2022-2023 FHAP Pacing Guide- Taking Flight with STEM

What is STEM?

STEM stands for Science, Technology, Engineering, and Math. Yet, STEM education can be hard to define. It is such a popular term that it means a lot of different things to a lot of different people. Although the science (biology, chemistry, etc.) and math (algebra, calculus, etc.) parts of the abbreviation might be easy to figure out, the technology and engineering parts might be less clear. Technology includes topics such as computer programming, analytics, and design. Engineering can include topics like flight, civil engineering, electronics, biomedical engineering, and robotics. The key term, when talking about STEM, is *integration*. STEM curriculum intentionally melds these disciplines. It's a blended approach that encourages hands-on experience and gives students the chance to gain and apply relevant, "real world" knowledge in the classroom. See the back of this document for more details of the skills and practices that STEM courses involve.

In this course, we will focus on the principles of flight and space exploration. **Grades 7 and up.**

Quarter 1	**Focus Topics**	**Related Topics**	**Major Projects**
Basic flight principles Introduction to aircraft Hot air balloons	Air Pressure Air resistance Bernoulli's Principle Gravity Lift Drag Materials Science	History of flight Fluids Angles Acceleration Types of aircraft Inventions Aerospace careers	Design and construct a (model) Hot Air Balloon
Quarter 2			
Airplanes	Atmosphere Weight, drag, thrust, lift principles beyond the atmosphere Fuels Propulsion	History of space flight Current space missions Fuels Materials science	Design and construct a model airplane following criteria and constraints Properly fly an RC plane following certain parameters
Quarter 3			
Helicopters and Drones	Thrust Lift Drag Weight Camber Glide-slope Aspect ratio Velocity	History of airplanes Aviation careers Milestones in aviation Aviation setbacks Improvements in aviation technology	Construct (model) helicopters from various materials to test factors affecting flight. Properly fly a model helicopter following certain parameters. Properly fly a drone following certain parameters
Quarter 4			
Rockets	Newton's Laws, and principles beyond the atmosphere Fuels Propulsion	Earth's atmosphere, history of rocketry, evolution of rockets	Design, construct, test and revise model rockets.

Note: These units of focus are subject to change based on timing and resources. This document will be updated periodically and postings in Schoology will be the most up to date information of topics being covered. If you have any questions, comments, or concerns, please contact Ms. Jane (jwilson@d49.org)

NGSS SCIENTIFIC AND ENGINEERING PRACTICES

ASK QUESTIONS AND DEFINE PROBLEMS

- I formulate empirically answerable questions.
- I establish what is already known.
- I determine what questions have yet to be answered.
- I define constraints and specifications for a solution.

DEVELOP AND USE MODELS

- I construct mental and conceptual models to represent and understand phenomena.
- I use models to explain and predict behaviors of systems, or test a design.
- I refine my models in light of new empirical evidence.

PLAN AND CARRY OUT INVESTIGATIONS

- I identify questions to be investigated.
- I identify variables and controls.
- I design and perform experiments to test my hypothesis.
- I decide what data will be collected and how much, and what tools are needed.

ANALYZE AND INTERPRET DATA

- I use tables, graphs, spreadsheets, etc. to display and analyze data.
- I recognize patterns in data and see relationships between variables.
- I revise my initial hypothesis when the data doesn't support it.
- I analyze performance of a design under a range of conditions.

USE MATHEMATICS AND COMPUTATIONAL THINKING

- I use mathematics and statistics to analyze data.
- I express relationships between variables by writing mathematical models or equations.
- I use technology to collect and analyze data.
- I use mathematical models and computer simulations to test my predictions and designs.

CONSTRUCT EXPLANATIONS AND DESIGN SOLUTIONS

- I evaluate information and form hypotheses.
- I construct explanations or models of phenomena.
- I design a variety of solutions to a problem.

ENGAGE IN AN ARGUMENT FROM EVIDENCE

- I defend my explanation.
- I formulate evidence based on solid data.
- I examine my own understanding in light of the evidence.
- I collaborate with my peers in searching for the best explanation.

OBTAIN EVALUATE AND COMMUNICATE INFORMATION

- I communicate findings clearly and persuasively.
- I derive meaning from scientific text.
- I engage in discussions with scientific peers.
- I evaluate the validity of the findings of others.