5th Grade STEM Outclass
Overview
2022 - 2023

This document is designed to provide parents/guardians/community an overview of the curriculum taught in the FBISD classroom. This document supports families in understanding the learning goals for the course, and how students will demonstrate what they know and are able to do. The overview offers suggestions or possibilities to reinforce learning at home.

Included at the end of this document, you will find:
- A glossary of curriculum components
- The content area instructional model
- Parent resources for this content area

To advance to a particular grading period, click on a link below.
- Grading Period 1
- Grading Period 2
- Grading Period 3
- Grading Period 4

Process Standards

The process standards describe ways in which students are expected to engage in the content. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use knowledge learned efficiently and effectively in daily life.

TA1.A create original products using a variety of resources

TA4.B collect, analyze, and represent data to solve problems using tools such as word processing, databases, spreadsheets, graphic organizers, charts, multimedia, simulations, models, and programming languages;

TA5.A adhere to acceptable use policies reflecting positive social behavior in the digital environment

TA5.C abide by copyright law and the Fair Use Guidelines for Educational Multimedia

TA5.D protect and honor the individual privacy of oneself and others

TA5.E follow the rules of digital etiquette

TA5.F practice safe, legal, and responsible use of information and technology

TA5.G comply with fair use guidelines and digital safety rules

M5.1A: apply mathematics to problems arising in everyday life, society, and the workplace

M5.1B: use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution

M5.1C: select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems

M5.1F : analyze mathematical relationships to connect and communicate mathematical ideas

M5.7A: solve problems by calculating conversions within a measurement system, customary or metric

M5.9A: represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots

Grading Period 1
Unit 1: Introduction to the STEM Lab
Estimated Date Range: August 10 – October 7
Estimated Time Frame: 4 Class Periods

Unit Overview:

In this unit, students will be introduced to STEM Outclass. They will learn and practice classroom routines, procedures, and safety guidelines. In-person, they will review proper use of iPads and how to log-on to the district network. Virtually, they will review proper use of devices and how to log-on to the district resources, as well as learn how to navigate through a variety of online resources that will be utilized for at home / online learning. Such resources include accessing the district's Learning Management System, Schoology and adding content to a Discussion Board in Schoology. They will practice skills that allow them to own their learning. Digital Citizenship, internet safety, and lab safety are taught in context with each lesson as required.

At home connections:
- Discuss ways your child can practice good digital citizenship when online at home.
- Have your child demonstrate how they upload items such as pictures or text to a discussion board in Schoology.

Concepts within Unit #1	Success Criteria for this concept
Concept #1: Routines, Procedures and Safety S5.1A	- Determine what safety practices must be followed in a variety of situations. - Follow the safety rules when conducting an investigation

Unit 2: Fundamentals of Computational Thinking
Estimated Date Range: August 10 – October 7
Estimated Time Frame: 4 Class Periods

Unit Overview:

In this unit students continue practicing computational thinking using iteration in algorithms. The concept of iteration, or repeated steps is first applied in coding and programming and then to the engineering design process.

Algorithms are a sequence of steps used to accomplish a task and solve problems. Students learn the fundamental skills of following directions using algorithms that are applied in everyday life, engineering design projects, coding and programming projects, as well as digital media. In this unit, students will engage with various online resources that promote using algorithms to solve problems.

Fifth graders continue to practice two types of iterations through coding and programming with more complexity.

Iteration or loops are a sequence of events that are repeated until conditions are met (or goal is reached). The three types of loops are;
- For loops – used for a predetermined sequence of events; the initial value is performed once and a count is taken after each iteration (example: move forward 2, repeat 6 times)
- Do loops – used to repeat a sequence until a known condition is met
- While loops – used in situations where we do not know how many times the loop is repeated beforehand.

The concept of iteration is applied to the engineering design process as students learn about conditional statements such as "if and then" and "repeat until" as they engineer products to solve problems with a culminating project that allows students to solve a problem by engineering a way make an object float that is denser than water. The math and science concepts of 5.5A and data collection Math 5.1A are embedded in the project.

At home connections:

- Have your child create a set of directions from one place to another. For example: Start in the kitchen – take 5 steps forward – turn right – enter the living room.
- Have students contribute solutions to a variety of problems around home. Talk about whether or not the proposed solutions would work or not. If the solution does not work, talk about why / why not.

Concepts within Unit # 2 **Link to TEKS**	Success Criteria for this concept
Concept #1: Using Algorithms to Solve Problems TAK.4A, TA4.B, S3.2E	- Create a variety of algorithms to solve a problem. - Students can practice using iterations (repeated steps) with loops through coding and programming.

Grading Period 2
Unit 3: Applying Computational Thinking with Algorithms
Estimated Date Range: October 11 – December 16
Estimated Time Frame: 8 Class Periods

Unit Overview:

Students will continue to develop the skills of following directions using algorithms that are applied in everyday life, engineering design projects, coding and programming projects as well as digital media.

5th grade students will continue to build on computational thinking to solve problems, but in this grading periods, students will be able to use algorithms to solve multi-step problems. Multi-step problems in coding / computer science are problems that will require more than one solution (coding block, algorithms, etc.) for it to function. Students will have opportunities to design, code, test and execute programs that corresponds to a set of specifications.

 In this unit, students are introduced to Functions. The purpose of functions:
- Allows programmers to group a set of instructions.
- Allows programmers to create a set of instructions that are re-useable throughout a project.
- Provides efficiency code in which one function block represents many "action" blocks.

In Scratch a function is created by using the "My Blocks" category and are represented/named by a "do something" (verb) action.
Examples of Functions being used in a programming environment could include:
- *Defining your own set of blocks in Scratch*
- *Creating an algorithm that represents different languages based on a number that is chosen. (ie: 1 = Hello, 2 = Bonjour, 3= Hola)*

In addition to the coding concepts, the idea of algorithms to solve multi-step problems is used in the Engineering Design Process. For example, the steps of the EDP can be thought of as individual algorithms. In this unit students will build structures that solve real-life problems.

Throughout the course of this unit, students will conduct observational investigations by building and testing structures. Students will have to identify information regarding a problem and explain the steps they will take towards solving the problem. As a reminder, the EDP is our reinforcement of following steps to solve a problem. (ie: algorithms)

The Science concept of Science 4.6A *differentiate among forms of energy, including mechanical, sound, electrical, light, and thermal* and *Math 5.1A: apply mathematics to problems arising in everyday life, society, and the workplace* will be the context in which we use the EDP.

At home connections:
- Have your child create a set of directions to do something. (ie: How to make a bed, making a sandwich, etc.)

Concepts within Unit # 3 **Link to TEKS**	Success Criteria for this concept
Concept #1: Building and Testing Structures TA4.A, S4.6A	- Use the Engineering Design Process to design, build and test their own energy efficient house. - Be a positive team member by using collaborative and communication skills.
Concept #2: Using Algorithms to Solve Multi-Step Problems. TA4.A	- Students can create algorithms that can solve multi-step problems. - Students can use functions within their algorithms to promote efficiency within their program.

Glossary of Curriculum Components

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TEKS – Texas Essential Knowledge and Skills (TEKS) are the state standards for what students should know and be able to do.

Unit Overview – The unit overview provides a brief description of the concepts covered in each unit.

Concept – A subtopic of the main topic of the unit.

Success Criteria—a description of what it looks like to be successful in this concept.

Competency—Standards-Based Grading communicates students' understanding of the Texas Essentials Knowledge and Skills (TEKS). Using the TEKS, teachers developed grade-level competencies to communicate student progress in the Standards-Based gradebook. The competencies are the same for each grade-level content area (i.e. 1st grade math) across the district. Teachers report students' progress on the competencies using learning progressions.
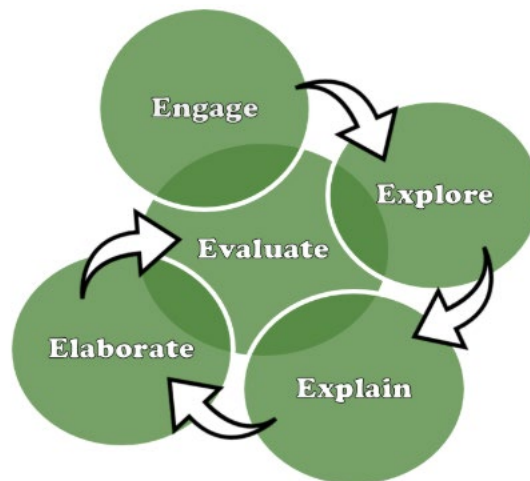
Parent Resources

The following resources provide parents with ideas to support students' understanding. For sites that are password protected, your child will receive log-in information through their campus.

Resource	How it supports parents and students
Code.org Course E	Code.org is a resource that students use throughout the year. This specific course is geared for 5th Graders. Click on the link to access the lessons.
Scratch	Scratch is a coding / computer science platform that helps students learn to think critically and creatively while also creating interactive media such as stories, games, and a variety of animations.
Engineering Design Process	Students will engage in using the Engineering Design Process when solving problems, working through building, and testing structures. The link provided shares information on the various stages of the Engineering Design Process.

Instructional Model

The structures, guidelines or model in which students engage in a particular content that ensures understanding of that content.

STEM Outclass uses the 5E Instructional model.

Engage: Teachers start the learning process by involving students in making connections between their past and present learning experience.

Explore: The teacher guides students as they perform hand-on investigations where scientific practices and process skills are used to ask questions, observe, predict, illustrate, and record.

Explain: The teacher guides students as they discuss the discoveries, they made during the Explore activity. Students will also make explicit connections between the Engage and Explore activities as well as the learning intentions of the concept.

Elaborate: Students apply what they have learned so far to new experiences in order to develop, extend, connect, and deepen their understanding. Students will also engage in alternative explorations and contrast new facts with prior knowledge.

Evaluate: Students reflect on the evidence provided of the new understandings of the concepts.

Grading Period 3
Unit 4: Exploring Patterns
Estimated Date Range: January 5 – March 10
Estimated Time Frame: 8 Class Periods

Unit Overview:

In this unit, fifth grade students will continue to develop their skills of using algorithms. However, in addition to solving multi-step problems with algorithms, students will now observe and identify patterns within their algorithms. Patterns in algorithms can either be either seen physically based on the movement of the sprite or it can be observed by the types of algorithms that are being used. Students will be able to look for patterns in addition to solving multi-step problems by interacting with a variety of tools such as Scratch, Lego WeDo, Code.Org and Dash Robot/Blockly.

In this unit, students are introduced to Nested Loops which are a type of Iteration. Nested Loops:
- o Are loops within loops
- o Are complex repetitions
- o Often take the shape of fractals
- o Utilizes a repeat loop inside of another repeat loop

As students continue to engage with using a variety of tools, they will need to be exposed to a variety of ways on how to draft, edit and publish products in different media both individually and in groups. Examples of publishing products could include using tools such as Word, PowerPoint, Scratch or WeVideo.

As the unit progresses, students will transition their learning from observing patterns in algorithms to observing the patterns in weather. Students will have opportunities to measure, record, graph and present weather information while identifying the patterns in the data. Students in 5th grade will be able to compile this data from a variety of locations while comparing the data.

Students will engage in the Engineering Design Process to address solutions to problems that various types of weather might bring. Students will also have opportunities to engage with digital media tools such as WeVideo to talk about the findings of their weather information.

The science concept of Science 4.8A- measure, record, and predict changes in weather and Math 5.1D- communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate will be the context that we use the Engineering Design Process in this unit.

At home connections:
- Have your child watch a local weather forecast and discuss the data included in the forecast.
- Have your child construct a wind vane and observe direction the wind is coming from or the direction it is blowing.

Concepts within Unit # 3 **Link to TEKS**	Success Criteria for this concept
Concept #1: Patterns in Our World TA2.A, S4.8A	• Students can use the Engineering Design Process to design and build a Floodgate. • Students can test and improve their floodgate design.
Concept #2: Making Predictions Using Patterns TA2.A, S4.8A	• Students will conduct research to discover which US cities receive the most rainfall. • Students will identify problems that these cities experience as a result of rainfall.

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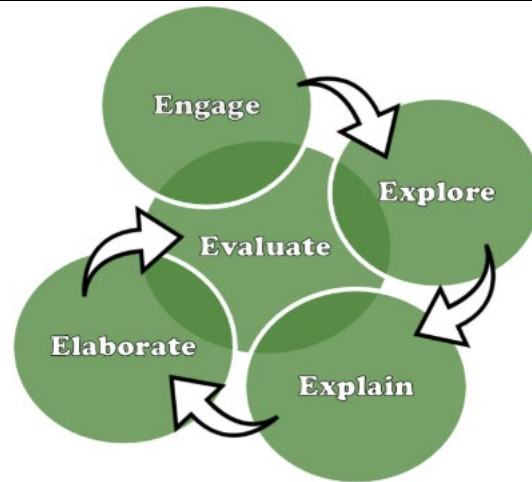
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Evaluate: Students reflect on the evidence provided of the new understandings of the concepts.

Grading Period 4
Unit 5: Designing and Building Original Programs
Estimated Date Range: March 20 – May 25
Estimated Time Frame: 7 Class Periods

Unit Overview:

In this unit, fifth grade students will continue to develop their skills of using algorithms. Up until now, students have learned how to explain how programs work, create a variety of animations and even include how to have multiple sprites interacting at the same time.

In this unit, students will work with the concept of randomization in their algorithms. In computer science, randomization is using algorithms that employ a degree of randomness as a part of the overall program.

Examples of randomization include:
Creating a random number generator
Creating a game with uncertain (random) conditions such as a ball bouncing off a corner and going in unpredictable directions.

As students continue to engage with using a variety of tools, they will need to be exposed to a variety of ways on how to draft, edit and publish products in different media both individually and in groups. Examples of publishing products could include using tools such as Word, PowerPoint, Scratch or WeVideo.

In this unit, students will investigate the science concepts of Science 5.9A - observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components and 5.9C - predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.
- o   Organisms interact with both living and nonliving elements to survive in their ecosystem.
- o   Living organisms, including humans, can change their environment.
- o   Changes to the environment made by organisms can affect other organisms.

Students will utilize the Engineering Design Process during this unit to solve environmental issues that occur in the natural world.

At home connections:
- Have your child observe how living organisms interact with nonliving elements in their environment.
- Provide your child with opportunities to predict how humans impact ecosystems and organisms.

Concepts within Unit # 3 **Link to TEKS**	Success Criteria for this concept
Concept #1: Environmental Solutions TA4.C, S5.9A, S5.9C	• Students can utilize the Engineering Design Process to solve an environmental issue facing the natural world. • Student can test and improve their designs based upon feedback.
Concept #2: Creating Original Programs TA4.C, S5.9A, S5.9C	• Students create a program using online programming tools to describe environmental changes that occur in the natural world.

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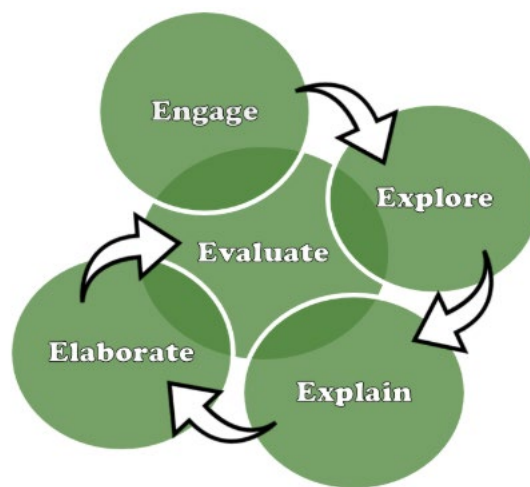
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