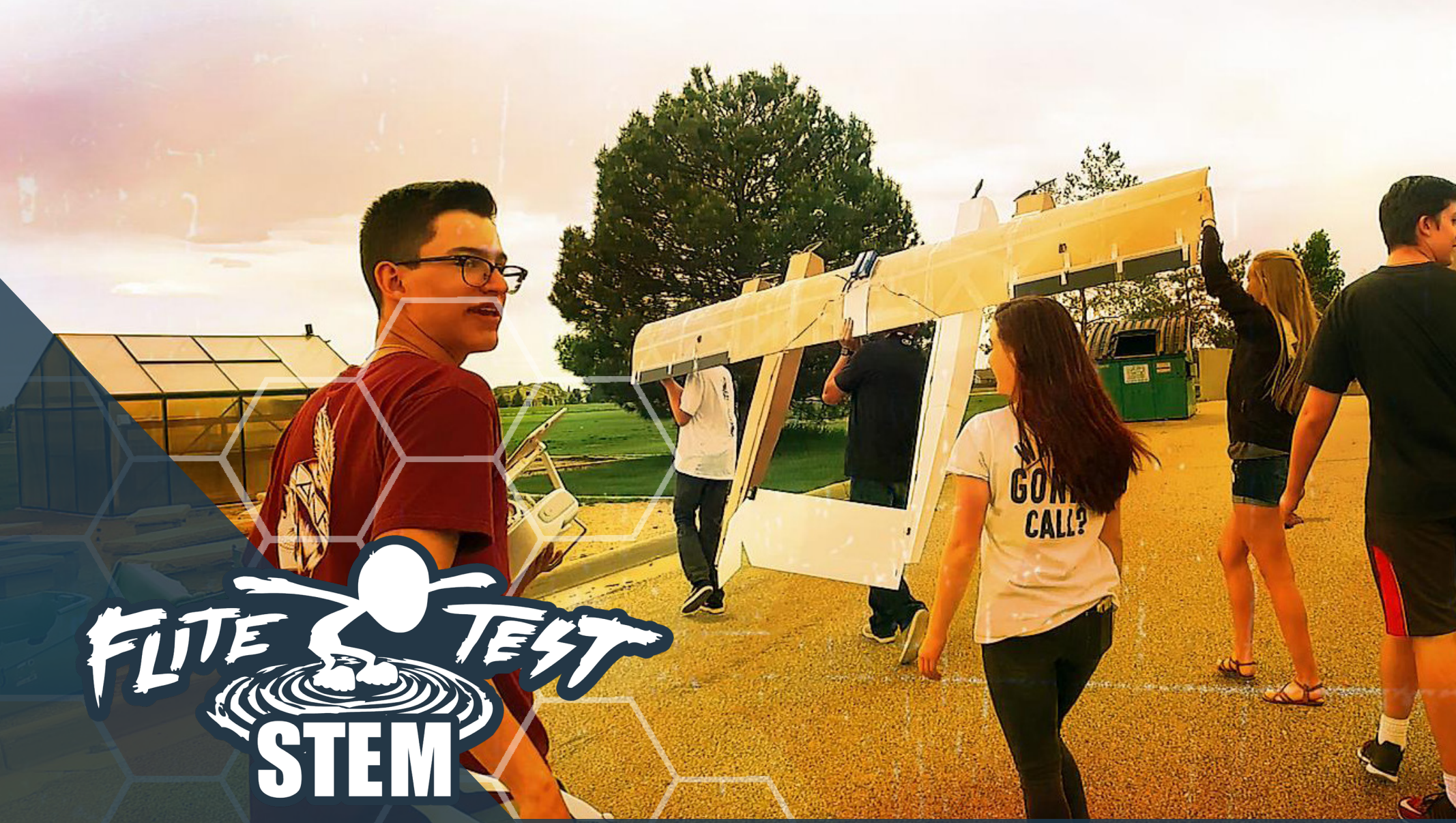

FLITE TEST STEM

EDUCATE
EMPOWER
ELEVATE

HIGH SCHOOL YEAR 2021-22

Flite Test STEM Curriculum Overview
Science, Technology, Engineering and Mathematics

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TABLE OF CONTENTS

FT STEM ORIGINS

Entertaining, Educating and Elevating The World of Flight!

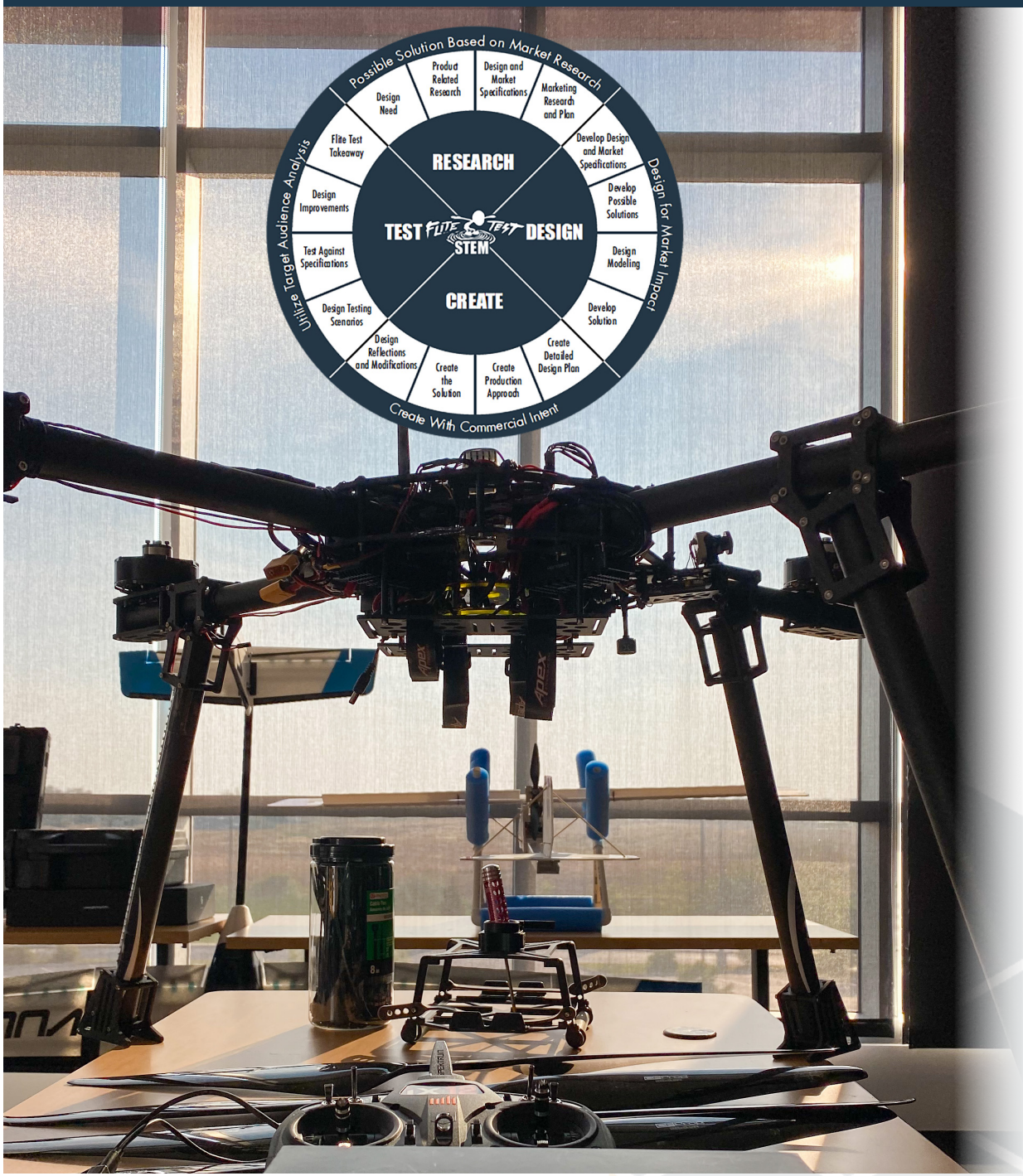
Flite Test was created for people passionate about flight. Our community organization is for the people that build and fly planes and multirotors as a hobby. They are the dreamers and engineers that are thrilled by the first launch of a maiden flight. What we do personifies the veteran and the beginner alike, giving them a chance to share common experiences with others and in turn, enhancing the R/C community. The goal was to develop a creative outlet that allows us to work in our passion daily. Flite Test was designed to empower our audience. Our YouTube connection shows just enough humor, technology and information to appeal to the R/C flight crowd as a whole. Our hope is to entertain, educate and elevate our viewers as we move forward with quality content.

2015 saw Flite Test become a leader in educating the hobby in remote control scratch build aviation. Our mission since then has been to take the Flite Test educational concept and fuse it with today's leading STEM learning platform being used in schools.

Flite Test + STEM = FT STEM

Constructing STEM literacy through the lens of scratch build aviation for 21st-century learners is the foundation of Flite Test's K–12 curriculum solution. Using a modified engineering design model process, the innovative, STEM-driven hands-on aircraft activities engage learners at every level and provide real-world learning opportunities that expose students to careers in science and technology. The program also stresses critical 21st-century skills, such as communication and teamwork. Students of all learning styles (interventions, talented and gifted programs, and extended learning instruction) have success in our Flite Test Clubs all across the world, and our hands-on approach provides a variety of flexible implementation models. Our curriculum involves both student-directed and teacher-led curricula to create a powerful and effective STEM experience.

OUR CURRICULUM



Making and Impact

As of 2021 FT STEM has over 5,000 enrolled students and teachers and is currently being adopted across the country and the World in STEM programs, summer camps, EAA Young Eagle Programs, after school enrichment programs, home and public schools. Through the growth and success of the curriculum, Flite Test has been able to deliver scratch build flight to a growing community of first time hobbyists and future aviation engineers and pilots. This growth, along with our major influence on the hobby in general, has propelled us to create the *Flite Test Community Association.* A program designed to "Bring Hope to the Hobby" organizing our community to promote model aviation.

How it Works

FT STEM is a curriculum designed to supplement or create a program in an educational setting from kindergarten to high school promoting a broad array of engineering and future aviation careers. As a supplemental option, educators can pull specific elements from the curriculum to meet the needs of their classroom. The following overview is a suggested and recommended approach based on the input from teachers developing and currently using the curriculum. The overview is the big picture of the curriculum and for its implementation as a school course option. Educators and students are encouraged to use the following amenities from the FT STEM interactive site;

- Online Teacher and Student Hangars
- Over 100 foundational lessons, lesson creator for teachers, and ability to assign lessons to students.
- Teacher grading portal of student submitted design projects.
- Teacher and student resource bank of Flite Test articles, How to videos, drawing files, and more.
- Student Online design project creator.

Over 1500 Teachers

Meets National Standards

Over 3,000 Students

STANDARDS ALIGNMENT

FT STEM aligns its curriculum with standards that are nationally known and that can be easily adopted or modified by educational programs. Having a heavy emphasis on engineering and critical thinking, a majority of the curriculum is aligned with ISTE *(International Society for Technology in Education)*.

Others include Next Generation Science Standards, Science and Engineering Standards of NSTA, National Council of Teacher Mathematics Standards, and National Career and Technical Education Standards.

International Society For Technology in Education

1. Empowered Learner - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences. (1B, 1C, 1D) *See ISTE Video Playlist Connection*
2. Digital Citizenship - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. (2B, 2C) *See ISTE Video Playlist Connection*
3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. (3A, 3B, 3C, 3D) *See ISTE Video Playlist Connection*
4. Innovate Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. (4A, 4B, 4C, 4D) *See ISTE Video Playlist Connection*
5. Global Collaborator - Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. (7B, 7C, 7D) *See ISTE Video Playlist Connection*

(2021) ISTE - https://www.iste.org/standards/for-students

National Career and Technology Standards (Career STEM Clusters)

1. STEM Career Cluster-
    - Common Career Technical Core Standards with Performance Elements (ST 1, ST 2, ST 3)
    - Knowledge and Skills Statements (SCC02, SCC03, SCC04, SCC06, SCC10)
    - Engineering and Technology Career Pathway (ST-ET 1, ST-ET 2, ST-ET 3, ST-ET 4, ST-ET 5)
    - Science and Math Career Pathway (ST-SM 1, ST-SM 4)

(2021) CTE - https://careertech.org/STEM

STANDARDS ALIGNMENT CONTINUED

Next Generation Science Standards

1. Engineering and Design - Systematic approach to solving problems. (HS-ETS 1, HS-ETS 2, HS-ETS 3, HS-ETS 4)
2. Energy - Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS3-3)
3. Motion and Stability- Forces and Interactions. (HS-PS 2)

(2021) NGSS https://www.nextgenscience.org

National Council of Teacher Mathematics Standards

1. Measurement - Understand measurable attributes of objects and the units, systems, and processes of measurement. Apply appropriate techniques, tools, and formulas to determine measurements.
2. Geometry - Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships. Specify locations and describe spatial relationships using coordinate geometry and other representational systems. Apply transformations and use symmetry to analyze mathematical situations. Use visualization , spatial reasoning, and geometric modeling to solve problems.
3. Data Analysis and Probability - Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them. Use appropriate statistical methods to analyze data Develop and evaluate inferences and predictions that are based on data. Understand and apply basic concepts of probability.
4. Algebra -Understand patterns, relations, and functions. Represent and analyze mathematical situations and structures using algebraic symbols. Use mathematical models to represent and understand quantitative relationship. Analyze change in various contexts.

(2021) www.nctm.org

STEMPATHY

Flite Test Takeaways

Soft skills include clear communication, teamwork, problem solving, flexibility and creative thinking, among others. Colleges of Engineering seek students who possess strong soft skills and who are willing to practice and grow in their personal development. Below are the major themes mentioned:

- Effective communication with colleagues and presenting ideas to foster product development.
- Ability to give and take constructive suggestions/criticisms.
- Willingness to learn and evolve as an individual and with the team.
- Ability to visualize a project's completion prior to its creation.
- Competitive approach and the confidence to solve any problem.
- Tech savvy with willingness to adapt to the change of technology.

The progress of product development requires students to be imaginative and creative to solve problems. Colleges and the engineering industry need students who have prior experience in Design Thinking to reduce "on the job training." Below is the desired basic Design Thinking process:

- Use information literacy to generate solutions for an identified problem.
- Work as a team with different viewpoints to develop multiple ideas.
- Use available technology to create a solution.
- Perform appropriate tests needed to finalize a product.

Colleges of Engineering seek students who have made an attempt to apply their learning in technology to support their engineering pathway. Below are tech skills praised by college reps during FT STEM prerequisite research:

- Design software such as Solidworks, Inventor and AutoCAD
- Programming and entry-level usage with embedded electronics
- Basic hand tool usage
- Fabrication Lab equipment usage i.e. laser cutters, 3D printers, CNC routers, soldering, etc.

OUR LEARNING STRANDS

Strand #1 - FT Workbench

The FT-Workbench is the foundational skill sets students need to acquire in order to successfully design, build, engineer, and fly content related projects. Curriculum lessons that teach these fundamentals should be chosen and assigned to students, see curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Flight Safety and Maintenance
- Basic FAA Rules and Regulation
- Fundamental Concepts of Flight
- Flite Test Build Techniques
- Power Plant and On-board Components
- Aircraft Design
- Fundamental Concepts of Design

STEMPATHY

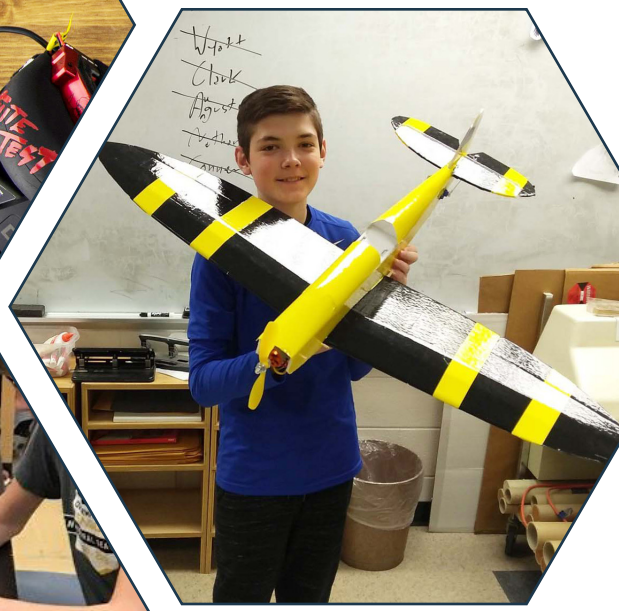
FT Workbench will see students learning to work in teams, putting into practice Design Thinking, and learning to build aircraft within Flite Test techniques.

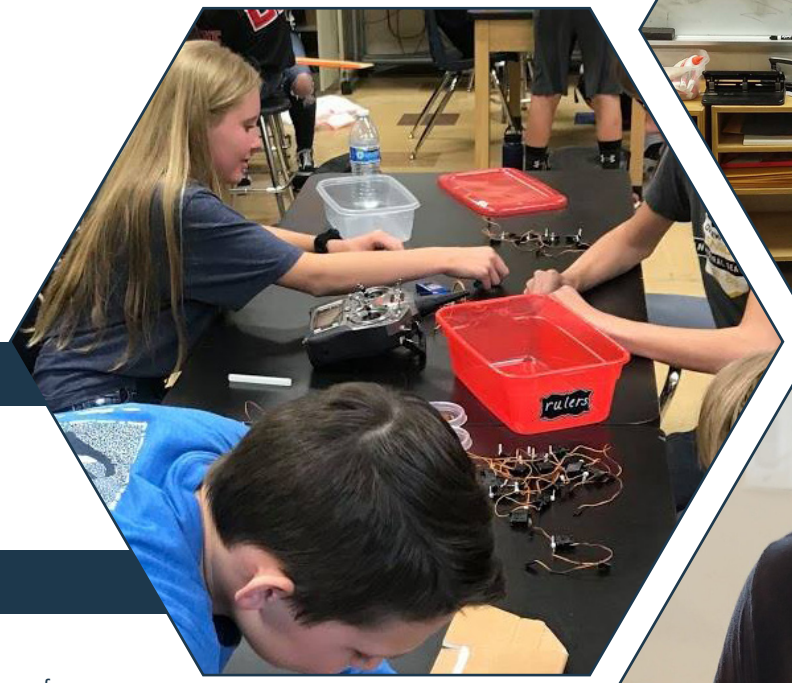
- Soft, Design, and Tech

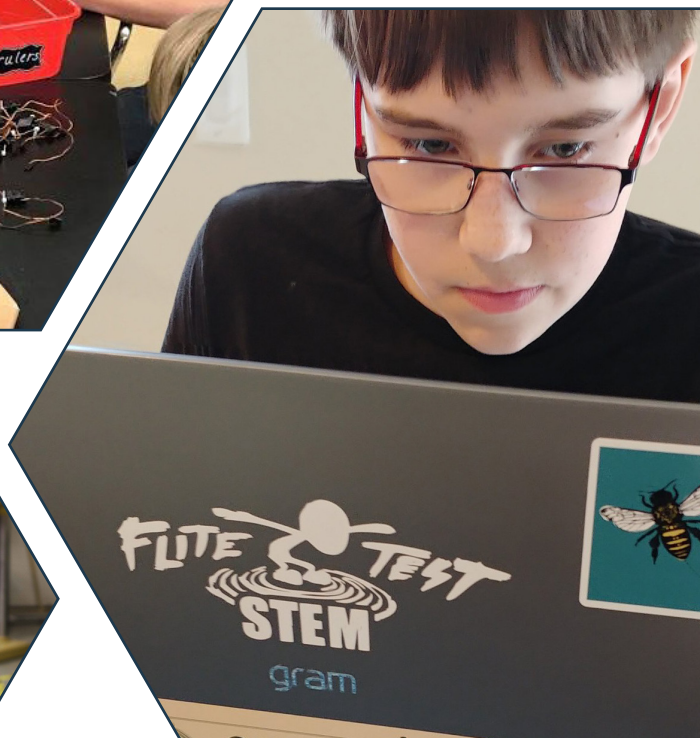
Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

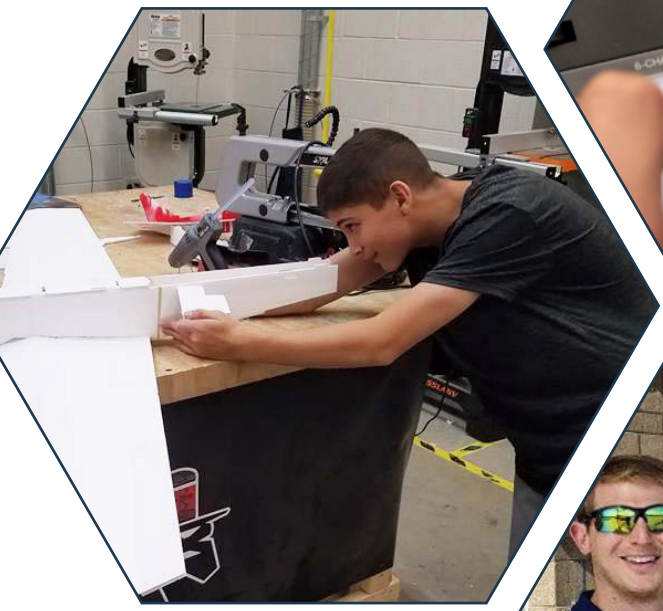
- FT Safety 5
- Intro to FAA Part 107
- Principles of Flight
- UAV Power Plant and Components
- Aircraft Design
- Design Communication
- Design Thinking







OUR LEARNING STRANDS



Strand #2 - Build to Fly

The Build to Fly strand exposes students to the construction and flight of Flite Test designed aircraft including free flight, power flight, and multirotors. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Multi-platform understanding
- Scratch Build Construction
- Power Systems
- Propulsion and Control Systems
- Radio Systems
- Flight Safety and Maintenance

STEMPATHY

Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

- Soft and Tech

Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Build to Fly Units

OUR LEARNING STRANDS

Strand #3 Inquiry and Design

Inquiry and Design challenges students to modify or change an existing Flite Test designed aircraft. Allowing for student practice within the engineering design model and integrating new aircraft design opportunities. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Scratch Build Safety
- Engineering Design Model Implementation
- Cont. Scratch Build Construction
- Aerodynamics and Design
- 2D and 3D CAD Integration
- Lab Fabrication and Manufacturing
- Flight Safety and Maintenance

STEMPATHY

Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

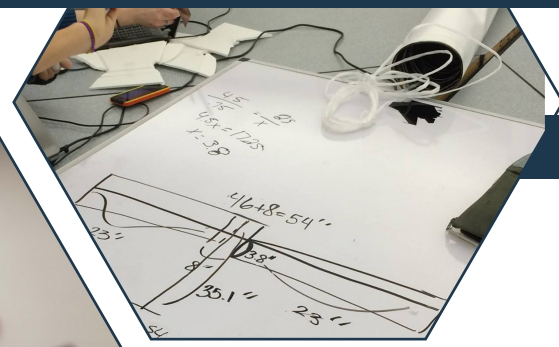
- Soft, Design, and Tech

Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Aircraft Design
- Design Communication
- Design Thinking
- Inquiry and Design Units

OUR LEARNING STRANDS



Strand #4 - Engineering and Design

Engineering and Design challenges students to research, design, create, and test a solution to a problem ranging for a simple aircraft design to solving a real world problem in the world of UAV. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Scratch Build Safety
- Engineering Design Model Implementation
- Product development through marketing and manufacturing
- Cont. build construction, aerodynamic design, and flight safety maintenance.
- 2D and 3D CAD Integration
- Lab Fabrication and Manufacturing
- Flight Safety and Maintenance

STEMPATHY

Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

- Soft, Design, and Tech

Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Aircraft Design
- Design Communication
- Design Thinking
- Engineering and Design Units

A CURRICULUM DESIGN EXAMPLE

Unit Planning

As an instructor, you know what is best for your classroom, and FT STEM is designed as your supplemental curriculum tool. Prior to purchasing, use the following Curriculum Overview to plan your FT STEM experience.

Example:

- **Grade**: High School
- **Subject**: Design Class (IT)
- **Unit**: Transportation
- **Timeline**: 4 Weeks
- **Objective**: Longest flight duration and use equipment from semester to semester
- **Teams**: Groups of 3

Unit Outline:

- **Safety** - FT STEM Take 5 - Basic Lab Rules
  - Battery Safety - Power Pack Safety and Charging
- **Flight Fundamentals** - Plane Physics - Student led research
- **Build 2 Fly** - Model chosen FT Simple Stick
  - Design challenge is to create a new wing using only 2 foam board pieces
- **Design Thinking** - Students document project using the Flite Test Design Notebook.
- **Final Testing and Design Notebook Submission**

Support:

Need help planning or you have completed your FT STEM experience and need guidance in purchasing the right equipment? Contact our awesome teacher support staff at support@ftstem.com and we can help.

If you are a seasoned pro and know exactly what you want, then please visit our store and find the latest Flite Test STEM products and prices by going to www.store.ftstem.com

SAMPLE HIGH SCHOOL SCHEDULES

Develop Based on Unit Plan

Your unit plan will determine the length of your ideal high school schedule. Depending on how many units you want to attempt will determine if your FT STEM experience is just that, a unit, a quarter, semester, or a year long class. Some institutions will build multiple year schedule progressions. Below is some basic schedule templates with topics taken from our curriculum overview.

4-6 Week Module:

- **Educational Platform**: Home School or integrated unit within an industrial technology or science course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Aircraft Design (Subject/Standard Connection), Build 2 Fly Flite Test Model, and Flight.

Quarterly:

- **Educational Platform**: Home School or integrated unit within an industrial technology or science course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Basic Design, Aircraft Design, Build 2 Fly Flite Test Model, Flight, Inquiry and Design, and Flight to test assigned design problem.

Semester:

- **Educational Platform**: Home School or Elective Course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Design, Aircraft Design, Build 2 Fly Flite Test Model, Flight, Engineering and Design, Flight to test assigned design problem.

Support:

Need help planning or you have completed your FT STEM experience and need guidance in purchasing the right equipment? Contact our awesome teacher support staff at support@ftstem.com and we can help.

If you are a seasoned pro and know exactly what you want, then please visit our store and find the latest Flite Test STEM products and prices by going to www.store.ftstem.com

CURRICULUM MAP

Unit	Learning Strand	Significant Concept(s)	National Standards	Time	Lesson/Product Application	Evidence of Outcomes
Safety	FT Workbench	Improvement in safety leads to improvement in productivity and a safer airspace. Longevity of a scratch build aircraft is dependent upon the understanding and safety of LiPo batteries.	ISTE Standards • Innovate Designer • Knowledge Constructor • Empowered Learner Career and Tech Education • STEM Cluster Standards NGSS Standards • Energy NCMT Standards • Algebra	1-2 weeks	Lesson 1: What is FT STEM? Lesson 2: FT-Safety 5 Lesson 3: Power Pack Safety Lesson 4: Power Pack Components Lesson 5: Power Pack Installment	Students will understand and execute the appropriate use of safety in construction and flying of aircraft. Students will understand the LiPo battery and its usage and safety when dealing with scratch build aircraft.
Power Systems	FT Workbench Build to Fly	Mechanical power acting as a component of propulsion.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner	1-2 Weeks	Lesson 1: Power Pack Safety Lesson 2: Power Pack Components Lesson 3: Power Pack Installment	Students will understand the usage and how the electronic components work with the construction of the FT-Power Pod and multirotor.
Design Thinking	FT Workbench Inquiry and Design Engineering and Design	Using a process of design makes for an improved product and function.	ISTE Standards • Knowledge Constructor • Innovate Designer Career and Tech Education • Stem Career Cluster NGSS Standards • Engineering and Design	1-2 Weeks	Lesson 1: Covering the EDM Lesson 2: Project Based on FT-EDM usage	Students will be able to achieve processes of engineering design, defining a problem, developing solutions and comparing solutions by testing them to see which best solves the problem.

Unit	Learning Strand	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Design	FT Workbench Inquiry and Design Engineering and Design	Computer Aided Design (CAD) or drafting ideas graphically results in solutions for problems.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner Career and Tech Education • Stem Career Cluster NGSS Standards • Engineering and Design NCMT Standards • Measurement • Geometry	2-4 Weeks	Lesson 1: Design Communication Lesson 2: Using CAD Software Lesson 3: Measurement Importance Lesson 4: Basics to Plane Design Lesson 5: Basics to Multirotor Design Lesson 6: Printing Layouts Lesson 7: Laser Cutting Lesson 8: Project Based Design Practice	Students will be able to CAD/draw an idea graphically on paper to communicate their understanding of measurement and basic aircraft design.
Aircraft Design	FT Workbench Inquiry and Design Engineering and Design	Understanding the different design elements that make up an aircraft supports future aircraft solutions.	ISTE Standards • Knowledge Constructor • Empowered Designer	2-4 Weeks	Lesson 1: Aircraft Types Lesson 2: Aspect Ratios Lesson 3: Wing Elements Lesson 4: Winglets Lesson 5: Empennage Design Lesson 6: Wing Loading Lesson 7: Thrust to Weight Ratio	Students will through a series of lessons learn about the different aircraft design choices associated with creating an aircraft to serving a specific function.
Part 107	FT Workbench	Understanding proper small unmanned aerial vehicle operating procedures can support a safer airspace being used in cooperation with general aviation.	ISTE Standards • Innovate Designer Career and Tech Education • Stem Career Cluster	2-3 weeks	Lesson 1: General UAV Operations Lesson 2: Sectional Charts Lesson 3: Weather Lesson 4: Airspace Lesson 5: Flight Planning	Students will understand the basic rules and regulations of the FAA Part 107 by conducting safe flying through the creation and testing of their DIY aircraft.
Flight & Part 107 Training	FT Workbench	Correct finger placement along with controlled stick movements translates to better performance in aircraft during flight.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner	Ongoing	Lesson 1: Flight Training Lesson 2: Part 107 Fundamentals Lesson 3: Flight Patterns	Students practice and understand how an R/C plane flies using the FT-Simulator.

Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Flight Fundamentals	FT Workbench	Given specific forces on an aerodynamically correct object can result in flight.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner Career and Tech Education • STEM Cluster Standards NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Geometry • Data Analysis and Probability	2-4 Weeks	Lesson 1: Physics Research Paper Plane Physics: • The Basics • Control Surfaces in Action • CG Importance • Airfoils • Wing Configurations • Aerobatics Multirotor Physics: • The Basics • Movement • Control Boards • Configurations • Aerobatics	Students will understand how basic flight aerodynamics work within their aircraft designs and builds.

Build to Fly	FT Workbench
	Build to Fly
		Precision in measurement and build techniques increases successful function of a product.	ISTE Standards
			• Knowledge Constructor
			• Innovate Designer
			• Empowered Learner
			Career and Tech Education
			• STEM Cluster Standards
				Ongoing	Lesson: Build 2 Fly
					Flite Test Aligned Build Kits Options;
					• Multiwing Configuration
					  • (EZ) Project BasiX
					  • (EZ) Project Starship
					  • (EZ) Project Jets (1 Week)
					• High-wing Concept
					  • (1) FT Trainer
					  • (2) FT Simple Cub
					  • (3) FT Simple Stick (1-3 weeks)
					• Flying Wing Concept
					  • (2) FT Versawing
					  • (3) FT Spear (1-3 weeks)
						Students will understand the basic scratch build approach to creating an FT-Aircraft and learning the different aircraft configurations to support future student designs in the later learning strands.
						
						LEVELS:
						FT Aircraft assessed based on build and flight characteristics.
						
						EZ
						Basic (1)
						Intermediate (2)
						Experience (3)

BASIC BUILD TO FLY ALIGNED DIY AIRCRAFT

Project EZ

FT Might Trainer

FT Simple Cub

FT Simple Stick

FT Versawing or Spear

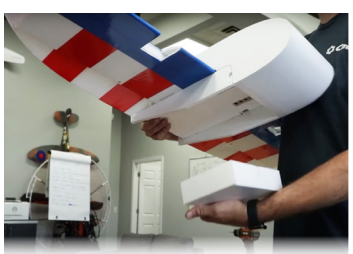
Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Inquiry and Design	FT Workbench Inquiry and Design	Altering a product can lead to new developments in its design and performance.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner • Digital Citizenship Career and Tech Education • STEM Cluster Standards NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Algebra • Geometry • Data Analysis and Probability	Ongoing	Lesson: Inquiry and Design • Students see CAD Vault within Online Hangar for drawing download. Flite Test Aligned Build Kits Options; • (2) FT Explorer Fuselage Length Concept (3-5 weeks)	Through discovery, students will be able to apply the Flite Test Fundamentals (Design, EDM and Build 2 Fly) to alter the designs of current aircraft build kits. LEVELS: FT Aircraft assessed based on build and flight characteristics. Beginner (1) Intermediate (2) Advanced (3)

INQUIRY AND DESIGN ALIGNED DIY AIRCRAFT

FT Explorer

Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Engineering and Design	FT Workbench Inquiry and Design Engineering and Design	Engineering new designs can lead to the development of new technologies.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner • Digital Citizenship Career and Tech Education • STEM Cluster Standards NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Algebra • Geometry • Data Analysis and Probability	Ongoing	Lesson 1: Engineering and Design Lesson 2: Simulated UAV Problems Flite Test Aligned Product Application: • FT Shield VTOL • FT STEM Online • FT EDM Student Design Brief Creator • FT-Foam Board • FT-Design Templates • FT-Crafty Kit • FT-Power Pack • FT-Electronics Kit • CAD Software • Fab Lab or Innovation Center	Students will be able to apply the Flite Test High School Fundamentals (Design, EDM, Build 2 Fly, Inquiry and Design) to the creation of new aircraft design or to solve a simulated UAV real world problem.

DIY UAV SIMULATED PROBLEM IDEAS



Project Shield VTOL

Medical Drop Aircraft

Agriculture Aircraft

Vertical Takeoff and LandingAircraft

Search and Rescue Aircraft

*This unit breakdown can be designed to start at the Middle School level and progress to the High School level. This potiential pathway progression only works if the school has aligned its STEM implementation by grade level. In an isolated case, a teacher can start the curriculum at any grade level with success. A school could also choose to use the Build to Fly Strand only and conduct build activities for the students. If your school has a specific engineering model that you need to follow, you can easily replace the FT-EDM implementation with your own to meet building or district standards.

Flite Test Design

Design, or the "The Process," as Flite Test calls it, is the foundation of the development of new technologies. Design is the driving force that forms our societies, and it guides how we see and process information, adapt to our surroundings, and communicate and solve problems. The design process leads us to plan, create and test as we push for constant progression in the workings of our lives.

Design is the bridge between creativity and innovation, and it is not in the hands of only a selected few, it is in all of us. It starts with the students sitting in your classroom. Your students could design the next big solution for our future. Let's give them a solid foundation for how to create and solve problems.

Flite Test design requires the use of the FT-Engineering Design Model (FT-EDM) as a tool, which provides the approach used to structure the research and analysis of problems, the development of possible solutions, creation, and the testing and evaluation of the solution.

The FT-Design Brief or student online project journal, will organize the students' journey through the process and can be used as an assessment tool for the educator and/or a portfolio option for students in the future to demonstrate their growth and content understanding.

FT Design Skill Sets	Description
Critical Thinking Skills	Students are pushed to apply critical thinking skills to identify and solve difficult problems through an orchestrated approach individually and collaboratively.
Communication	Students are expected to understand and express ideas using a variety of different communication techniques in a team environment.
Grit	Students' willingness to use scratch build aviation as a lens to approach problem-solving applications and explore different methods, ideas and strategies so they have an opportunity to present and defend their solutions.
Design Respect	With multiple opportunities to experience the design process, students will understand its contribution to academic, physical and emotional balance and a student's personal achievement.
Integrity	The act of creating an idea is highly valued. With integrity and honesty, students will utilize information to design technological solutions to problems in the correct academic manner.
Flite Test Values	Students will create lifelong relationships through scratch build aviation, producing higher student achievement due to an environment of belonging.

HS Design Cycle

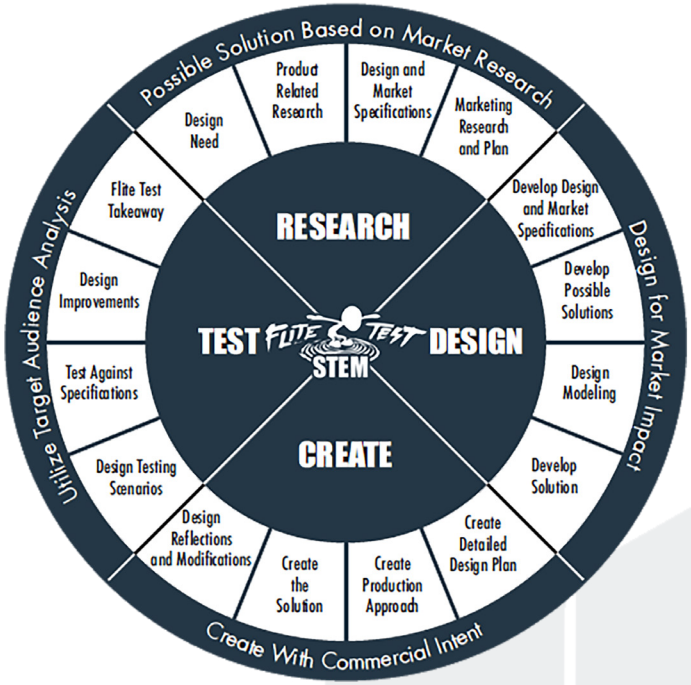
DIRECTION: The FT-EDM is designed to guide the students though the process of creating a solution. The student has free movement within the FT-EDM in order to achieve the best results. Students will not only use this method for solving Flite Test STEM Curriculum problems but should also be able to transfer this knowledge across subject areas and to real-life applications. Unlike the Elementary and Middle School level FT-EDMs, the HS FT-EDM incorporates the market lens and its influence on the product and how it should be designed.

RESEARCH: In this stage, the student identifies a design need, compares existing solutions while conducting research on alternative solutions, generates design and market specifications, and develops a plan based on market research. The research can be student-led or guided to help this initial stage.

DESIGN: After researching the necessary information to find a possible solution, students need to develop the design and marketing specifications to follow. They need to communicate their understanding of the problem by creating a series of sketches, drawings or physical models by following the steps traditionally taken in the aerospace industry (Concept Design, Preliminary Design, and Detailed Design). After analyzing all possible solutions, the student must choose one to justify and proceed to development.

CREATE: The student creates the solution using appropriate technology and strategies while following the developed design. It is important for the student to constantly reflect on the progress of their solution and to follow their Design Plan while noting any changes made to their overall solution.

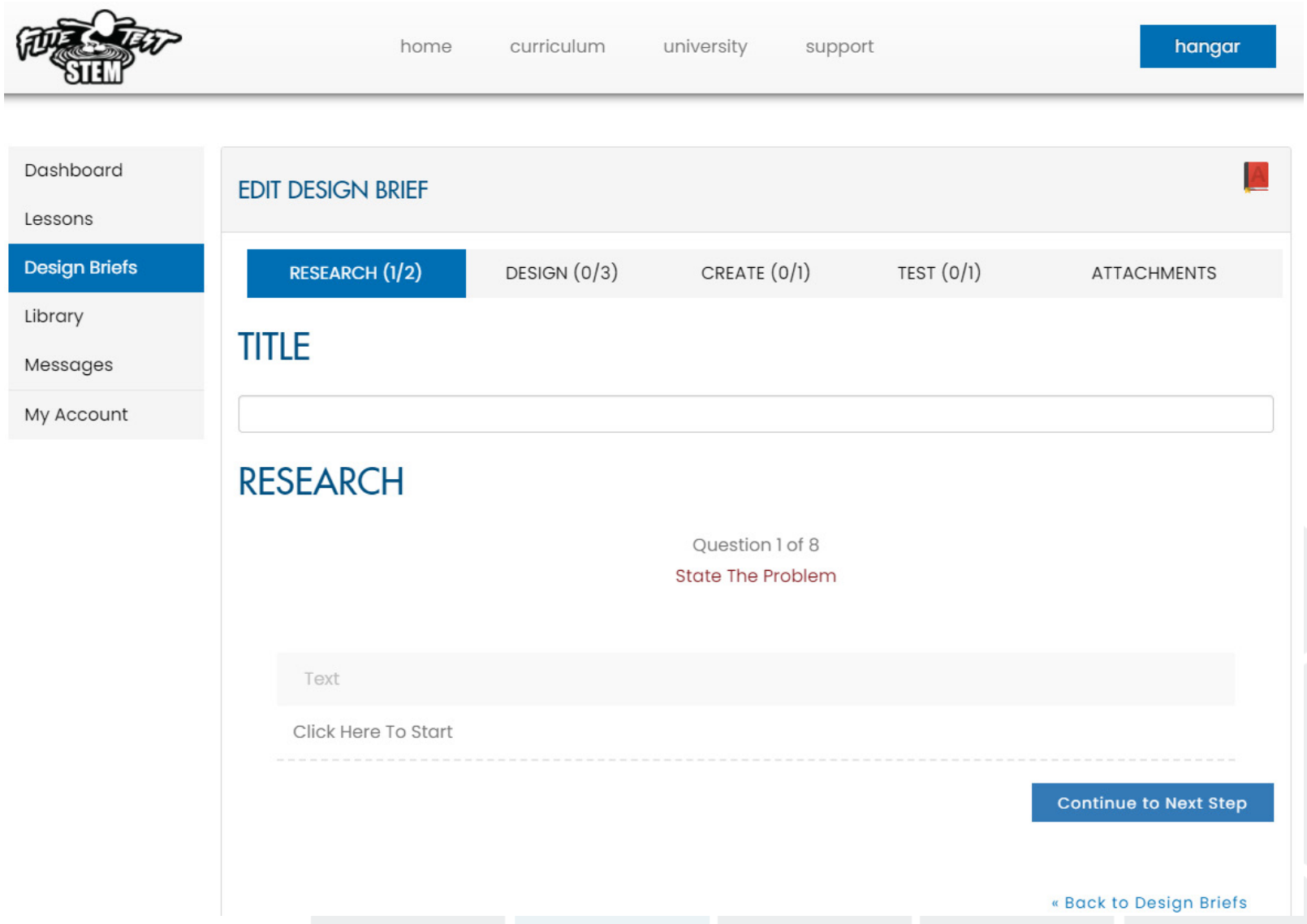
TEST: The final stage of producing a solution: putting the solution through a series of designed or assigned tests. The students will compare their solutions to others and suggest ways of improving their solutions while discussing the impact or takeaway from the project.



High School Flite Test Engineering Design Model (FT-EDM)

STUDENT DESIGN BRIEF "ENGINEER NOTEBOOK"

In the engineering field, a design brief "Engineering Notebook" is a written work for a design project developed by a single designer or design agency for a client. Design briefs organize the process that is followed to complete a product. Below is the online FT-Design Brief that high school students can use to solve a problem during the Inquiry/Engineering and Design Learning Strands. The FT-EDM Engineering Notebook can be used as a grading tool for conceptual understanding. Please see the rubric after the diagram below. This brief was also designed to take into account other STEM-related problem-solving applications. The High School EDM brief can be done electronically using the FT-STEM Online Student Hangar Option or printed and used as hard-copy.



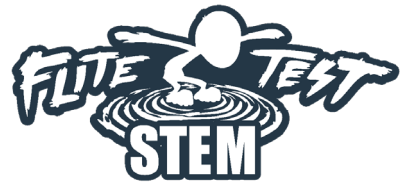
ASSESSING THE ENGINEERING NOTEBOOK

Below is a simple approach for assessing your students using the FT-EDM. This rubric can and should be adjusted to accommodate your school/district grading systems. No single grade level has to be assessed using the FT-EDM Engineering Notebook Rubric. However, by the end of each quarter or semester, a modified assessment or the one below should be used to show data of student achievement or growth. The FT-EDM can be used for every build the students complete. The instructor can decide how they would like to orchestrate this requirement.

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
RESEARCH	In this stage, the student identifies a design need, compares existing solutions while conducting research on alternative solutions, generates design and market specifications, and develops a plan based on market research. The research can be student-led or guided to help this initial stage.	**Advanced 5**	□ The student identifies the design need. □ The student generates design and market specifications if applicable. □ The student investigates resources needed for possible solutions. □ Research shows evidence of comparison to existing solutions. □ Student develops a plan based on market research.	
		Proficient 3–4	□ The student states the design need. □ The student somewhat presents the design need and applicable market specifications. □ The student attempts some research. □ The student attempts to use market research to develop a plan.	
		Partially Proficient 1–2	□ The student somewhat states the a need. □ The student attempts some research on possible solutions.	
		Non-Proficient 0	The student does not reach a level described above but has attempted to research a solution.	

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
DESIGN	After researching the necessary information to find a possible solution, students need to develop the design and marketing specifications to follow. They need to communicate their understanding of the problem by creating a series of sketches, drawings or physical models. After analyzing all possible solutions, the student must choose one to justify and proceed to development.	**Advanced 5**	□ The student develops a design and market specifications if applicable. □ The student generates a conceptual, preliminary, and detailed design of solution. □ The student generates a physical model for prototyping. □ The student chooses one solution to justify. □ The student chooses a drawing format to communicate the final solution idea.	
		Proficient 3–4	□ The student develops a design and market specifications if applicable. □ The student generates a solution sketch. □ The student attempts a physical model for prototyping. □ The student justifies a solution.	
		Partially Proficient 1–2	□ The student attempts to identify the Design Specs. □ The student has attempted a design.	
		Non-Proficient 0	The student does not reach a level described above.	
CREATE	The student creates the solution using appropriate technology and strategies while following the developed design. It is important for the student to constantly reflect on the progress of their solution and to follow their Design Plan while noting any changes made to their overall solution.	**Advanced 5**	□ The student expertly uses techniques and equipment. □ The student completes a good-quality product. □ The student follows design and market specifications. □ Students noted any changes to their overall solution. □ Student reflects on progress of product.	

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
CREATE (continued)		**Proficient 3–4**	□ The student uses appropriate techniques and equipment. □ The student completes product with appropriate quality. □ The student somewhat follows their design and market specifications. □ The student attempts to reflect on progress of product.	
		Partially Proficient 1–2	□ The student attempts to appropriately use techniques and equipment. □ The student attempts product.	
		Non-Proficient 0	The student does not reach a level described above.	
TEST	The final stage of producing a solution: putting the solution through a series of designed or assigned tests. The students will compare their solutions to others and suggest ways of improving their solutions while discussing the impact or takeaway from the project.	**Advanced 5**	□ The student appropriately tests their product conducting two or more testing scenarios. □ The student uses a targeted market audience to test the solution. □ The student evaluates their product performance. □ The student identifies methods for making improvements. □ Student discusses impact or takeaway from the project.	
		Proficient 3–4	□ The student tests their product. □ The student evaluates their product performance. □ The student somewhat discusses the impact or takeaway from the project.	
		Partially Proficient 1–2	□ The student tests their product. □ The student attempts a final testing response.	
		Non-Proficient 0	The student does not reach a level described above.	



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ELEVATE