

## 4<sup>th</sup> 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

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

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

S4.2E: demonstrate that repeated investigations may increase the reliability of results

S4.6D: Design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism

M4.1A: apply mathematics to problems arising in everyday life, society and the workplace

M4.1B- 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

M4.1C- 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

M4.1D- communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate

M4.8B- convert measurements within the same measurement system, customary or metric, from a smaller unit into a larger unit or a larger unit into a smaller unit when given other equivalent measures represented in a table

## 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 <a href="#">Link to TEKS</a>	Success Criteria for this concept
Concept #1: Routines, Procedures and Safety S4.1A	<ul style="list-style-type: none"> <li>• Determine what safety practices must be followed in a variety of situations</li> <li>• Follow the safety rules when conducting an investigation</li> </ul>

### 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 to use computational thinking to learn about iteration using 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.

Fourth graders continue to practice two types of iterations, “for loops” and “do loops” through coding and programming. 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 to use force to move an object. The math and science concepts of force to learn the more mass an object has, the more force needed to move the object. 4.6D Science and data collection Math 4.1A 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.

<b>Concepts within Unit # 2</b> <a href="#">Link to TEKS</a>	<b>Success Criteria for this concept</b>
Concept #1: Using Algorithms to Solve Problems TAK.4A, TA4.B, S4.2E	<ul style="list-style-type: none"> <li>• Create an animation project in Scratch.</li> <li>• Use and create algorithms to solve a problem.</li> </ul>

## 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.

4<sup>th</sup> grade students will continue to build on computational thinking to solve problems, but in this grading period, 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 will also apply the concept of decomposition (breaking down a problem into smaller, more manageable parts) within creating algorithms and the Engineering Design Process. A common way of decomposing problems regardless of they are coding based or not is to start with then end in mind and in a sense, work backwards on the smaller tasks that make up the larger problem.

In this unit, students are introduced to “conditional statements” which are statements that only run under certain conditions. Examples of conditional statements include:

- *if/then*
- *when*
- *<, >, =*

Programming based Examples of Conditional Statements include:

- *IF a sprite in Scratch touches the edge of the plane, THEN it would turn around and walk a different direction.*
- *IF a sprite in Scratch touches a red circle, THEN the sprite would say “red”*
- *IF a number is > or = 2, THEN sprite would move forward.*

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. Students will demonstrate and observe how position and motion are changed by pushing and pulling objects using the EDP. 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 3.6B *demonstrate and observe how position and motion can be changed by pushing and pulling objects such as swings, balls, and wagons* and Math 4.1D: *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language is the context in which the EDP will be used.*

#### At home connections:

- Engage in fun at home “If/then” activities such as:
  - When parent snaps their fingers; students clap their hands.
  - When parent whistles, students snap their fingers.
- Find a variety of items at home that can be rolled, slid, or spun and compare the differences in how each item looks when moved.

<b>Concepts within Unit # 3</b> <a href="#">Link to TEKS</a>	<b>Success Criteria for this concept</b>
Concept #1: Using Algorithms to Solve Problems TA4.A, 3.6B	<ul style="list-style-type: none"> <li>• Students will use the Engineering Design Process to test the distance and accuracy of a launched object.</li> <li>• Students will be a positive team member by using collaboration and communication skills.</li> <li>• Create algorithms to write a program for a robot.</li> </ul>
Concept #2: Building and Testing Structures TA4.A, S3.6B	<ul style="list-style-type: none"> <li>• Students will use the Engineering Design Process to build and test catapults.</li> <li>• Design and build a basketball hoop / target</li> </ul>

**Glossary of Curriculum Components**

**Overview**– The content in this document provides an overview of the pacing and concepts covered in a subject for the year.

**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.

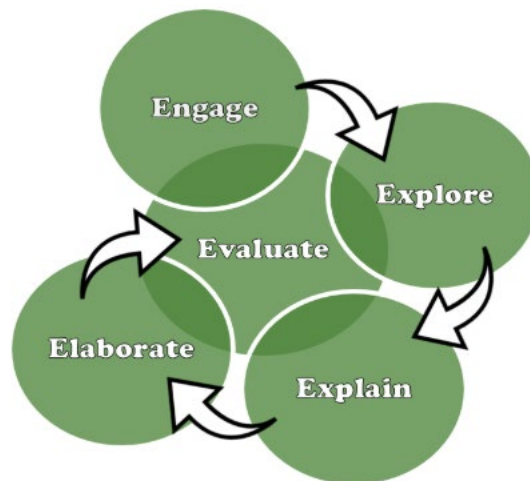
**Parent Resources**

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
<a href="#">Code.org Course E</a>	Code.org is a resource that students use throughout the year. This specific course is geared for 4 <sup>th</sup> Graders. Click on the link to access the lessons.
<a href="#">Scratch</a>	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.
<a href="#">Engineering Design Process</a>	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, fourth 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 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 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*

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 4<sup>th</sup> 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 3.8A- *observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation* and Math 4.1D- *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 use a thermometer to record the current temperature?
- Have your child observe daily weather conditions including temperature, wind direction and precipitation.

Concepts within Unit # 4 <a href="#">Link to TEKS</a>	Success Criteria for this concept
Concept #1: Making Predictions Using Patterns TA2.A, S3.8A	<ul style="list-style-type: none"> <li>• Students will research and record weather data about a city.</li> <li>• Student will use their data to create a PowerPoint about the weather in their city.</li> </ul>
Concept #2: Patterns in Our World TA2.A, S3.8A	<ul style="list-style-type: none"> <li>• Students will write a script for their weather forecast and create a video using WeVideo.</li> <li>• Student will program Dash to correct weather outcomes.</li> </ul>

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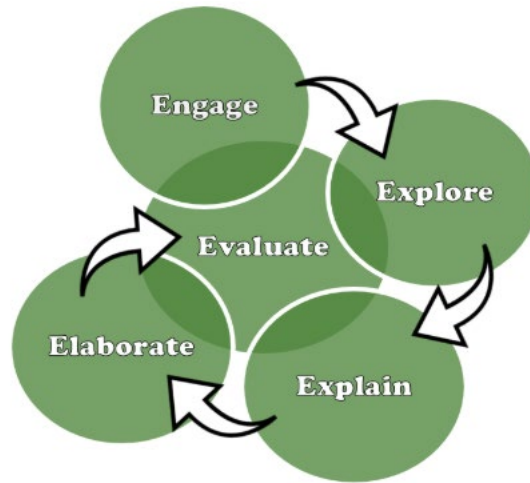


[Engineering Design Process](#)

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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, students will dive deeper with Functions in programming. 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 )
- Creating a predefined set of rules within a block
- Creating a generic formula that gives a percentage of a number.
- 

As students continue to engage with Scratch, the priority is to provide opportunities for students to engage in peer feedback / peer review. Teachers can engage in student-to-student feedback using a variety of tools such as Flipgrid, Schoology Discussion Board, etc.

Students will have the opportunity investigate the following science concepts under Science 3.9A - observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem and 3.9C - describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

- Environments have specific characteristics that provide food, water, air and protection to populations and communities of plants animals in an ecosystem.
- Changes in an environment can affect whether certain organisms can survive in the ecosystem.
- Environmental changes such as floods, droughts, or fires will cause some organisms to perish or move while allowing other organisms to thrive.

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 make observations about the physical characteristics of environments.
- Have your child describe how changes to the environment impact living organisms.

Concepts within Unit # 4

[Link to TEKS](#)

Success Criteria for this concept

Concept #1: Creating Original Programs TA4.C, S3.9A	<ul style="list-style-type: none"> <li>Students create a program using online programming tools to describe environmental changes that occur in the natural world.</li> </ul>
Concept #2: Environmental Solutions TA4.C, S3.9A	<ul style="list-style-type: none"> <li>Students can utilize the Engineering Design Process to solve an environmental issue facing the natural world.</li> </ul>

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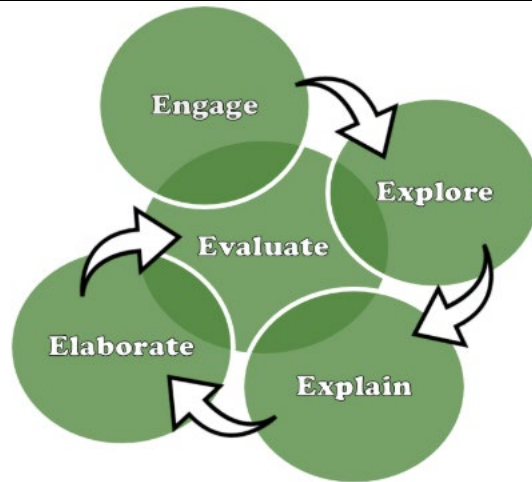
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