all environments, to prepare learners with the skills required to be successful citizens in a dynamic society.



MCPS STEM Plan Review, 2015-2018

The STEM committee reviewed Manassas City Public Schools previous STEM plan (2015-2018) and identified the following **successes**:

a. ITTS coaches, K-12
b. Upgraded infrastructure to support additional technology
c. Increased number and/or provided class sets of internet devices for middle school classrooms
d. Implemented backpack initiative (1:1), grades 9-12
e. Implemented STEM labs and STEM coaches K-4
f. Implemented STEM teachers 5-6, 7-8
g. Explored and expanded university and business partnerships, 9-12
h. Conducted PD through digital resources, such as Better Lesson
i. Hosted elementary STEM nights (limited)
j. Explored and implemented PLTW, K-12
k. Attended and presented at Children's Engineering Conference
l. Established Robotics teams (extra-curricular)

The STEM committee reviewed Manassas City Public Schools previous STEM plan and identified the following areas of **growth**:

a. Annual review of STEM plan
b. PD focus on STEM
c. Shift in pedagogy for STEM as the natural method for instructional delivery
d. STEM integration throughout instructional day
e. Resource support for all schools
f. STEM curriculum, K-8
g. Expansion of PLTW, K-12
h. Space and time for STEM collaboration
i. Internship and Independent Study Opportunities, 9-12
j. Business Partnerships, K-12
k. Expansion of STEM courses, K-12

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

MCPS STEM Plan Review, 2019-2021

Based on STEM successes and opportunities for growth, the STEM committee (1) established short and long term STEM goals, (2) created a STEM framework K-8, and (3) outlined a 4 year SMART plan to reach desired goals.

Goals

Short Term Goals

- Create STEM framework K-8 with interdisciplinary connections
- Create student learning maps, K-8, based on the STEM framework, with specific learning outcomes
- Vertical representation of learning outcomes in curriculum framework
- Unit of study-topical, skills-based, and thematic

Long Term Goals

- Increase in STEM literacy for all students, including those who do not pursue STEM-related careers or additional study in STEM disciplines
- Broaden the participation of female students and minorities in STEM
- Expand the opportunities for students who want to pursue degrees and careers in STEM fields

STEM Framework K-8

Rationale: The best STEM education provides an interdisciplinary approach to learning. The MCPS STEM committee felt strongly in the need for a cross-curricular framework of the performance standards for science, math, and computer science, as well as a list of related learning activities that directly support the MCPS STEM vision and mission.

Who is responsible for STEM: In an ideal world, *every* educator would be responsible for STEM, however, this requires intensive training and restructuring to be successful. Here at MCPS, we are extremely fortunate to have STEM coaches (K-4), STEM teachers, (5-8), and Career and Technical Education Teachers (9-12). STEM coaches will use the framework to create sequenced units of study with real-world lessons that make connections between school, community and work. The STEM coaches and ITTS will train and model STEM lessons to elementary teachers and work collaboratively with elementary teachers to embed STEM learning in the classroom. STEM teachers and ITTS, 5-8, will use the STEM framework to directly incorporate STEM modules and projects that continue to build on the skills learned in elementary school, ultimately preparing students for a STEM high school experience. At the high school, Career and Technical Education Teachers will provide STEM education via specific STEM courses within the Governor's STEM academy and STEM will be incorporated in other content areas, where applicable.

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Themes: With the adoption of new state standards, the *2018 Science Standards of Learning* support the Virginia Profile of a Graduate through the development and use of communication, collaboration, critical and creative thinking, and civic responsibility via applications of science. Standards are more conceptual with intentional vertical alignment to support content (www.vdoe.org). To align with the Virginia science standards of learning, STEM K-8 will be based on themes with vertical alignment of science concepts, and engineering practices and skills. The grade-level themes are as follows:

K. Using My Senses to Understand My World

1. How I Interact with My World
2. Change Occurs All Around Us
3. Interactions in Our World
4. Our Place in the Solar System
5. Transforming Matter and Energy
6. Our World; Our Responsibility
7. Relationships in our Living World
8. The Structure of Matter and the Characteristics of Energy

STEM Strategic Plan 2018-2021

STEM Committee				
Goal: The goal of the STEM committee is to ensure that all MCPS students have access to high-quality STEM education.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**
Criteria for Success (measurement)				
	Review former MCPS STEM plan Create MCPS STEM mission Celebrate strengths and recognize	Obtain feedback from teachers and business partners on STEM plan Complete final draft of STEM plan	Meet quarterly to review progress on adopted STEM plan	Meet monthly to update/modify MCPS STEM plan

	opportunities for growth Complete draft of new STEM plan Complete MCPS STEM curriculum framework	Present STEM plan to academic committee and school board Adopt STEM plan		
Resources Required: Previous MCPS STEM plan, Federal and VDOE documents on STEM (see reference page)				
Budget Implications: curriculum writing pay for STEM committee members				
Persons Responsible: STEM committee				
Technology required: NA				

PLTW and STEM module implementation				
Goal: To ensure that every MCPS student is provided quality STEM experiences, grades K-12.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**
Criteria for Success (measurement)				
K-4	STEM coaches choose 2 STEM modules for students to complete in 2019-2020 school year (one of these modules can be PLTW).	STEM coaches will train on PLTW launch with PLTW coach, Susan Mayo, on one PLTW module for K-2 respectively STEM coaches will establish a calendar of training sessions for elementary teachers and work with ITTS and elementary teachers	STEM coaches will add one more STEM module to each grade level, totaling 2 STEM modules, 1 of which may be PLTW STEM coaches will establish a calendar of training sessions for elementary teachers and work with ITTS and elementary teachers	STEM coaches will work with STEM committee to review STEM plan and provide input on success and opportunities of PLTW/STEM modules. STEM coaches will establish a calendar of training sessions for elementary teachers and work

		to complete 2 STEM modules per grade level k-4, one being PLTW for k-2 Every elementary student complete 1 STEM module (one of which may be PLTW)	to complete 1 STEM module per grade level, one may be PLTW Every elementary student completes 1 STEM module (one of which may be PLTW)	with ITTS and elementary teachers to complete 2 STEM modules per grade level k-4, one being PLTW or STEMscopes Every elementary student completes 2 STEM modules (one of which will be PLTW or STEMscopes)
5-6	STEM teachers establish norms for intermediate schools to ensure STEM equitability Two STEM modules (one of which must be PLTW) are chosen to complete in grades 5-6	STEM teachers write student learning maps based on new science standards and STEM framework STEM teachers will train on PLTW launch with PLTW coach, Susan Mayo. STEM teachers will teach 2 common STEM modules for each grade level, one of which will be PLTW	STEM teachers will teach 3 common STEM modules for each grade level, one of which will be PLTW	STEM teachers will review STEM plan and provide input on success and opportunities for growth
7-8	STEM teachers establish norms for intermediate schools to ensure STEM equitability	STEM teachers write student learning maps based on new science standards and STEM framework	STEM teachers will teach 3 common STEM modules for each grade level, one of which will be PLTW	STEM teachers will work with the STEM committee to review STEM plan and provide input on success and

	Two STEM modules (one of which must be PLTW) are chosen to complete in grades 7-8	STEM teachers will teach 2 common STEM modules for each grade level, one of which will be PLTW		opportunities for growth
9-12	PLTW courses offered: Principles of Engineering Civil Engineering Digital Electronics New Class of Governor's STEM Academy students are inducted in the fall each year.	PLTW course to add: Aerospace Engineering	Review current PLTW courses and determine if any others should be added.	Review current PLTW courses and determine if any others should be added.
Resources Required: STEMscopes, PLTW				
Budget Implications				
	NA	K-7: $30,000 9-12: $30,000	K-7: $30,000 9-12: $30,000	K-7: $30,000 9-12: $30,000
Persons Responsible: content specialists, STEM coaches, STEM teachers, CTE teachers				
Technology Required: Some, but not all, PLTW/STEM modules require tablets or chromebooks for student use				

Curriculum and Instruction				
Goal: To create STEM learning maps and balanced assessments that integrate the new science standards, STEM framework, and engineering processes.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**
Criteria for Success (measurement)				

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

K-4	STEM coaches rewrite science student learning maps, K-3, to be implemented 2019-2020 school year STEM coaches create balanced assessments, K-3. ITTS and STEM Coaches collaborate to plan and implement the STEM curriculum in the classroom	STEM coaches rewrite science student learning maps, grade 4, to be implemented 2020-2021 school year ITTS and STEM Coaches collaborate to plan and implement the STEM curriculum in the classroom STEM coaches create balanced assessments, grade 4.	STEM coaches will continue to meet monthly to review student learning maps, student data, and student assessments as well as teacher feedback.	STEM coaches will continue to meet monthly to review student learning maps, student data, and student assessments as well as teacher feedback. ITTS and STEM Coaches collaborate to plan and implement the STEM curriculum in the classroom
5-6	STEM teachers establish norms to ensure STEM equitability	STEM teachers write student learning maps, grade 5 and 6, based on new science standards and STEM framework. ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM teachers modify pacing calendar with STEM activities that support math, science, and computer science standards that include a variety of programs and modules. ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	ITTS and STEM teachers will review STEM plan and provide input on successes and opportunities for growth ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom
7-8	STEM teachers establish norms to	STEM teachers write student	STEM teachers modify pacing	ITTS and STEM teachers will review

	ensure STEM equitability	learning maps, grade 7 and 8, based on new science standards and STEM framework. ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	calendar with STEM activities that support math, science, and computer science standards that include a variety of programs and modules. ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM plan and provide input on successes and opportunities for growth ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom
9-12	STEM teachers establish norms to ensure STEM equitability Students can apply to be accepted in the Governor's STEM Academy to choose between three STEM pathways: Automotive, Networking/IT, and Engineering	CTE teachers align CTE programs with MCPS STEM framework ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom Students can apply to be accepted in the Governor's STEM Academy to choose between three pathways: Automotive, Networking/IT, and Engineering Increase business partnerships in STEM	CTE teachers modify pacing calendar with STEM activities that support math, science, and computer science standards that include a variety of programs and modules. Students can apply to be accepted in the Governor's STEM Academy to choose between three pathways: Automotive, Networking/IT, and Engineering Offer STEM internship/independent study	CTE teachers will review STEM plan and provide input on successes and opportunities for growth Science teachers embed STEM experiences in curriculum, based on new scientific and engineering processes (Virginia standards)

		Research possible internship/independent study opportunities and work with OHS guidance counselors to create an application form	opportunities to OHS juniors and seniors Science teachers rewrite curriculum to embed STEM experiences, based on new scientific and engineering processes (Virginia standards)	
Resources Required: New science standards, MCPS STEM curriculum framework, Science and Engineering Processes				
Budget Implications: curriculum writing pay for STEM teachers, Science teachers, and CTE teachers				
Persons Responsible: content specialists, STEM coaches, STEM teachers, CTE teachers, and ITTS				
Technology Required: Depending on the STEM module, some require computer access				

Professional Learning Communities				
Goal: Through coaching and teacher leads, build strong foundations for STEM literacy, increase diversity, equity, and inclusion for STEM, and prepare our MCPS students for the STEM workforce.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**
Criteria for Success (measurement)				
K-4	Establish criteria for coaching framework	STEM coaches establish norms across all 5 elementary schools to ensure STEM equitability	STEM coaches will model the 5Es of inquiry based learning STEM coaches will provide coaching and PD to teachers to increase STEM	STEM coaches will model the 5Es of inquiry based learning STEM coaches will provide PD to teachers to increase

		A STEM coaching framework, with emphasis on the 5E model of inquiry based instruction with integrated vocabulary will be established STEM coaches work with other coaches and content specialists to create a coaching framework	activities in their classrooms	STEM activities in their classrooms
5-6		STEM teachers establish norms across both intermediate schools to ensure STEM equitability A STEM coaching framework, with emphasis on the 5E model of inquiry based instruction with integrated vocabulary.will be established ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM teachers will model the 5Es of inquiry based learning ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM teachers will model the 5Es of inquiry based learning ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom

7-8		STEM teachers establish norms that are vertically aligned to ensure STEM equitability A STEM coaching framework, with emphasis on the 5Es model of inquiry based instruction with integrated vocabulary.will be established ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM teachers will model the 5Es of inquiry based learning ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom	STEM teachers will model the 5Es of inquiry based learning ITTS and STEM teachers collaborate to plan and implement the STEM curriculum in the classroom
9-12		ITTS and CTE teachers collaborate to plan and implement the STEM curriculum in the classroom	ITTS, biology, and CTE teachers collaborate to plan and implement the STEM curriculum in the classroom	ITTS, science and CTE teachers collaborate to plan and implement the STEM curriculum in the classroom
Resources Required: coaching books/references; the 5Es model of inquiry based learning				
Budget Implications: $3000 for cost of reference materials				
Persons Responsible: content specialists, director of instruction, supervisor of professional learning, coaches, lead teachers				
Technology required: NA				

Professional Development and Conferences

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Goal: To provide STEM educators with continuous STEM education to develop the knowledge and skills needed to prepare students for a STEM world.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**
Criteria for Success (measurement)				
K-4	STEM coaches and teachers attend the children's engineering conference and the GMU STEM workshop.	STEM coaches participate in professional development based on The Impact Cycle Coaching Model. STEM coaches and teachers attend the children's engineering conference or VAST conference and the GMU STEM workshop.	STEM coaches participate in professional development based on an established coaching framework created by the content specialists STEM coaches and teachers attend the children's engineering conference or VAST conference and the GMU STEM workshop. STEM coaches attend the VMI STEM Education Conference	STEM coaches will provide PD to teachers who want to increase STEM activities in their classrooms STEM coaches and teachers attend the children's engineering conference or VAST conference and the GMU STEM workshop. STEM coaches attend the VMI STEM Education Conference
5-6	STEM teachers attend the children's engineering conference and the GMU STEM workshop.	STEM teachers attend the children's engineering conference or VAST conference and the GMU STEM workshop.	STEM teachers participate in professional development based on an established	STEM teachers participate in professional development based on an established

			coaching framework created by the content specialists STEM teachers attend the children's engineering conference or VAST conference and the GMU STEM workshop. STEM teachers attend the VMI STEM Education Conference	coaching framework created by the content specialists STEM teachers attend the children's engineering conference and the GMU STEM workshop. STEM teachers attend the VMI STEM Education Conference
7-8	STEM teachers attend the children's engineering conference and the GMU STEM workshop.	STEM teachers attend the children's engineering conference and the GMU STEM workshop. STEM teachers attend the VAST conference with a focus on STEM	STEM teachers participate in professional development based on an established coaching framework created by the content specialists STEM teachers attend the children's engineering	STEM teachers participate in professional development based on an established coaching framework created by the content specialists STEM teachers attend the children's engineering

			conference and the GMU STEM workshop. STEM teachers attend the VMI STEM Education Conference	conference and the GMU STEM workshop. STEM teachers attend the VMI STEM Education Conference
9-12		Science teachers attend the VAST conference with a focus on STEM Science teachers attend training on the new science standards	Lead teachers participate in professional development based on an established coaching framework created by the content specialists	Lead teachers participate in professional development based on an established coaching framework created by the content specialists
Resources Required: coaching references, STEM references, conference references				
Budget Implications: $15,000 per year				
Persons Responsible: content specialists, STEM coaches, STEM teachers, Science teachers, CTE teachers				
Technology required: NA				

Robotics and Engineering Camps				
Goal: To provide students with STEM experiences outside of the classroom.				
	2018-2019	**2019-2020**	**2020-2021**	**2021-2022**

MANASSAS CITY PUBLIC SCHOOLS **STEM PLAN**

Criteria for Success (measurement)				
K-4	FLL robotics club at every elementary school	FLL robotics club at every elementary school	FLL robotics club at every elementary school Children's engineering camps	FLL robotics club at every elementary school Children's engineering camps
5-6	VEX IQ club at both intermediate schools	VEX IQ club at both intermediate schools Children's engineering and/or coding camps offered in the summer PLTW robotics: 6th grade STEM	VEX IQ club at both intermediate schools Children's engineering and/or coding camps offered in the summer PLTW robotics: 6th grade STEM	VEX IQ club Children's engineering and/or coding camps offered in the summer PLTW robotics: 6th grade STEM
7-8	VEX IQ/VEX club	VEX IQ/VEX club	VEX IQ/VEX club	VEX IQ/VEX club
9-12	First Robotics Club	First Robotics Club Robotics Course in STEM academy	First Robotics Club Robotics Course in STEM academy	First Robotics Club Robotics Course in STEM academy
Resources Required: VDOE, FLL, VEX, STEM resources				
Budget Implications: $35,000 for robotics per year; $10,000 for Engineering Camps per year				
Persons Responsible: content specialist, robotics coaches, teachers of engineering camps				
Technology required: NA				

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What is STEM education? http://www.doe.virginia.gov/instruction/stem/index.shtml