FLITE TEST STEM

Flite Test STEM Curriculum
Science, Technology, Engineering and Mathematics

LOWER ELEMENTARY YEAR 2017-2018

ABOUT

Entertaining, Educating and Elevating the World of Flight!

Flite Test was created for people passionate about flight. Our show 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. The show 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. It has 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.

Making and Impact

As of 2017, FT STEM has over 1,000 enrolled students and teachers and is currently being adopted across the country and in Europe in over 300 schools. Through the growth and success of the curriculum, Flite Test has been able to develop a funding program called the "Help Schools Take Flight Initiative" that will reach over 10,000 dollars this year through the sale of FT STEM student engineered products going back into schools. Please visit www.ftstem.com for more information about our impact and what FT STEM can do for your classroom.

How it Works

FT STEM is a curriculum designed to supplement an educational setting from kindergarten to high school with a fully supported online store. As a supplemental option, educators can pull specific elements from the curriculum to meet the needs of their students. 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 80 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.

DISCLAIMER: All Flite Test STEM-related products are intended for educational purposes only and should only be used under the supervision of an adult. Teachers and parents will be the judge of whether a student is developmentally mature enough for safe use of a certain product or activity.

DEFINING TABLE OF CONTENTS

PAGE/TITLE	DEFINITION
PAGE 4 - Learning Strands	Learning Strands outline the skills students are expected to know and be able to do at specific stages of the FT STEM Curriculum. Learning Strands describe educational objectives such as the skills students should have learned by the end of a course or grade level/span. They do not describe any particular teaching practice.
PAGES 5 - Schedules & Strategies	For curriculum implementation ideas, we took feedback from our FT STEM cohort and developed a basic schedule and implementation strategies that a teacher could use. By no means this is the ONLY WAY, these suggestions simply lay a foundation for the curriculum's use.
PAGES 6-9 / Curriculum Map	Unit by unit, associated standards and resources, all mapped out for an educator needing to see the big picture of what and how the curriculum is laid out.
PAGES 10-11 / Engineering Design Model	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.
PAGES 12-13 / Design Brief and Assessment	Student Design Brief explanation and how to assess their work process of using it.

LEARNING STRANDS

FT-Workbench	Build 2 Fly	Inquiry and Design	Engineering and Design
The FT-Workbench is the foundational skill sets students need to acquire in order to successfully design, build, engineer, and fly content related projects. See curriculum map for alignment. Curriculum Skills Sets: • Scratch Build Safety • Flight Safety and Maintenance • Fundamental Concepts of Flight • Fundamentals Concepts of Design • Engineering Design Model Implementation	Build 2 Fly exposes students to the construction and flight of Flite Test designed aircraft including free flight, power flight, and multirotors. See curriculum map for alignment. Curriculum Skills Sets: • Scratch Build Safety • Scratch Build Construction • Power Systems • Propulsion and Control Systems • Radio Systems • Flight Safety and Maintenance	Inquiry and Design challenges students to modify or change an existing Flite Test designed aircraft. Allowing for student practice within the engineering design model. See curriculum map for alignment. Curriculum Skills Sets: • Scratch Build Safety • Engineering Design Model Implementation • Cont. Scratch Build Construction • Aerodynamics and Design • Flight Safety and Maintenance	Engineering and Design challenges students to research, design, create, and test a solution to a problem through the lens of aviation. See curriculum map for alignment. Curriculum Skills Sets: • Scratch Build Safety • Engineering Design Model Implementation • Product development through marketing and manufacturing • Cont. build construction, aerodynamic design, and flight safety maintenance.
Curriculum Resources			

• FT STEM interactive Online site for Workbench assigned lessons and Teacher/Student Hangars
• FT-5 Point Safety Unit
• Fundamentals to Flight Unit/Lessons
• Fundamentals to Design Unit/Lessons
• Fundamentals to the FT STEM Engineering and Design Model
• Power Systems Unit/Lessons
	• FT STEM interactive Online site and store for quick reference to Flight Test;
	  • Grade Level Assigned Aircraft
	  • Aircraft Associated Power Packs
	  • Aircraft Build Videos
	  • Aircraft Performance Videos
	• FT-5 Point Safety Unit
	• Power Systems Unit/Lessons
		• FT STEM interactive Online site for the following;
		  • Grade Level Aircraft Options
		  • Engineering and Design Model/ Online Student Design Brief Creator
		  • Fundamentals to Design Unit/ Lessons
		  • Aircraft Performance/Build Videos
		  • Aircraft PDF/CAD files
			• FT STEM interactive Online site for the following;
			  • Engineering and Design Model/ Online Student Design Brief Creator
			  • Fundamentals to Design Unit/ Lessons
			  • Aircraft PDF/CAD files

Recommended Equipment			
• FT-Crafty Kit/Foam Board/Working Mats • Great Planes Real Flight Simulator • See Curriculum Map below for unit/lesson recommended consumables. See store for purchasing options	• FT-Crafty Kit/Working Mats • Transmitter and Receiver • Great Planes Real Flight Simulator • See Curriculum Map below for recommended aircraft consumables and equipment. See store for purchasing options	• FT-Crafty Kit/Foam Board/Working Mats • Transmitter and Receiver, assortment of Power Packs • See Curriculum Map below for recommended aircraft/multirotor and associated power pack products for modification. See store for purchasing options	• Consumables and equipment dependent on proposed project. See store for purchasing options

SUGGESTED SCHEDULES

The Right Fit

Based on input from our top FT STEM schools, we have created a possible schedule that could be adopted by your classroom environment. Based on our Learning Strands, the ultimate goal is to have your students learn and promote themselves over the course of the year and to achieve the highest strand, "Engineering and Design." We know that not all FT STEM curriculum implementations are the same, from a one week curriculum use to a fully CTE accredited course, we have seen it all and would love to help you, please contact support@ftstem.com for a free consultation.

Implementation Strategies

The execution of the curriculum is based on the educators' classroom management approach. The FT-STEM classroom solution promotes the students' complete immersion into the curriculum. The students should receive the FT-Workbench Fundamentals each week throughout the semester/year while working on the building, the testing or the engineering of scratch build aircraft. This approach fosters natural student inquiry in the content of the class, from learning and applying the fundamentals, to generating questions from firsthand experiences. This keeps the students moving and motivated, fostering a natural differentiation of the curriculum for the students even if each student works at a different pace and project. Assessments can be accomplished by grading each student on a design brief per project, participation or portfolio for review at the end of the semester.

OPTION: Semester Schedules

This option is perfect for a school that has multiple classes at the K-3 grade levels. After the first semester, the curriculum and FT-equipment can be passed on to another teacher for the second semester.

The week's lessons should scaffold and progress over time. The curriculum ACTIVITIES can be chosen for the assigned days and are provided in the pages attached. FLITE TEST means time given to the students to conduct either their Build 2 Fly, Inquiry and Design or Engineering and Design models. Due to weather conditions for flight, these days can be switched around, leaving one day off for flexibility. Having the curriculum run 2 to 3 days per week during an hour block seems to be the best fit.

DAYS	ACTIVITIES
Monday	FT EDM/Design/Workbench Skills
Wednesday	Optional Flex Day
Friday	Flite Test

MONTHS	FT-STRANDS ATTAINED
1	FT-Workbench/Build 2 Fly
2	FT-Workbench/Build 2 Fly/Inquiry and Design
3	Build 2 Fly/Inquiry/Engineering and Design
4	Inquiry/Engineering and Design

IMPORTANT: Any classroom environment conducting this curriculum should house a first aid kit and perform safety procedures prior to starting coursework.

CURRICULUM MAP

Unit	Unit Question	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Intro Unit Scratch Build Safety	How does safety help produce a quality worker?	Improvement in safety leads to improvement in productivity.	The following National Standard Groupings of STEM will be implemented in this module. • Next Generation Science Standards • International Society for Technology in Education Standards • Science and Engineering Standards of NSTA • National Council of Teacher Mathematics Standards	• 1 week • NOTE: It is advised to revisit safety procedures periodically throughout each project.	Lesson: Introduction and Flite Test the Room! Resources: • FT-STEM Online • FT-Safety Posters • FT-Crafty Kits	Students will understand and execute the safety in construction and flying of aircraft.
Fundamentals 2 Design	How can I use drawings to communicate, create and solve problems?	Drafting ideas graphically enables solutions for problems.	SCIENCE AND ENGINEERING PRACTICES NEXT GENERATION SCIENCE STANDARDS Develop a simple sketch, drawing or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-2 NATIONAL COUNCIL OF TEACHER MATHEMATICS STANDARDS MEASUREMENT • Understand how to measure using nonstandard and standard units. • Select an appropriate unit and tool for the attribute being measured. NUMBERS AND OPERATIONS Understand and represent commonly used fractions such as 1/4, 1/3 and 1/2. GEOMETRY Recognize, name, build, draw, compare and sort two- and three-dimensional shapes.	• 1-2 Weeks • NOTE: Design would then be used throughout the semester or school year.	Lesson: Mapping for Design Resources: • FT-STEM Online • FT-Design Paper Template • FT-Cub Design Guide	Students will be able to draw an idea graphically on paper to communicate their understanding of measurement and basic aircraft design.

Unit	Unit Question	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
FT-Engineering Design Model (FT-EDM)	How do we get better at solving problems?	Having a process for creating a product brings an idea to reality.	SCIENCE AND ENGINEERING PRACTICES NEXT GENERATION SCIENCE STANDARDS • Ask questions, make observations and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-1 • Analyze data from tests of two objects designed to solve the same problem in order to compare the strengths and weaknesses of how each performs. K-2-ETS1-3 FLITE TEST EDM CREATE STANDARDS 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 the solution.	• 1-2 Weeks • NOTE: EDM would then be used throughout the semester or school year.	Lesson: Transport the Gremlin Lesson 2: Ongoing EDM and Beyond Resources: • FT-STEM Online or • FT-EDM Level K–3 Templates • Level K–3 Design Brief	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.
Build 2 Fly FT-Cub	Why is a shoulder wing perfect for light aircraft designs?	Flight effects with high bearing wings.	FLITE TEST EDM CREATE STANDARDS 	1–2 hours a day for 2–4 days.	Lesson: Build 2 Fly Resouces: • FT-Cub Glider Build Kit • FT-Crafty Kit	Students will be able to create the specific glider build kit, which requires understanding the building process, preparing for flight, and testing of foam gliders.
Build 2 Fly FT-Spitfire	How does an elliptical wing minimize drag in a monoplane design?	Flight effects with low bearing wings.	FLITE TEST EDM CREATE STANDARDS 	1–2 hours a day for 2–4 days.	Lesson: Build 2 Fly Resources: • FT-Spitfire Glider Build Kit • FT-Crafty Kit	Students will be able to create the specific glider build kit, which requires understanding the building process, preparing for flight, and testing of foam gliders.

Unit	Unit Question	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Build 2 Fly FT-Raptor	How does a trapezoidal wing create high performance in an aircraft?	Flight effects of mulitple triangular wings.	FLITE TEST EDM CREATE STANDARDS 	1–2 hours a day for 2–4 days.	Lesson: Build 2 Fly Resources: • FT-Raptor Glider Build Kit • FT-Crafty Kit	Students will be able to create the specific glider build kit, which requires understanding the building process, preparing for flight, and testing of foam gliders.
Build 2 Fly FT-Eurofighter	What are the design advantages of the Delta wing?	Flight effects of delta shape wings.	FLITE TEST EDM CREATE STANDARDS 	1–2 hours a day for 2–4 days.	Lesson: Build 2 Fly Resources: • FT-Eurofighter Glider Build Kit • FT-Crafty Kit	Students will be able to create the specific glider build kit, which requires understanding the building process, preparing for flight, and testing of foam gliders.
Inquiry and Design	What are the effects on performance when designs are altered?	Altering a product can lead to new developments in its design and performance.	SCIENCE AND ENGINEERING PRACTICES NEXT GENERATION SCIENCE STANDARDS K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3 INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION ISTE STANDARDS FOR STUDENTS • Creativity and Innovation • Research and Information Literacy • Critical Thinking, Problem Solving and Decision Making • Technology Operations and Concepts NATIONAL COUNCIL OF TEACHER MATHEMATICS STANDARDS Measurement, Number and Operations, and Geometry FLITE TEST EDM STANDARDS Research, Design, Create, Test	Dependent upon educator/advisor usage	Lesson: Inquiry and Design Resources: • FT STEM Online • FT EDM Student Design Brief Creator • All FT-Glider Build Kits • FT-Crafty Kit • FT-Foam Board • FT-Design Templates of Aircraft	Through discovery, students will be able to put into practice the Flite Test Level K–3 Fundamentals (Design, EDM, and Build 2 Fly) to alter the designs of current aircraft build kits.

Unit	Unit Question	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Engineering and Design	Does what I create define me?	Engineering new designs can lead to the development of new technologies.	SCIENCE AND ENGINEERING PRACTICES NEXT GENERATION SCIENCE STANDARDS K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3 INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION ISTE STANDARDS FOR STUDENTS • Creativity and Innovation • Research and Information Literacy • Critical Thinking, Problem Solving and Decision Making • Technology Operations and Concepts NATIONAL COUNCIL OF TEACHER MATHEMATICS STANDARDS Measurement, Number and Operations, and Geometry FLITE TEST EDM STANDARDS Research, Design, Create, Test	Dependent upon educator/advisor usage	Lesson: Engineering and Design Product Application: • FT STEM Online • FT EDM Student Design Brief Creator • All FT-Glider Build Kit Parts • FT-Crafty Kit • FT-Foam Board • FT-Design Templates	Students will be able to apply the Flite Test Level K–3 Fundamentals (Design, EDM, Build 2 Fly, Inquiry and Design) to the creation of new aircraft design.

*The following unit breakdown can be designed to start at the K–3 level and progress to grade 6. This linear 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 2 Fly Strand only and build activities for the students. If a school has a specific engineering model that they have to follow, they can easily replace the FT-EDM implementation with their own to meet building or district standards.

LE ENGINEERING DESIGN

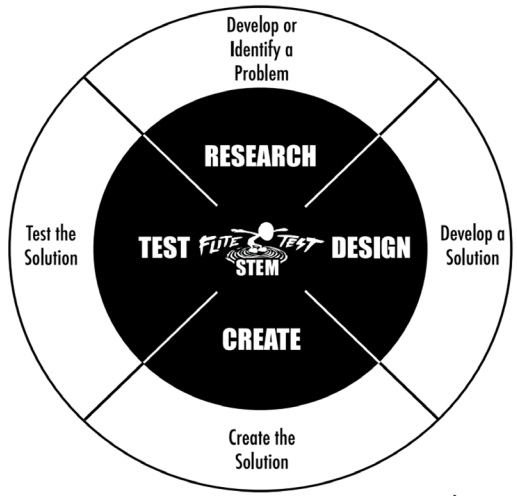
FLITE TEST DESIGN

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.



Level K-3 Flite Test Engineering Design Model

FT-EDM (ENGINEERING DESIGN MODEL) LEVEL K-3

DIRECTION: The FT-EDM is designed to guide the students through 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 contents and to real life applications.

RESEARCH: In this stage, the student is given a problem to identify, and in special circumstances, a student can develop his or her own problem. The student is guided with research and initial introduction of possible solutions.

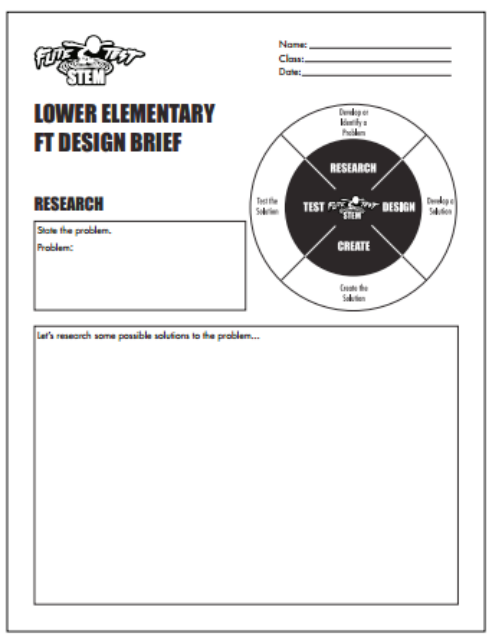
DESIGN: After the students research possible solutions for the problem, they then need to communicate their understanding of the problem by creating sketches, drawings or physical models. After analyzing all possible solutions, the student must choose one to justify, and then continue on with the process.

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.

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 identify methods for improving their solution.

STUDENT DESIGN BRIEF

In the engineering field, a design brief 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 modified FT-Design Brief K–3 students will use to solve a problem during the Inquiry/Engineering and Design phases. The FT-EDM Design Brief can be used as a grading tool for concept understanding. Please see the rubric after the diagram below. This brief was also designed to take into account other STEM-related problem-solving applications.


Name: _____
Class: _____
Date: _____

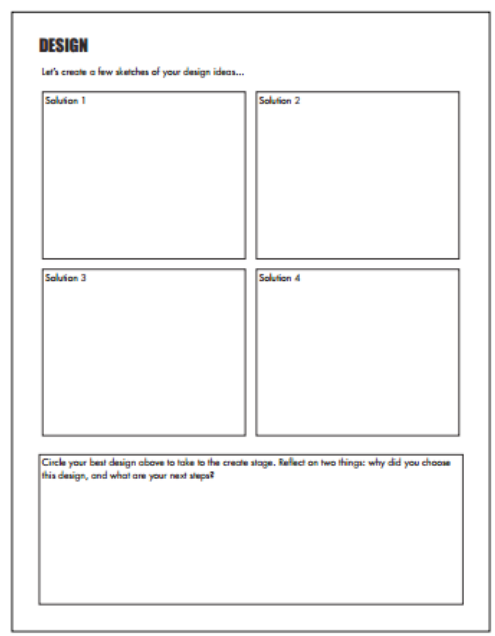
LOWER ELEMENTARY FT DESIGN BRIEF

Develop or Identify a Problem
RESEARCH
DESIGN
CREATE
Create the Solution
Test the Solution
Develop a Solution
TEST

RESEARCH

State the problem.
Problem:

Let's research some possible solutions to the problem...


DESIGN

Let's create a few sketches of your design ideas...

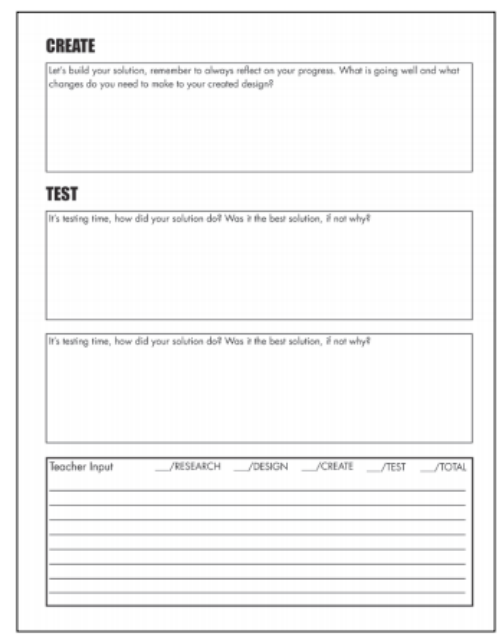
Solution 1

Solution 2

Solution 3

Solution 4

Circle your best design above to take to the create stage. Reflect on two things: why did you choose this design, and what are your next steps?


CREATE

Let's build your solution, remember to always reflect on your progress. What is going well and what changes do you need to make to your created design?

TEST

It's testing time, how did your solution do? Was it the best solution, if not why?

It's testing time, how did your solution do? Was it the best solution, if not why?

Teacher Input ___/RESEARCH ___/DESIGN ___/CREATE ___/TEST ___/TOTAL

FT-EDM ASSESSMENT

Using the Design Brief as an Assessment Tool to Measure Achievement:
Below is a simple approach for assessing your students against the 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 EDM Design Brief Rubric. In fact, we encourage the K–3 students to simply get a handle on how to use the EDM. It might be a good idea to assess students using the provided rubric by the time the students reach grade level 3.

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
RESEARCH	In this stage, the student is given a problem to identify, and in special circumstances, a student can develop his or her own problem. The student is guided with research and initial introduction of possible solutions.	Advanced 3	□ The student states the problem. □ The student investigates the problem. □ Student responses have appropriate handwriting and spelling.	
		Proficient 2	□ The student states the problem. □ The student investigates the problem.	
		Partially Proficient 1	The student somewhat states the problem.	
		Non-Proficient 0	The student does not reach a level described above.	
DESIGN	After the students research possible solutions for the problem, they then need to communicate their understanding of the problem by creating sketches, drawings or physical models. After analyzing all possible solutions, the student must choose one to justify, and then continue on with the process.	Advanced 3	□ The student generates the assigned amount of ideas___. □ The student chooses one design to justify. □ Student describes their next steps.	
		Proficient 2	□ The student created a design. □ The student chooses one design to justify.	
		Partially Proficient 1	The student has attempted a design.	
		Non-Proficient 0	The student does not reach a level described above.	

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
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 the solution.	Advanced 3	□ The student expertly uses techniques and equipment. □ The student completes product with appropriate quality. □ Student reflects on progress of product.	
		Proficient 2	□ The student uses appropriate techniques and equipment. □ The student completes product with good quality.	
		Partially Proficient 1	□ 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 is putting your solution through a series of designed or assigned tests. The students will compare their solutions to others and identify methods for improving their solution.	Advanced 3	□ The student appropriately tests their product. □ The student evaluates their product performance. □ The student identifies methods for making improvements.	
		Proficient 2	□ The student tests their product. □ The student evaluates their product performance.	
		Partially Proficient 1	The student tests their product.	
		Non-Proficient 0	The student does not reach a level described above.