TCBOE
Talladega County Schools
#LeadingTheWay

Computational Thinking Pathway

Overarching CT Competencies K-12:

Data Collection and Analysis - the process of gathering, measuring, and interpreting information in order to answer a specific question or set of questions. Once the data collection process is complete, students must determine how to best represent the data (e.g. infographic, graph, table) in order to communicate an idea, relationship or argument

Algorithmic Thinking - involves creating a precise set of instructions that can be programmed. It includes the process of defining a problem and breaking it down into smaller, more manageable steps that can be solved individually. These step-by-step instructions and rules for solving problems must be executed in a particular order to solve the problem or complete a task. Once completed, these steps can be repeated to solve problems given the same scenario

Building Models (through Design Thinking, PBL, EDP) - A model is a representation of a physical, mathematical, or logical system or process. The model depicts the relationships between key components of the system or process and is used to simulate, assess, predict and comprehend outcomes.

Simulations are used to gain a better understanding of systems or processes. Simulations can predict what might happen without actually completing the system or process, in case it is dangerous, expensive, or difficult.

Abstraction - the process of identifying and representing only the most important parts of a system. When students order the steps of a process, sort things into categories, or any other technique to simplify a complex idea or system, they are creating an abstraction

Decomposition - the process of breaking a system down into its component parts. This is a necessary step to be able to abstract these parts by selecting the most important elements, sorting them into categories, and placing them in a structured order.

Resources By Grade Level:

Grade K:	Grade 3:	Grade 6:	Grades 9-12:
Grade 1:	Grade 4:	Grade 7:	
Grade 2:	Grade 5:	Grade 8:	

Grade K: *By the end of Grade K, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.)*	**Key Vocabulary** (*Students will KNOW / understand…)*	**What Does it Look Like in Class?** (*Students will be able to DO…)*	**Opportunities to Learn (Lessons, Resources, etc.)**
ALGORITHMIC THINKING				
DLCS 1. List the sequence of events required to solve problems. Examples: tying shoes, making a sandwich, brushing teeth.	I can identify the order of events related to a specific task. I can identify what comes next or if a step is out of order. I can tell the order of events for a specific task. I can identify what comes next for specific tasks. I can identify a step that is not in the correct order.	**Algorithm:** A precise sequence of instructions for processes that can be executed by a computer **Bug**: Part of a program that does not work correctly **Debugging**: Finding and fixing problems in an algorithm or program **Sequence -** To arrange in a particular order	**ELA** - Write informational or explanatory text, such as how-to articles - Create/draft outlines for writings or projects - Express a routine as a sequence of step-by-step instructions - Map or outline a story - Create decision trees **Math** - List the steps to solving math problems. -Determine when a task is not in the correct order. -Order a sequence of events. **Science/SS** - List steps for a process. - Create if/then statements for concepts. -Order a sequence of events related to an experiment.	https://www.kodable.com/ Students use basic coding skills to follow a sequence. Beebot Challenge Cards Lesson where students follow directions to get the Beebot from point A to point B. Nearpod Lesson: Room on the Broom Story sequencing. Seesaw: Sequence the Story Activity for story sequencing that can easily be assigned to students. Debugging: Unspotted Bugs A lesson to help students understand the step involved in debugging.

DATA COLLECTION AND ANALYSIS				
DLCS 10. Collect data and organize it in a chart or graph collaboratively.	I can work collaboratively to collect data and create graphs or charts. I can collect data using simple methods such as tally sheets, paper squares, voting. I can build simple graphs on paper. I can enter simple data into a spreadsheet.	**Graph:** something drawn or written. **Spreadsheet:** a piece of paper or a computer application for recording numerical or other data using rows and columns. **Data:** facts, figures, or other pieces of information that can be used to learn about something	**ELA** - Collect and organize data from books/stories. -Create charts/graphs based on information in a read aloud. -Participate in student polls on Seesaw. **Math** - Graph data from Counting Collections and calendar activities. - Use data to make simple predictions. -Participate in daily data discussions. **Science/SS** - Collect data for research projects. - Use data to discuss past events. - Create charts to help understand differences in holiday traditions.	ALEX Lesson Plan for Counting, Sorting, and Comparing Fuzz Bugs Students will use "Fuzz-Bugs-Counting, Sorting, & Comparing" from ABCYA to collect and organize data. SeeSaw- There are several graphing activities in the activities library. PBS Kids Graphing Activity Students will create a "Laugh-O-Graph" to collect and analyze data Nearpod Lesson- Pictographs Nearpod Lessons K-2 PBS Kids Curious George Graphing Students will be able to visually see a bar graph created as Curious George collects colored hats. Easily can be turned into a discussion about data collection.

DLCS 11. Describe how digital devices save information.	I can open saved work from a location such as a desktop folder or online storage. I can save work to a specified location such as desktop folder or online storage.	**Save-** to store information **Store-** to keep something for future use	**All Subjects** **-** Create an online portfolio where students are able to store classroom artifacts to share with peers and parents.	Google Classroom Use Google Classroom to assign student activities and teach them to save the information in the assignment area. Seesaw Students can use Seesaw to save a variety of media to an online student/class portfolio. ClassDojo Students can maintain an online portfolio that can easily be shared with parents. This app also is a great classroom management tool.
DESIGN THINKING				
DLCS 13. Use a design process in a guided setting to create an artifact or solve a problem.	I can find and present solutions to problems. I can use different ways to find solutions. I can test possible solutions. I can find and define problems in a given context or scenario such as story, video, in the classroom or school when given support and guidance from an adult. I can use multiple strategies to find solutions to a problem when given	**Define-** to say the meaning of something **Strategy-** a plan to solve a problem **Visualize-** to create an image in your mind **Perspective-** the way you see something **Pattern-** a repeated design **Cause-** why something happened	**ELA** - Create a story video using cause and effect. -Design puppets to help act out stories. -Plan and write a story with a partner. - Use FlipGrid to create and record stories. **Math** - Solve complex math problems using patterns observed. - Break down a large problem into smaller parts. - Create story problems. **Science/SS**	"Happy Maps" Beginning Algorithms Lesson Plan-Unplugged Create an algorithm to move a character through the maze. ALEX Digital Sock Puppets Lesson Plan for creating digital sock puppets Bee-Bot Ruler Students will design and create Bee-Bot mazes using measurement increments of the Bee-Bot codes and test them. Click on the link to print a ruler for students to use for

	support and guidance from an adult, such as visualizing, changing perspectives, finding patterns, stating cause and effect.	**Effect-** what happened	**-** Make a map of the school and find different locations. - Create simple machines. - Design a path and use code to program a robot to follow the path.	measuring. A Place in the ShadeAn Engineering Challenge- Students will design and create a shade for protection from the sun. Lego WeDo Lesson: Make a Pinwheel Students will create a pinwheel following directions in order to create a simple machine.

Grade 1: *By the end of Grade 1, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Classify and sort information into logical order with and without a computer. Examples: Sort by shape, color, or other attribute; sort A-Z.	I can identify various attributes/characteristics of items. I can sort items based on an identified attribute/ characteristic. I can identify various attributes of items. I can sort items based on an	**Attributes-** a characteristic of an item	**ELA** - Explore themes or main ideas. -Create diagrams, flow charts, and other graphic organizers and tools. - Classify and sort events in a story into the correct order. **Math** - Determine what information is important in a chart/graph.	Seesaw: Noun sort Students sort nouns Nearpod: Let's sort and classify Students will order numbers and sort shapes. Seesaw: Digraph Sort Digraph sort with ch, sh, and th.

	identified attribute.		-Sort and classify given information into a variety of charts/graphs. -Use a digital platform to sort and classify information collected from peers.	
ALGORITHMIC THINKING				
DLCS 2. Order events into a logical sequence or algorithm. Examples: Unplugged coding activities, sequence of instruction.	I can identify and put in order the sequence of events related to a task. I can determine when a part of a task is not in the correct order. I can observe a sequence of events to identify a problem. I can identify the correct sequence of events for a specific task. I can identify a part of a task that is in the incorrect order. I can identify a problem within a sequence of tasks.	**Sequence-** the action of following an order **Tasks-** a piece of work that needs to be done **Algorithm-** a step by step solution to a problem	**ELA** - Write informational or explanatory text, such as how-to articles - Revise text - Create storyboards for multimedia projects. -Create/draft outlines for writing or projects - Express a routine as a sequence of step-by-step instructions. - Map or outline a story **Math** - Determine if a sequence is correct. -Change the sequence of events to correct a task. - Explain the order of a math problem. Show how it can be done in more that one way.	Nearpod Lesson: Room on the Broom(Sequencing Events) Students will sequence events in a story. Sequencing BrainPop Jr. Students will learn the meaning of sequencing and how to sequence. Seesaw: Sequence the Story Students will sequence the events in a story. Programming Unplugged: My Robotic Friends Lesson plan for an unplugged activity where students code their classmates to perform tasks.

DATA COLLECTION AND ANALYSIS				
DLCS 14. Discuss the purpose of collecting and organizing data.	I can determine when collecting and organizing data will serve the best purpose. I can determine the best method for organizing data collected. I can determine appropriate situations to collect data. I can determine a way to organize data they collect. I can answer questions based on information shown in a graph or chart.	**Data-** a collection of facts, such as words, numbers, measurements, observations, or even just description of things **Collection-** the act of gathering something together **Information-** a collection of facts **Graph-** drawings that show mathematical information with lines, shapes, and colors	**ELA** - Use descriptive writing to explain data collection. - Understand the importance of the sequence of events in a story. -Collect and organize thoughts to write a story in a coherent order. **Math** -Collect and gather data and create a graph to show the data. -Explain the importance of collecting and organizing data to better solve a problem. -Ask/answer questions about data collection and the correct tools for organizing the data.	Sid the Science Kid chart song to introduce charts. Video to introduce students to charts. Math data chart from SeeSaw. Simple chart for the teacher to use with students to collect data and share. Generic template for any data collection. SeeSaw tally and graph chart. SeeSaw worksheet activity to introduce students to collect data based on given information. Introduction video for using Google Drive in the classroom.
DLCS 15. Interpret data displayed in a chart. Example: Using charts which depict data students interpret the data either verbally or in written form (which has more, less, are equal).	I can observe data organized in a chart or graph and answer basic questions based on that data. I can observe organized data and interpret that data both verbally and in written form. I can save digital work in locations specified by an adult. I can determine certain results	**Data-** a collection of facts, such as words, numbers, measurements, observations, or even just description of things **Chart-** a visual display of information	**ELA** - Use descriptive writing to explain data collection. - Interpret graphic organizers created to better understand text. - Complete information in a given chart to better understand text. **Math** -Use mathematical terms to describe data gathered.	Use the links above to teach both standards simultaneously. Students will discuss data recorded in the lessons above. Sid the Science Kid chart song to introduce charts. Video to introduce students to charts. Math data chart from SeeSaw. Simple chart for the teacher to

	based on information in a graph or chart. I can answer questions based on information shown in a graph or chart. I can determine certain results based on information in a graph or chart.		- Break down information in a chart to better understand the problem. -Determine the important information in a chart that will best help with a solution to a given problem. - Create a problem based on data in a chart. **Science/SS** - Interpret data to better understand the natural world. -Participate in projects that require analysis of data. - Interpret data gathered from peers to better understand results.	use with students to collect data and share. Generic template for any data collection. SeeSaw tally and graph chart. SeeSaw worksheet activity to introduce students to collect data based on given information. Introduction video for using Google Drive in the classroom. Instructional video for using Google Drive.
DLCS 16. Demonstrate how digital devices can save information as data that can be stored, searched, retrieved, and deleted.	I can open documents from a specified location. I can perform a basic search for a document with assistance from a peer or adult. I can delete documents when determined they are no longer needed. I can save various types of documents in specified locations. I can open various types of documents from specified	**Save-** to store information **Search-** to look up **Store-** to keep something for future use **Delete-** to get rid of **Open-** to gain access	- Save data from all subject areas for student/parent conferences in student portfolios.	SeeSaw and Classdojo are great resources that offer student portfolios that are student friendly and easy to use. These can also be shared with parents.

	locations. I can collaboratively complete a basic search for a document. I can delete documents they no longer need.			
DESIGN THINKING				
DLCS 19. Identify and revise problem-solving strategies to solve a simple problem.	I can find problems in my environment. I can identify more than one solution to a problem. I can test my solutions to see if they work. I can present my solution. I can recognize a problem in their environment or in a story. I can find problems anywhere. I can use many strategies to find solutions, such as visualizing, changing perspective, finding patterns, and analyzing cause and effect. I can identify multiple solutions to one problem.	**Problem-** a matter or situation to overcome **Strategy-** a plan or method for achieving a goal **Solution-** a successful action for solving a problem **Visualize-** to see a mental image of something **Perspective-** the way you see something **Patterns-** a series or sequence that repeats **Cause-** why something happened	**ELA** -Identify basic similarities in and differences between two texts on the same topic. - Create a story video using cause and effect. -Plan and write a story with a partner. - Use FlipGrid to create and record stories. **Math** -Solve problems with a variety of strategies. - Solve math problems using patterns observed. - Break down a large problem into smaller parts. - Create story problems. **Science/SS** - Create simple machines. - Design a path and use code to program a robot to follow the path. -Analyze data gathered during a project and identify any	Computational Thinking Video- Brainpop Computational thinking video on BrainpopJr. About solving problems. Community Service Video Students will view a video on community service. As a class students will plan one community service project to focus on throughout the year and document the problems and solutions encountered. Reduce, Reuse, Recycle Video Video on Reduce, Reuse, Recycle for students. Students will create a plan to enhance recycling in the school after viewing the video. BeeBot Lesson Students will design and create Bee-Bot mazes using measurement increments of

	I can find and define problems in a given context or scenario such as story, video, in the classroom or school. I can use multiple strategies to find solutions to a problem, for example: visualizing, changing perspectives, finding patterns, stating cause and effect.	**Effect-** what happened	problem in the data.	the Bee-Bot codes and test them. Click on the link to print a ruler for students to use for measuring.

Grade 2: *By the end of Grade 2, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Create and sort information into useful order using digital tools. Examples: Sort data spreadsheets A-Z, simple filters, and tables.	I can collect and enter data into a spreadsheet independently. I can use functions of a spreadsheet to sort data. I can set up a simple filter to sort data. I can collect and enter data in a spreadsheet. I can sort data in a spreadsheet. I can determine a simple filter to sort data.	**Data-** a collection of facts such as numbers, words, measurements, and observations or even just descriptions of things **Filter-**a device that removes something from whatever passes through it **Sort-** to arrange a group in a special way (such as by size, type or alphabetically) **Spreadsheet-** a computer program that represents information in a grid of rows or columns **Column-**objects, people, numbers, etc. in a vertical line. **Row-** objects, people, numbers, etc. in a horizontal line.	**Math** **-** Use a spreadsheet to organize information for a math problem. -Create digital graphs and charts to better understand a problem. - Gather data from the class based on a prompted question. **ELA** - Write step-by-step instructions for solving a problem or completing a task to be put in a table. -Exchange written steps among peers to allow students to sort and complete a task. -Collaborate on a digital tool to sort through a story sequence and place in the correct order. **Science/SS** - Collect and organize data on a spreadsheet. - Sort and arrange dates in a particular order on a spreadsheet. - Use filters on a spreadsheet	Single Use Spreadsheets Spreadsheets to Accomplish a Single Task What's the Matter? Solid, Liquid, or Gas? Digital Sorting Game Litter Critters Recycling Sorting Game Favorite Season Spreadsheet Project Create a spreadsheet and turn it into charts and graphs.

			to organize information.	
ALGORITHMIC THINKING				
DLCS 2. Create an algorithm for other learners to follow. Examples: Unplugged coding activities, illustrate sequence of a process such as baking a cake.	I can develop a sequence of events related to a task that others can follow. I can develop a sequence of events for a task that others can follow.	**Sequence-**the action of following an order **Algorithm-**a step by step solution	**Math** - Write out the steps to a math problem. -Create an algorithm for a peer to figure out what strategy was used to solve a given problem. -Participate in coding activities. **ELA** - Illustrate or write instructions in expository text. -Follow instructions written by a peer. -Create a Lego design and allow others to read and follow the instructions. **Science/SS** - Create an algorithm to be decoded by other students. - Break down events in history into a sequence of smaller events or steps. - Create secret messages that may have been sent during different historical events.	Kodable: Fuzz Family Frenzy Game for teaching coding. Code.org Website with links to multiple activities. Lost in Space Google Drive Link Lesson plan and resources for an unplugged game on algorithms. Joe Lost Fun game that helps teach programming skills. There Was a Cold Lady This activity uses the book, "There Was a Cold Lady Who Swallowed Some Snow," and an Ozobot for a fun sequencing activity.

DATA COLLECTION AND ANALYSIS				
DLCS 14. Collect, create, and organize data in a digital chart or graph.	I can enter data into a spreadsheet to create a chart or graph. I can manipulate data in a spreadsheet. I can design charts and graphs using color, labels, titles etc.	**Collect -** the act of gathering something . **Create -** make or cause something to be or become. **Organize -** to bring order to **Digital Chart -** a visual display of information. **Graph -** drawings that show mathematical information with lines, shapes, and colors.	**Math** - Create all types of graphs and charts to match math problems or daily data. - Design a problem in a graph or chart form. -Analyze data and use a different chart/graph to show the data in a different way. **ELA** - Write descriptions of data analysis from organized data. - Write about data, support claims, and answer questions. - Create a chart based on informational text. - Write about opinions and conclusions from the results of graphs. **Science/SS** - Organize results from science experiments and EDP activities. - Create a graph or timeline to organize events in history. - Interpret data gathered from peers to better understand results.	I Surveyed My Classmates This lesson integrates technology into mathematics, writing, and technology standards with easy to follow, step-by-step instruction and worksheets for students Create a Graph Create online graphs. Heads or Tails? Students collect data from coin tosses and chart this information on a spreadsheet. Google Forms Survey and collect data. Introduction Graph Track their monthly reading log before inputting data into Google Sheets. Google Sheets Format and visualize data. Google Sheets Tips and Tricks Additional information for the teacher.
DLCS 15. Explain how users control the ways digital devices save information in an organized manner. Examples: Folders, cloud-based, pictures, chronologically, naming files.	I can assign file names. I can create and name folders for organizing files. I can save files in multiple	**Folders -** a digital way to group files together. **Storage -** an electronic	- Save documents, pictures, and files. - Name files and organize them into folders. - Access and organize Google Drive.	Organization Article - lesson ideas Folders and File Management Lesson plan with resources on managing files and folders. Organize Google Drive with

	places such as on a device or in the cloud.	memory device. **File Names -** a name used to identify a computer file stored in a file system **Organize -** to bring order to. **Cloud Storage -** information that is stored on a remote server or "cloud". **Chronological** - arranged in order according to time		Colors and Icons - demo video Google Drive Tutorial for students- Navigate, Name Files, Move folders, etc. Organizing Files Article- Article on organizing digital files.
DESIGN THINKING				
DLCS 18. Investigate the design process and use digital tools to illustrate potential solutions to a problem, given guidance and support	I can find and define problems in everyday life in the classroom, neighborhood, or city. I can state multiple solutions for a problem. I can draw, write about, or build a prototype to the solution. I can redesign a solution after testing and/or critique. I can share solutions through a digital platform.	**Design Process-**set of steps to create a solution to a problem **Critique-**a serious examination or judgement of something. **Redesign-** the act of reworking the form of something	**ELA** -Identify basic similarities in and differences between two texts on the same topic. - Create a story video using cause and effect. -Plan and write a story with a partner. - Comment on and review ideas by peers. **Math** -Solve problems with a variety of strategies. - Solve math problems using patterns observed. - Break down a large problem into smaller parts.	Toxic Popcorn Design This lesson introduces students to the engineering design process Balloon Car STEM Challenge This STEM challenge will take your students through the engineering design process as they brainstorm, design, build, and test with a fun and engaging project. Popsicle Stick Catapult STEM Activity for engineer and design process.

			- Create story problems. - Share ideas online with others using tools such as Seesaw. **Science/SS** - Create simple machines. - Design a path and use code to program a robot to follow the path. -Analyze data gathered during a project and identify any problem in the data. - Use digital tools to write, draw, or create solutions and prototypes.	
OTHER: PROGRAMMING AND CODING				
DLCS 3. Construct elements of a simple computer program using basic commands. Examples: Digital block-based programming, basic robotics.	I can drag and drop blocks of code to complete a task. I can run a program they develop using block based coding.	**Program:** a sequence of instructions that allows a computer to perform a task or a set of operations. **Code-**the arrangement of data or instructions in a computer program.	**Math** **-** Discuss patterns in math are like patterns in coding. **ELA** **-** Write instructions based on block coding activities for others to follow. **Science/SS** **-** Use coding activities with specific topics related to science and social studies standards.	Flappy Code - Block Coding Code.org block based programmer Disney's Moana Hour of Code Block Coding Design with Tinkercad Block Coding Programmable NASA Rovers Made Out of Paper A short 15-20 min. activity that is a great introduction to programming - without the need for computers, iPads, or other devices.
DLCS 4. Identify bugs in basic programming. Examples: Problem-solving, trial and error.	I can run a sequence of block based code and determine where there is an error. I can correct an error in block based code once it is	**Debug-**identify and remove errors from. **Errors-**mistakes.	- Use any opportunity in class to troubleshoot problems.	Ozoblockly for Ozobots Create programs for your Ozobot. Design 3D Objects with

	identified.	**Problem-Solving-** the thought process in solving a problem.		Tinkercad Create, design, and code anything. Scratch Create stories, games, and animations. Computer Coding Mazes - Unplugged lessons for the classroom.

* Covered, but under another DLCS Standard not Computational Thinking.

Grade 3: *By the end of Grade 3, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.)*	**Key Vocabulary** (*Students will KNOW / understand…)*	**What Does it Look Like in Class?** (*Students will be able to DO…)*	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Use numbers or letters to represent information in another form. Examples: Secret codes /encryption, Roman numerals, or abbreviations.	I can use numbers and letters to represent information in another form.	**Encryption -** the process of turning data into a code **Secret Codes -** a secret method of writing **Roman Numerals -** any of the letters representing numbers in the Roman numerical system **Abbreviations -** a shortened form of a word or phrase	**Math** **-** Explain how equations are balanced. - Use Roman numerals to write numbers differently. - Explain how equivalent decimals and fractions are examples of the same information in different forms. **ELA** **-** Illustrate or write instructions on breaking secret codes in expository text. **Science/SS**	Nearpod Lesson: Coding Lessons to strengthen coding skills. Khan Academy: Journey into Cryptography Assess the students' understanding of the code breaking presented in the ancient cryptography lesson. Purdue.edu: Encryption for kids Introduction to cryptology. Scholastic: Writing Secret

			- Create secret messages that may have been sent during different historical events.	Messages Using Ciphers How to use ciphers to create a secret message.
DLCS 2. Analyze a given list of sub-problems while addressing a larger problem. Example: Problem - making a peanut butter sandwich; sub-problem - opening jar, finding a knife, getting the bread. Problem - design and share a brochure; sub-problem - selecting font, choosing layout.	I can analyze a given list of sub-problems while addressing a larger problem.	**Sub-Problem -** a problem that is dependent on other parts of a problem **Problem -** a matter or situation to overcome	**Math** **-** Make students aware of foundational skills needed to complete larger problems. **ELA** **-** Write instructions on how to solve a problem or complete a task. **Science/SS** **-** Analyze and solve small problems during EDP. -Determine smaller problems that may have led to the bigger issue. For example, what are several reasons for the Civil War?	Khan Academy: Cognition Learn about types of problems and common approaches to solving them. Google Slides: Computational Thinking Concepts of computational thinking. Code.org: My Robotic Friend Start coding with algorithms, loops, conditionals, and events and then you'll move on to functions. Mystery Science: What Makes Bridges So Strong? In the activity, Paper Bridge Engineering, students will use their knowledge of forces to build a strong bridge that supports as many pennies as possible -- using only paper.
ALGORITHMIC THINKING				
DLCS 3. Explain that different solutions exist for the same problem or sub-problem. Example: Multiple paths exist to get home from school; one may be a shorter distance while one may encounter less traffic.	I can explain that different solutions exist for the same problem or sub-problem.	**Solution -** a correct answer to a problem **Sub-Problem** - a problem that is dependent on other parts of a problem **Problem** - a matter or situation to overcome	**Math** - Explain different strategies to solve the same problem. **ELA** **-** Use different text features to locate information. - Explain different viewpoints of characters in a story. **Science/SS**	Mystery Science: How can You Go Faster Down a Slide? The Great Slide Challenge, students work in groups of four to test which materials have the most friction and which materials have the least friction. Mystery Science: How can You Keep a House from

			- Study the water cycle, discuss that the path water takes is not always a perfect circle. - Discuss how maps show multiple ways to get to a destination.	Blowing away in a Windstorm? In the activity, Design a Windproof House, students build paper house models.
DLCS 4. Examine logical reasoning to predict outcomes of an algorithm.	I can examine logical reasoning. I can predict the possible outcomes of an algorithm.	**Logical Reasoning -** process of using a rational series of steps to arrive at a conclusion **Outcome -** the way something turns out **Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations	**Math** - Estimate answers. - When a student gets an answer (right or wrong), determine if the answer is a logical one. **ELA** **-** Predict text. **Science/SS** - Predict solutions and make hypotheses.	Khan Academy: Intro to Algorithms Overview of algorithms. Google Drive: Introduction to Computational Thinking Unit Folder containing everything you need to teach computational thinking. Computational Thinking and Puzzles Do the puzzles and develop computational thinking skills as well as learn about some core computing topics.
DLCS 5. Create an algorithm to solve a problem as a collaborative team. Examples: Move a character /robot/person through a maze. List steps to build a sandwich.	I can create an algorithm. I can work collaboratively. I can solve a problem or complete a task with the algorithm.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations **Collaborative-** the act of working together	**Math** **-** Write the steps to a math problem. **ELA** **-** Write the steps to completing a task. **Science/SS** **-** Create a diorama. - Use the Hummingbird to code a moving element in a diorama.	Khan Academy: What is an Algorithm and Why Should You Care? Introduction to algorithms. How to Explain Algorithms to Kids Article on teaching kids about algorithms. Code.org: Course D Students develop their understanding of loops, conditionals, and events. Beyond coding, students learn about digital citizenship.

DLCS 6. Describe the function of a flowchart.	I can describe the function of a flowchart.	**Flowchart -** a diagram of the sequence of movements or actions of people or things involved in a complex system or activity **Function -** a thing or process that is dependent on other factors, usually requires steps	**Math** **-** Create input/output charts in math. **ELA** **-** Create a graphic organizer depicting the events/flow of the story. **Science/SS** **-** Create a timeline of historical events. - Create a flowchart explaining the steps of a process.	Smart Draw: Flowchart Symbols Article teaching about symbols used in flowcharts. Google Drive: Flowchart exercises Exercises using flowcharts.
DATA COLLECTION AND ANALYSIS				
DLCS 17. Describe examples of data sets or databases from everyday life. Examples: Library catalogs, school records, telephone directories, or contact lists.	I can describe examples of data sets or databases from everyday life.	**Database -** a structured set of data held in a computer **Data Set -** a collection of related sets of information that is composed of different elements	**Math** **-** Use databases to collect data for charts and graphs. - Create real-world math problems from databases. **ELA** **-** Use book databases to locate books by topic or genre. **Science/SS** **-** Collect information about science/ss topics from databases.	ALEX: Edmodo Communication is Key The students will take a poll on Edmodo created by their teacher. They will then create a bar graph to show the classroom results. Khan Academy: Ways to Represent Data Here are a few of the many ways to look at data. Khan Academy: Welcome to SQL SQL is useful for creating and querying relational databases. Learn how to use SQL with this interactive course.
OTHER: PROGRAMMING AND CODING				
DLCS 7. Test and debug a	I can test a given program in	**Test -** to check the quality,	**Math**	Scratch Pizza Pickle

given program in a block-based visual programming environment using arithmetic operators, conditionals, and repetition in programs, in collaboration with others. Examples: Sequencing cards for unplugged activities, online coding practice.	a block. I can base a visual programming environment using arithmetic operators, conditionals, and repetition in programs. I can debug a given program in a block. I can base a visual programming environment using arithmetic operators, conditionals, and repetition in programs. I can collaborate with others.	performance, or reliability of something **Debug -** identify and remove errors from **Program** - a sequence of instructions that allows a computer to perform a task or a set of operations **Block-Based Programming** - an introductory program that teaches programming by dragging “blocks” of instruction **Arithmetic Operators** - symbols that represent arithmetic math operations **Conditionals**- depending on or imposing a certain condition or conditions **Repetition** - the act or process of repeating	**-** Check math problems for errors. **ELA** **-** Use sequencing cards for events in a story. **Science/SS** **-** Test and debug coding activities based on standard related topics.	Debugging Activity Students will use coding to create a pizza. Bee: Debugging In this lesson, students will encounter puzzles that have been solved incorrectly. They will need to step through the existing code to identify errors, including incorrect loops, missing blocks, extra blocks, and misordered blocks. 2D Shape Drawings This Barefoot Computing activity for upper primary goes deeper into the concept of algorithms, using logical reasoning and debugging to find errors and to improve accuracy and efficiency. Grace Hopper Debugging Activity Debugging activity focused on teaching students about Grace Hopper.

* Covered, but under another DLCS Standard not Computational Thinking.

Grade 4: *By the end of Grade 4, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Construct a basic system of numbers, letters, or symbols to represent information as a cipher.	I can construct a basic system of numbers, letters, or symbols to represent information as a cipher.	**basic system of numbers-** a way to represent numbers **symbols-** a mark or character used to represent an object, function, or process **cipher-** a secret way of writing, a code.	**Math** **-** Create a battleship game to practice fact fluency.. - Combine data from multiple sources. **ELA** **-** Create a secret code to accompany a story. **Science/SS** **-** Create a Morse-Code for other students to decode.	Analyzing Insect Data Lesson Plan In this activity, students will analyze and interpret the data that they collected in various habitats Budget Expense Chart Lesson with Excel Each of these short video tutorials covers an essential skill needed to make simple Excel budgets and charts. How to Create a Battleship Game with Google Sheets In this video we will explore how to use Google Spreadsheets to play a game of Battleship. Basics of Google Sheets Instructional video for Google Sheets.

DLCS 2. Formulate a list of sub-problems to consider while addressing a larger problem.	I can formulate a list of sub-problems to consider while addressing a larger problem.	**formulate-** create a strategy **sub-problem-** a problem that is dependent on other parts of a problem.	**Math** - Complete multi-step math problems **ELA** - Complete graphic organizers for various text features. **Science/SS** - Find errors in circuits and fix the problem.	Budget Expense Chart Lesson with Excel Each of these short video tutorials covers an essential skill needed to make simple Excel budgets and charts. Learn Zillion Multiply Step Problem Instructional video for solving multi-step word problems by organizing data. Multi Step Problem Achieve the Core Lesson that sets an expectation for students to solve multi-step word problems using the four operations.
DLCS 3. Show that different solutions exist for the same problem or sub-problem.	I can show that different solutions exist for the same problem or sub-problem.	**solution-**a correct answer to a problem **sub-problem-** a problem that is dependent on other parts of a problem.	**Math** - Show multiple ways to solve various problems. **ELA** - Complete graphic organizers on problems and solutions. **Science/SS** - Complete various experiments changing up the variables and chart the outcomes.	Math Playground Math task with closed questions and open ended questions. Different Solutions to Solve Problems Khan Academy- Math lesson on multiple solutions.

ALGORITHMIC THINKING				
DLCS 4. Detect and debug logical errors in various basic algorithms.	I can examine basic algorithms and determine where errors may exist.	**detect-** discover the presence or existence of something. **debug-**identify and remove errors from. **logical-**well-reasoned **errors-**mistakes **algorithm** - a process or a set of rules that are used in calculations or problem-solving operations.	**Math** **-** Trace the path of a set of directions to determine success or failure. **ELA** - Create an algorithm that demonstrates the sequence of a story. **Science/SS** **-** Trace the path of a set of directions to determine success or failure.	Math Errors Article and Download Blog post on implementing error analysis in the classroom. Includes a free downloadable activity. Error Analysis Blog post on implementing error analysis in the classroom. Includes a free downloadable activity.
DLCS 5. Use flowcharts to create a plan or algorithm.	I can use flowcharts to create a plan or algorithm.	**flowchart-**a diagram of the sequence of movements or actions of people or things involved in a complex system or activity. **plan-** a detailed proposal for doing or achieving something. **algorithm** - a process or a set of rules that are used in calculations or problem-solving operations.	**Math** - Analyze charts and graphs. **ELA** - Read and analyze various graphs and charts within informational text. **Science/SS** - Create a flowchart to show different life cycles.	Having Fun with Flowcharts- Article and lesson on flowcharts. Explanation of Algorithm and Flowchart Article about algorithms and flowcharts. Code.org: Planting a Seed- Video showing how planting a seed is a type of algorithm.

DLCS 6. Define a simple pseudocode.	I can define a simple pseudocode. I can determine a simple pseudocode is code for programs I can actually convert it into a specific programming language or simply a set of steps.	**Pseudocode** - a notation that resembles a simplified programming language. This is used in program design. Specifically using if/then/else language.	**ELA** - Read passages and determine what information is necessary for discussing the passage. **Math** **-** Identify a mathematical operation needed to solve a problem. **Science/Social Studies** **-** Use the EDP to create simple pseudocode.	Definition of Pseudocode Definition and description of pseudocode. Pseudocode Slides Introduction to pseudocode. Examples of Pseudocode Printable examples of pseudocodes. Pseudocode and Flowcharts Explanation of pseudocode and flowcharts.
COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 26. Create a simple digital model of a system, individually and collaboratively, and explain what the model shows and does not show.	I can create a simple digital model of a system, individually and collaboratively, and explain what the model shows and does not show. I can use digital models when it is not physically possible to reproduce an event or system or it is too cost prohibitive to reproduce an event or system.	**digital model-** a computer model of an object that exactly replicates the form of an object **system-** a set of working things together as part of a mechanism or network	**ELA** **-** Use Google Draw pictures to describe a process explained in literature. **Science/SS** **-** Create an animation using Scratch to model a phenomenon or process. - Use existing computer simulations to learn about real world systems.	Minecraft Building (ALCOS Lesson) Minecraft is a tool where students can demonstrate their knowledge and creativity by building their own virtual world, and keep a journal where they discuss their character, setting, and specific details that have taken place inside their digital world.

DLCS 19. Use data from a simulation to answer a question collaboratively.	I can use data from a simulation to answer a question while working with other students. I can use strategies for using data from a simulation to answer a question collaboratively. I can use strategies for working with others. I can use data from a simulation to answer a question. I can collaboratively work with others. I can use data from a simulation to answer a question collaboratively.	**data-**facts and statistics collected together for reference or analysis **simulation-** imitation of a situation or process	**Math** - Analyze charts and graphs. -Solve a given problem by answering and asking questions from collected data. **ELA** **-** Create a group presentation using information gathered during a Math, Science, or Social Studies project. **Science/SS** **-** Collect data on a given project. -Design a simulation based on targeted standards. -Test and revise a simulation.	LegoWeDo Lesson Link to LegoWeDo site where you can find a variety of lesson plans to strengthen students' understanding of the 8 science and engineering practices, including asking questions and solving problems, modeling,
DATA COLLECTION AND ANALYSIS				

DLCS 16. Gather and organize data to answer a question using a variety of computing and data visualization Methods.	I can gather data to answer a question using a variety of computing and data visualization methods. organize data to answer a question using a variety of computing and data visualization methods how to use various computing methods.	**gather data-** the process of collecting data or information relevant to goals or objectives **organize data-**organizing data sets to make them more useful **computing methods-** a variety of methods to sort data **data visualization methods-** models that create a visual representation of data	**All Subjects:** - Use various strategies for gathering and organizing data to answer a question using a variety of computing and data visualization methods. - Determine which solutions call for certain types of computing and data visualization.	Who Has Access? (ALCOS lesson) Students will collect and analyze data from the website, Broadband Now, to understand that not everyone has the same level of access to technology in the U.S. based on their geographic location. Comparing and Contrasting (ALCOS lesson) The Venn diagram app allows students to compare and contrast any topic. Interactive Plot Diagram (ALCOS lesson) This organizational tool for grades K-12 uses the plot diagram pyramid to map events in a story.
OTHER: PROGRAMMING AND CODING				
DLCS 7. Create a working program in a block-based visual programming environment using arithmetic operators, conditionals, and repetition in programs, in collaboration with others.	I can work in a visual programming environment while using arithmetic operators, conditionals, and repetition in programs, in collaboration with others. I can use the definitions for arithmetic operators, conditionals, and repetition as they relate to programming. I can use strategies for collaborating with peers. I can create a working program	**Program:** a sequence of instructions that allows a computer to perform a task or a set of operations. **Block-based programming:** an introductory program that teaches programming by dragging “blocks” of instruction. **arithmetic operators-** symbols that represent arithmetic math operations	**Math** - Create a moving robot that can complete a task using given angle measurements. - Create algorithms to explain steps taken to solve a problem. -Create a block based program to assist in fact fluency. **ELA** **-** Create a sequence event program for a text. **-**Create a program to tell a story.	Tynker Website with lesson/project ideas Ozoblockly Website with lesson/project ideas Scratch- Website with lesson/project ideas Code.org- Website with lesson/project ideas

	in a block-based visual programming environment using arithmetic operators, conditionals, and repetition in programs. I can implement strategies to collaborate with others. I can use operators in programming and make many options available, reducing the length of an algorithm, pseudocode, or program.	**Conditionals:** depending on or imposing a certain condition or conditions. **Repetition:** the act or process of repeating.	- Design a code to learn about the order of events in a story. **Science/SS** **-** Create a moving robot that can complete a task. -Create a working model of different earth systems. -Design a model that will be coded to have functional elements.	

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Grade 5: *By the end of Grade 5, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Construct a complex system of numbers or letters to represent information. Example: Student-created complex secret codes using more than one form to solve a problem or answer a question.	I can construct a system of numbers or letters to represent information.	**Code:** a system of symbols for sending messages. **Cipher:** a system that substitutes letters and symbols for the letters and symbols contained in a written message in order to conceal its meaning; code. **Construct:** to build	**ELA:** Students will be able to read and make a system of letters to communicate with others on a topic of interest. **Math:** Students will be able to take data from a table and manipulate it to create various charts and graphs. . **Science/Social Studies:** Students will problem solve to derive meaning from code	YouTube:The Internet: Encryption & Public Keys -Video on how the internet and encryption keeps information/data safe NearPod Lesson -Nearpod lesson on concepts of coding and computer programming PigPen Code Breaking Activity-Code Writing/Breaking Activity

			used by different groups of people in history.	Code.Org- Binary Bracelets -Coding and Decoding Binary Letters Lesson
DLCS 7. Identify variables.	I can identify variables in computing and other subject areas.	**Variable:** something that can change or that has no fixed value.	**ELA:** Students can write about their findings in Science experiments. **Math:** Students can solve given math problems using variables. **Science/Social Studies:** Students can identify variables in science experiments.	Variables -Nearpod Lesson Skate Park Variables -Nearpod Interactive Simulator My Loopy Robotic Friends -Code.org Lesson Plan
ALGORITHMIC THINKING				
DLCS 2. Create an algorithm to solve a problem while detecting and debugging logical errors within the algorithm. Examples: Program the movement of a character, robot, or person through a maze. Define a variable that can be changed or updated.	I can create an algorithm to solve a problem. I can detect and debug logical errors within an algorithm.	**Algorithm:** a completely determined and finite procedure for solving a problem, esp. used in relation to mathematics and computer science. **Debug:** to find and remove mistakes or flaws from. **Detect:** to discover or notice. **Logical Errors:** a bug in a program that causes it to operate incorrectly. **Variable-** a data item that can take on one or more value	**ELA:**Students will create an algorithm that demonstrates the sequence of a story that the student is reading or writing. **Math:**Students will create and follow an algorithm to determine a mathematical process (ie. Order of Operations) **Science/Social Studies:** Students will create an algorithm that represents the steps of a scientific process.	What's an algorithm? - David J. Malan -Video explanation of algorithms Nearpod Algorithm Lesson -Nearpod lesson on computer algorithms YouTube Intro to Debugging -Video Intro to Debugging Code.org Debugging -Debugging Activity

DLCS 3. Create an algorithm that is defined by simple pseudocode.	I can create a set of steps that is written in simple pseudocode.	**Algorithm:** a completely determined and finite procedure for solving a problem, esp. used in relation to mathematics and computer science. **Pseudocode:** a notation resembling a simplified programming language, used in program design.	**ELA:** Students will be able to read passages and determine what information is necessary for discussing the passage. **Math:**Students will be able to identify mathematical operations needed to solve a problem through a pseudocode. **Science/Social Studies:** Students can use the Engineering Design Process to create an algorithm that is defined by simple pseudocode.	What's an algorithm? - David J. Malan -Video explanation of algorithms What is Pseudocode -Pseudocode Reading Blog Slide Share -Pseudocode SlideShare Presentation
DLCS 4. Create a simple pseudocode.	I can create simple pseudocodes.	**Pseudocode:** a notation resembling a simplified programming language, used in program design.	**ELA:** Students can create a pseudocode or write out a statement to model chronological order in stories. **Math:** Students can utilize a pseudocode method to determine the operations needed to solve a complex, real-world problem. **Science/SS:** Students can use pseudocode to explain historical events and natural phenomena.	Algorithms and Pseudocode -ALEX Algorithms & Pseudocode Learning Activities Puzzles and Computational Thinking -Resource Hub
DLCS 5. Develop and recommend solutions to a given problem and explain the process to an audience.	I can develop and recommend solutions to a given problem. I can explain the development process to an audience.	**Solution:** a means of solving a problem. **Process**: a series of actions used to produce something or reach a goal.	**ELA:** Students will be able to research a problem with both print and digital resources and create expository and/or persuasive writing to share with an audience.	Engineering a Mountain Rescue Litter -Hands on Activity Lesson Biodomes Engineering Design Project -Hands on Activity Lesson

			Math: Students will be able to identify mathematical operations needed to solve a problem and share their solutions with their audience. **Science/Social Studies:** Students will be able to use the EDP process to find a solution to a given problem.	Toxic Popcorn Design Challenge -Challenge Lesson Plan
COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 25. Analyze the concepts, features, and behaviors illustrated by a simulation. Examples: Object motion, weather, ecosystem, predator/prey.	I can analyze the concepts, features, and behaviors illustrated by a simulation.	**Analyze:** to separate into parts for close study; examine and explain. **Concept:** a general idea or thought. **Features:** a part or quality of something. **Behavior:** the typical actions of a person, animal, thing, or group, either in general or in certain situations. **Simulation:** a computer calculation that predicts the outcome of, or creates a model of, a real process.	**ELA -** Students and teachers can use simulators for storylines. **Math-**Students can utilize simulations for multiple units across the math discipline for modeling and explaining. **Science/SS -** Students can use simulations for experiments.	Video: What is a simulation -YouTube Video Google Sky -Solar System Simulation Plate Tectonics -Plate Tectonics Simulator Creating a Simulation -Links to multiple simulation activities
DLCS 26. Connect data from a simulation to real-life events.	I can connect data from a simulation to real-life events.	**Simulation:** a computer calculation that predicts the outcome of, or creates a model of, a real process. **Data:** facts, figures, or other pieces of information that can be used to learn about something.	**ELA -** Students can use simulators for storylines. **Math-**Students can utilize simulations for multiple units across the math discipline for modeling and explaining. **Science/SS -** Students can	Video: What is a simulation -YouTube Video Intro to Cubic Units: Can You Visualize It? -ALEX Learning Activity Creating a Simulation -Links

			use the Engineering Design Process to build a simulated model of a prototype based on data to solve a real world problem.	to multiple simulation activities
DLCS 8. Demonstrate that programs require known starting values that may need to be updated appropriately during the execution of programs. Examples: Set initial value of a variable, updating variables.	I can demonstrate that programs require known starting values that may need to be updated appropriately during the execution of programs.	**Programs:** an algorithm that has been coded into a form that can be run by a machine. **Values:** the worth, importance, or usefulness of something. **Updated:** to provide with new or current information; bring up to date. **Execution:** the act of executing or carrying out. **Initial:** of the beginning; first.	**ELA:** Students can give an oral report on their creation on code.org. **Math:** Students can create a game using variables on code.org. **Science/Social Studies:** Students can create a moving robot that completes a task.	Envelope Variables -Code.org Lesson Functions with Minecraft -Understanding Functions Lesson My Loopy Robotic Friends -Simplifying simple patterns lesson Code.org
SYSTEMS				
DLCS 22. Identify computing services that may be initially turned on by default. Examples: Geolocations, geotagging.	I can identify computing services that may be initially turned on by default.	**Computing Services:** scripts and code running in the background of your operating system that run and support all the software. **Default:** in computing, selected automatically by a program or device in the absence of an active selection by the user. **Geolocations-** the process of identifying the geographical location of a person or device by means of digital information processed via the internet.	**ELA:** Students can research through print and digital sources potential dangers of geotagging and create an informational writing piece that explain these dangers to an audience. **Math:** Students can research and collect data on the amount of geotags for a given location and create a graph based on the information. **Science/Social Studies:** Students can research through print and digital	What is Geotagging -Youtube video on Geotagging Students can research the potential dangers of geotagging and create a presentation with their findings using a Google App. Students can create a “How To” video using WeVideo on how to turn off geotagging on various devices.

		Geotag- an electronic tag that assigns a geographical location to a photograph or video, a posting on a social media website, etc.	sources the history and effects of geotagging.	
DLCS 23. Identify the key components of a network. Examples: Links, nodes, networking devices.	I can identify key components of a network.	**Network:** a system of computers that are connected to one or more other computers. **Links:** to join or unite by a link or connection. **Nodes:** a point at which lines or pathways intersect or branch; a central or connecting point. **Networking Devices:** are physical devices that are required for communication and interaction between hardware on a computer network.	**ELA:** Students can research the different components of a network and how they work together. **Math:** Students can identify the key components of networks of technologies such as spheros, ozobots, ect. then combine coding and mathematical competencies. **Science/Social Studies:** Students can use the Engineering Design Process to build a model of a network.	How the Internet Works -TeacherTube video on how the internet works How Computer Networks Connect and Work -YouTube video Computer Components -Article on computer components
DLCS 24. Describe the need for authentication of users and devices as it relates to access permissions, privacy, and security. Examples: Logging in at school, logging personal devices to public networks.	I can describe the need for authentication of users and devices as it relates to access permissions, privacy, and security.	**Authentication:** to prove the genuineness, reality, or validity of. **Users:** one who uses a computer. **Devices:** an invention or machine used to perform simple tasks or something else made for a specific purpose. **Access:** to obtain or reach on a computer.	**ELA:** Students can research using both print and digital resources and present on the importance of strong passwords. **Math:** Students can experiment with how many strong passwords they can create with given letters, numbers and symbols. **Science/Social Studies:** Students can research using both print and digital resources and present on the	Creating a Strong Password! -Nearpod How to Create Strong Passwords -Common Sense Lesson Plan Password Protect -Digital Passport Game

		Permission: consent from an authority to do something. **Privacy:** the condition of being alone or away from the view of other people. **Security:** something that gives protection.	history of strong passwords.	
DATA COLLECTION AND ANALYSIS				
DLCS 21. Manipulate data to answer a question using a variety of computing methods and tools to collect, organize, graph, analyze, and publish the resulting information.	I can manipulate data to answer a question using a variety of computing methods and tools to collect, organize, graph, analyze, and publish the resulting information.	**Manipulate:** to manage, influence, or use skillfully to achieve a desired end. **Data:** facts, figures, or other pieces of information that can be used to learn about something. **Computing Tools**: any program or utility that helps programmers or users develop applications or maintain their computers.	**ELA** -Students can create, write, and read surveys for data. **Math** - Students can create graphs, charts, and tables for given data as well as data they collect. **Science/SS** - Students can collect data to predict polling as well as read polls as data comes in.	Designing Charts -Nearpod Lesson Pet Giraffe - Code.org lesson Create A Graph -website to create different types of graphs Comparing and Contrasting- Lesson from ALEX using a Venn Diagram Who Has Access? (ALCOS lesson) -Google Sheets 101 Lesson from ALEX
OTHER: PROGRAMMING AND CODING				
DLCS 6. Create a working program in a block-based visual programming environment using arithmetic operators, conditionals, and repetition in programs.	I can create a working program in a block- based visual programming environment. I can create a program in a block- based visual programming environment using arithmetic operators	**Program:** a sequence of instructions that allows a computer to perform a task or a set of operations. **Block-Based Visual Programming:** coding within a programming language where	**ELA:** Students can create a review game using the blocks-based program of their choice. (For example, programming TinkerCAD to work with Makey Makey for a review game) **Math:** Students can use	Flappy Code -Code.org block based programmer Getting Loopy -Code.org activities/lessons For Loop Fun -Code.org activities/lessons

	such as AND, OR, and NOT. I can create a program in a block- based visual programming environment using conditionals such as IF, THEN, and/or ELSE. I can create a program in a block- based visual programming environment using repetition or loops.	instructions are mainly represented as blocks. **Arithmetic Operators:** a mathematical function that takes two operands and performs a calculation on them. **Conditionals:** depending on or imposing a certain condition or conditions. **Repetition:** the act or process of repeating.	resources such as TinkerCAD, BlocksCAD, Spheros to combine coding with mathematical competencies. **Science/Social Studies:** Students can create a review game using the blocks-based program of their choice. (For example, programming TinkerCAD to work with Makey Makey for a review game)	

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Grade 6: *By the end of Grade 6, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.)*	**Key Vocabulary** (*Students will KNOW / understand…)*	**What Does it Look Like in Class?** (*Students will be able to DO…)*	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Remove background details from an everyday process to highlight essential properties. Examples: When making a sandwich, the type of bread, condiments, meats, and/or vegetables do not affect the fact that one is making a sandwich.	I can remove any unnecessary information. I can identify details and descriptors. I can remove descriptors and only leave details.	**Process** - a series of actions or steps taken in order to achieve a particular end. **Essential Process** - a process that is absolutely necessary to achieve a certain goal.	**ELA -** Students will be able to read passages and determine what information is necessary for discussing the passage. **Math-**Students will be able to dissect word problems and use the required information/eliminate unnecessary information to solve the mathematical statement.	ReadWorks Article: Students must read the article and eliminate unnecessary information to answer the questions NearPod: Cross-Curricular - Science and Math - student paced lesson- learn how to identify important information in the text

			Science/SS - In science, students will be able to determine if particular information has an effect on earth and space. Additionally they will be able to determine the perintent steps in a lab experiment. In social studies, students will be able to determine what details caused history events, and what details had little to no effect on history.	
DLCS 2. Define a process as a function. Example: Functions or sets of steps combined to produce a process: turning off your alarm + getting out of bed + brushing your teeth + getting dressed = morning routine.	I can discuss steps in the correct order and produce a completed task. I can combine steps to create a function. I can understand why we discuss processes rather than individual steps for certain phenomena.	**Process** - a series of actions or steps taken in order to achieve a particular end. **Function -** a thing or process that is dependent on other factors, usually requires steps	**ELA -** Students will be able to use the steps of writing to produce research papers for various science projects. **Math-** Students will be able to apply steps to generate a desired outcome. For example, students can check “rise over run” to determine slope. **Science/SS -** In science, students will apply steps to produce desired outcomes in laboratory experiments. In social studies, students will be able to discuss the processes that happened simultaneously which lead to the two world wars.	NearPod: Science: Discuss and identify steps of the rock cycle and identify the rock cycle as a process Code.org lesson plan for teachers where students learn to define and call procedures Teacher Resource: Kodable video: Teacher learning what functions actually are

ALGORITHMIC THINKING				
DLCS 3. Create pseudocode that uses conditionals. Examples: Using if/then/else (If it is raining then bring an umbrella else get wet).	I can compile a set of steps that contain conditional operations to include if, then, and else. I can communicate a process and if available a yes/no and true/false option.	**Pseudocode** - a notation that resembles a simplified programming language. This is used in program design. Specifically using if/then/else language. **Conditionals** - has a set value if an answer to something is true and an opposing value if the answer is false.	**ELA -** Students will use if/then statements to rationalize sequence in reading and writing. **Math -** Students can use conditionals to determine which method to use in solving a math problem. **Science/SS-** Students can use conditionals as well as if/then statements to determine facts about the history and natural sciences.	Teacher Resource: Teacher learning what pseudocode is and how it works Student Resource: Learning to define If/Then/Else and creating statements regarding Teacher Led Simon Says: Introduction to If/Then statements for students
DLCS 4. Differentiate between flowcharts and pseudocode. Example: Flowcharts use shapes to indicate what to do at each step while pseudocode uses text.	I can list steps to complete a process in pseudocode. I can express the same process in a flowchart noting the differences.	**Flowcharts** - a diagram of the sequence of movements or actions people or things are involved in to complete a complex activity. **Pseudocode** - a notation that resembles a simplified programming language. This is used in program design. Specifically using if/then/else language.	**Math -** Students can utilize a flowchart method to determine the operations needed to solve a complex, real-world problem. **ELA -** Students can create a flowchart or write out a statement to model chronological order in stories. **Science/SS -** Students can use pseudocode to explain historical events and natural phenomena.	Teacher Reference/VIsual Difference: What is a flowchart vs pseudocode Create a FlowChart resource for creating a digital flowchart Teacher Resource - What is a flowchart vs pseudocode Flowchart creation sites: Lucidchart Creately: Draw.io

DLCS 5. Identify algorithms that make use of sequencing, selection or iteration. Examples: Sequencing is doing steps in order (put on socks, put on shoes, tie laces); selection uses a Boolean condition to determine which of two parts of an algorithm are used (hair is dirty? True, wash hair; false, do not); iteration is the repetition of part of an algorithm until a condition is met (if you're happy and you know it clap your hands, when you're no longer happy you stop clapping).	I can find algorithms that demonstrate the three basic programming structures. I can understand that differences exist in sequencing, iteration, and selection.	**Sequencing -** something that must be arranged in a particular order to complete a particular goal **Iteration** - repeating a process several times. **Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Selection** - choosing something carefully to ensure that it is the best option	**Math-**. Students will be able to utilize sequencing to solve complex real-world problems. **ELA -** Students can use sequencing to identify chronological order and types of writing. **SS-** Students can write out step by step instructions to teach others how to use a design. **Science -** Students can utilize sequencing in laboratory experiments and to explain natural phenomena.	Lesson Plan from Code.org *Student lesson yes/no* Lesson Plan from Code.org: *getting creative with coding* Sequencing an Algorithm *Student lesson with sequencing (embedded videos)* Student Resource: Khan Academy Unit on Algorithms Finding routes and algorithms throughout things in your life What are the 5 stages of developing solutions? Teacher article on what the 5 stages of developing solutions are
DLCS 8. Create a program that initializes a variable. Example: Create a flowchart in which the variable or object returns to a starting position upon completion of a task.	I can set variables back to their original values before start. I can understand that programs need to be initialized before a program can work properly more than once.	**Initialize** - to set to the value or put in the condition appropriate to the start of an operation. **Variable**- a data item that can take one or more values.	**ELA-** Students can read a story and identify the variable of the story. Students can then create a flowchart of the actions from the variable. **Math-** Students can create a flowchart of how to find an equivalent fraction. **Science/SS-** Students can create a flowchart to answer a question.	General Tech Tool for Standard 8: Scratch This is a student program students can use to create something using a variable

COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 26. Explain why professionals may use models as logical representations of physical, mathematical, or logical systems or processes. Example: Students will discuss why an engineer may build a model of a building before actually constructing the building.	I can explain why one might create a model or simulation. I can identify a reason a system or process cannot be easily replicated. I can identify situations in which it is best to use a model or simulation	**Physical processes** - an interactive system that (hardware or software) that can respond to the analog world. **Mathematical Processes** - essential aspects of a system that presents knowledge in a usable form. **Logical Processes** - standardizes the people, places, things and the rules that relate them using a standard language.	**Math -** Students can utilize models to explain their algorithmic thinking. **ELA -** Students can utilize modeling to represent a self created story or a novel. **Science/SS -** Students can use models to explain historical events and natural phenomena. **All Subjects:** Students can apply the engineering design process in STEM related activities across all disciplines to create models for their designs. Students will be able to discuss the significance of the model.	BlendSpace - *Students learn the engineering design process* EdPuzzle - *Student video about the EDP with embedded questions* Design Squad - For Parents and Educators *online workshop to get parents and teachers involved in the design aspect of things*
DLCS 27. Explain how simulations serve to implement models.	I can explain how simulations serve to implement models. I can explain that simulations and models are both representations of a system or process. I can explain how simulations serve to implement models.	**Simulations** - imitation of a process.	**ELA -** Students and teachers can use simulators for storylines. **Math-** Students can utilize simulations for multiple units across the math discipline for modeling and explaining. **Science/SS -** Students can use simulations for experiments.	Student Resource: PhET *simulations by grade level for all subject areas* Internet Simulator Students learn to create a simulation on the internet

DATA COLLECTION AND ANALYSIS				
DLCS 19. Track data change from a variety of sources. Example: Use editing or versioning tools to track changes to data.	I can track data over a period of time. I can assess how data can change over time. I can identify how data can look different depending where it came from.	**Data-** facts or statistics collected together for reference or analysis	**ELA** -Students can create, write, and read surveys for data. **Math** - Students can create graphs, charts, and tables for given data as well as data they collect. **Science-** Students can collect weather data, and evaluate how it changes based upon locations. **Social Studies** - Students can collect data to predict polling as well as read polls as data comes in.	Better Lesson: student resources for types of data collection KhanAcademy: student videos and practice for data collection NearPod: How polling works and how to create a poll
DLCS 20. Identify data transferring protocols, visualization, and the purpose of data and methods of storage. Examples: Using an online collection tool or form to collect data that is then stored in a spreadsheet or database.	I can create charts, tables, and plots for various types of data. I can identify data transferring protocols that are used for specific purposes depending on the data and storage methods.	**Transfer protocols** - standard protocol that transfers files between the computer and the internet. **Visualization** - the formation of a mental image of something.	**All subjects -** Students can collect data and find appropriate methods of storing and sharing files.	Transfer Protocols: What you need to know before you get online with transfer Collection Tool Survey Monkey- A way for students to collect data Google Drive for Storage A place to store things once you have collected the data - Specifically Google Sheets

DLCS 21. Identify varying data structures/systems and methods of classification, including decimal and Binary. Examples: Difference between a bit and a byte, bit representation, pixels.	I can identify how binary can be used for bit representation in pixels. I can recognize a binary number based on bits and bytes. I can understand several data structures and methods in classification.	**Data structures** - specialized format for organizing and storing data. **Decimal** - a system of numbers based on the number 10, tenth parts, and powers of ten. **Classification-** grouping together according to shared qualities or characteristics. **Binary** - information can be expressed as combinations of numerical digits 0 and 1. **Bit** - a unit of information usually expressed as either a 0 or 1 in binary notation. **Byte** - a group of binary digits or bits operated as one unit.	**ELA** Students can read an article about bit and an article about byte, afterwards students can fill out a graphic organizer displaying the similarities and differences of bit and byte. **Math** Using number cards, students can learn to count binary numbers using combinations of 1 and zero. **Science/SS** Students use pixels to create a model of natural phenomena or historical events.	Bit vs. Byte defined Explaining the difference between a bit and a byte Decimal and Binary conversion table The table to convert decimals to binary form Binary Numbers- Math Click on instructions for Binary numbers. Student activity to learn to count binary numbers
OTHER				
DLCS 7. Describe how automation works to increase efficiency. Example: Compare the amount of time/work to hand wash a car vs. using an automated car Wash.	I can describe how automation increases efficiency.	**Automation** - using largely automatic equipment in a system of manufacturing or other production processes. **Efficiency**- an action designed to achieve productiveness.	**ELA-** Students can read an article about automation and write a summary of how automation could be useful. **Math-** Students can come up with ratios/unit rates to identify what would be the cheapest or fastest way to do something. **Science/SS-** Students can identify the most efficient way to classify a group of animals.	Teacher Lesson Plan- Teacher plan to introduce students to what automation is and how it works.
DLCS 22. Summarize the purpose of the American	I can understand the American Standard Code for	**ASCII** - American Standard Code for Information	**All subjects -** Students can see the progression of	What is the ASCII? Teacher and student resource to learn

Standard Code for Information Interchange (ASCII).	Information Interchange. I can understand that without ASCII there would be no way for programs to communicate with computers.	Interchange - numerical representation of a character on a keyboard.	general code to specific code throughout history. Thus inspiring students utilize the Engineering Design Process to create new coding pathways.	what ASCII means and how it is used Video: What is ASCII? Teacher and student resource video of ASCII and how it is used

* Covered, but under another DLCS Standard not Computational Thinking.

Grade 7: *By the end of Grade 7, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Create a function to simplify a task. Example: Get a writing utensil, get paper, jot notes can collectively be named “note taking”.	I can summarize a collection of steps or algorithms as one function.	**Function-** A procedure or routine in programming. **Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations.	**Mathematics:** Create a simple function to simplify the steps of a mathematical equation. **ELA:** Create a simple function to simplify the steps of the writing process. Create a simple function to simplify the steps of reading a text. **Science/SS:** Create a simple function to simplify the steps of the scientific method.	Beanz:The Magazine for Kids, Code, and Computer Science- Functions -Magazine Article Magazine Article for Student use Youtube Video: Programming Basics: Statements & Functions: Crash Course Computer Science #12 Youtube Video introduction of programming basics Youtube Video: How to Create a Simple Function: Code.org Youtube video on the process of creating a simple function. Lesson Plan: Creating

				Functions Lesson Plan-Code.or 45 Min Digital Activity on creating functions ALEX Classroom Resources Alabama Learning Exchange Resources DLCS1
ALGORITHMIC THINKING				
DLCS 2. Create complex pseudocode using conditionals and Boolean statements. Example: Automated vacuum pseudocode – drive forward until the unit encounters an obstacle; reverse 2"; rotate 30 degrees to the left, repeat.	I can compile a set of complex steps that contain conditional operators to include if, then, else and Boolean statements such as >, <, =.	**Pseudocode** - a notation that resembles a simplified programming language. This is used in program design. **Boolean Statements-** Defining a truth using the following choices: and, or, not. **Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Sequencing -** something that must be arranged in a particular order to complete a particular goal. **Selection** - choosing something carefully to ensure that it is the best option. I**teration** - repeating a process several times. **Conditionals** - has a set	**Math:** Students will create Boolean Logic truth values to represent mathematical equations. **ELA:** Students will use Boolean Logic to evaluate logical questions and the relations between certain aspects of text. **Science/SS:** Students will use Boolean Logic to determine the association between certain aspects of science and social sciences (i.e. what is the relationship between aspirin, children, and Reye's syndrome).	Google Slides Presentation: Boolean Logic History & Gates Slideshow on the History of Boolean Logic and Creation of Logic Gates Task Cards: Logic Gates Activity Printable Task for students to create their own interactive logic circuit tools Unplugged Lesson Plan: Booleans and Logic Code.Org Student Activity in which students explore how to use Boolean Logic to evaluate logical questions ALEX Classroom Resources Alabama Learning Exchange Resources DLCS2 Computing at School-Pseudocode, Python, VB.Net Quick References

		value if an answer to something is true and an opposing value if the answer is false.		Interactive code snippets in pseudocode explained alongside VB.NET and Python Code. Type with Code- Typing Challenge Interactive Games Student Interactive Lesson- Improve your knowledge of Python and VB.NET through typing exercises. Khan Academy Lesson- Playing with pseudocode Student Interactive Lesson including videos and activities.
DLCS 3. Create algorithms that demonstrate sequencing, selection or iteration. Examples: Debit card transactions are approved until the account balance is insufficient to fund the transaction = iteration, do until.	I can create an algorithm using one of the three basic programming structures: sequencing, selections, or iterations.	**Pseudocode** - a notation that resembles a simplified programming language. This is used in program design. **Boolean Statements-** defining a truth using the following choices: and, or, not. **Sequencing -** something that must be arranged in a particular order to complete a particular goal. **Selection** - choosing something carefully to ensure that it is the best option. I**teration** - repeating a process several times.	**Mathematics:** Create an algorithm to determine a mathematical process (i.e. an algorithm to determine if a number is prime). **ELA:** Create an algorithm that demonstrates the sequence of a story that the student is reading or writing. **Science/SS:** Create an algorithm that represents the steps of a scientific process (i.e. life cycle).	Tynker Blog Post: How to Explain Algorithms to Kids Teacher Resource Article with tips on how to explain algorithms to children Unplugged Lesson Plan: Real Life Algorithms: Student Activity in which students relate the concepts of algorithms back to real life activities (i.e. the creation of paper airplanes) in order to build skills that translate real-world situations into online scenarios. Khan Academy Assignment: What is an Algorithm and why should you care? Online Interactive Lesson including videos, text, and discussion on what algorithms are and what they mean in

				regards to programming. BBC Bitesize Lesson- Iteration Online Interactive Lesson including videos, visual aids, and online assessment. ALEX Resources Alabama Learning Exchange Resources DLCS3
DLCS 4. Design a complex algorithm that contains sequencing, selection or iteration. Examples: Lunchline algorithm that contains parameters for bringing your lunch and multiple options available in the lunch line.	I can design complex algorithms that demonstrate the three basic programming structures: sequencing, selections, or iterations.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Sequencing -** something that must be arranged in a particular order to complete a particular goal. **Selection** - choosing something carefully to ensure that it is the best option. I**teration** - repeating a process several times.	**All Subjects:** Students will be able to design complex algorithms that demonstrate the three basic programming structures: sequencing, selections, and iterations. **Math -** Students can create an algorithm to determine the operations needed to solve a complex, real-world problem. **ELA -** Students can create an algorithm to model chronological order in stories. **Science/SS -** Students can create an algorithm to explain historical events and natural phenomena.	Common Sense Media Blog Article: Getting Started With Coding In the Classroom Teacher resource including Videos, Tipsheets, and lists of coding applications suited for the classroom. S4: Lesson 13: Iterate Mate- Nearpod Lesson using Code Monkey Nearpod+Code Monkey online interactive lesson bundle with discussion questions and quizzes Computing-Algorithms Khan Academy Lessons Group of Online Interactive Lessons covering the three basic programming structures: sequencing, selections, or iterations. GROK LEARNING: Virtual Pet Lesson Plan- Application Design Online Lesson Plan- Structured sequence of

				interactive notes that students answer in order to design a virtual pet interactive application. ALEX Resources Alabama Learning Exchange Resources DLCS4
DLCS 6. Create and organize algorithms in order to automate a process efficiently. Example: Set of recipes (algorithms) for preparing a complete meal.	I can use algorithms to automate a process such as sorting numbers in a random list or playing cards in a deck.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Automation** - using largely automatic equipment in a system of manufacturing or other production processes.	**Mathematics:** Create an algorithm to automate a mathematical process. **ELA:** Create an algorithm to automate a reading process. **Science/SS:** Create an algorithm to automate a scientific process.	HyperDoc: Creating Algorithms to solve problems Interactive Student Lesson including examples of sequence, selection, and loops in a flowchart. Junior Computer Science: Sentence Check Algorithm Lesson Plan Teacher Lesson- An activity to reinforce grammar rules using computing science concepts. Google Drive Folder of Algorithm Resources Multiple Teacher Resources for using algorithms in the classroom. Google Slides Presentation: The Merge Sort Algorithm Student Slideshow presentation covering the merge sort algorithm with examples.
COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 26. Categorize models based on the most appropriate representation of various systems.	I can categorize models based on their function: predictive, cluster and	**Function-** a procedure or routine in programming. **Predictive-**using data to	**Mathematics:** Use cluster and classification models to identify similar traits in data and group alike terms.	DZONE Article: When to Use Categorization Models Teacher Resource- Article with real-world examples of

	classification, and decision.	forecast results. **Cluster**- finds "natural" grouping of instances given non-labeled data. **Classification**- learns a method for predicting the instance class from pre-labeled (classified) instances. **Decision**- data that is continuously split according to certain parameters.	**ELA:** Use decision models to simulate outcomes of decisions so that the user is aware of possible risks associated with each option. **Science/SS:** Use predictive models to forecast a possible outcome based on historical data.	when to appropriately use each model representation. Images of Categorization Examples Student Resource- Online Images and Examples of Categorization.
DLCS 27. Identify data needed to create a model or simulation of a given event. Examples: When creating a random name generator, the program needs access to a list of possible names.	I can select a process or system and then determine the data needed to create a model or simulation of the process or system.	**Simulations** - imitation of a process. **Sequence-**arranged in a particular order to complete a particular goal. **Model-**a three-dimensional representation of a person or thing or of a proposed structure. **Process-**a series of actions or steps taken in order to achieve a particular end. **System-** a set of working things together as part of a mechanism or network.	**Mathematics:** Students will determine data needed to create a model or simulation. **ELA:** Students create a set of simulations based around a novel to work on reading strategies such as inferencing, questioning, visualization, and clarification. **Science/SS:** Students will create a simulation prototype of a scientific process or system or historical event.	PHET Math and Science Simulations: Interactive Database of interactive math and science simulations for students to use in the classroom. History Simulations Lesson Plans Simulations, Engaging Interactive historical lesson plans, simulations, and engaging powerpoints English Simulations- University of Wisconsin Resources From the Mixed-Up Files of Mrs. Basil E. Frankweiler Virtual World and Google Art Project Example

DATA COLLECTION AND ANALYSIS				
DLCS 22. Compare data storage structures. Examples: Stack, array, queue, table, database.	I can explain the differences in a minimum of 3 different data storage structures.	**Database-**a structured set of data held in a computer. **Array-** a data storage system that is used for block-based, file-based, or object storage. **Queue-**data storage that follows a particular order in which operations are performed. **Table-** a data structure that organizes into rows and columns. **Stack-**data storage structure in which data is removed in a last-in-first-out manner.	**ELA/SS**- Read about storage structures and create a KWL chart to display knowledge of data storages. **Math/Science-** Students gather data and determine which data storage structure is appropriate to use.	DZone Article: 3 Fundamental Data Storage Structures Examples of Data Structures and their real-world applications Actian Comparison Summary Activity A chart to use as a quick reference for deciding what storage structure to use. Study.com-What is Data Storage? Video, Lesson, Quiz Interactive lesson including video and quiz about the different types of data storage structures.
OTHER - PROGRAMMING AND CODING				
DLCS 7. Create a program that updates the value of a variable in the program. Examples: Update the value of score when a coin is collected (in a flowchart, pseudocode or program).	I can create a variable whose value changes during the program.	**Variable-** a value that can change depending on conditions or information passed to the program. **Flowchart-** a diagram which uses a set of standard graphic symbols to represent the sequence of coded instructions fed into a computer, enabling it to perform specified logical and arithmetical operations. **Program-** a list of instructions	**All Subjects:** Students will create a variable whose value changes during their program.	Interactive Lesson: How to think like a Computer Scientist- 2.11 Updating Variables How to think like a Computer Scientist Interactive Student Lesson with checks for understanding. Lesson 5: Variables- Code.org Teacher Lesson Plan using Code.org Codestudio to use variables to save a random number.

		that tells a computer what to do. **Value-** a representation of some entity that can be manipulated by a program.		Let's Get Started Coding Article- Variables Teacher Resource-Article of Types of Variables and Their Usages.

* Covered, but under another DLCS Standard not Computational Thinking.

Grade 8: *By the end of Grade 8, what will ALL students **know and be able to do**?*				
Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.)*	**Key Vocabulary** (*Students will KNOW / understand…)*	**What Does it Look Like in Class?** (*Students will be able to DO…)*	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Design a function using a programming language that demonstrates abstraction. Example: Create a program that utilizes functions in an effort to remove repetitive sequences of steps.	I can design a function that demonstrates the removal of repetitive sequences of steps.	**Function-** A procedure or routine in programming. **Abstraction**-The act of representing essential features without including the background details or explanations. **Programming**- The act of writing computer programs.	**Math -** Students will be able to design, create, and graph a function. **ELA -** Students will be able to remove repetitive information from story lines. **Science/SS -** Students will be able to apply functions, specifically loops, to laboratory experiments and project designs.	General: Hour of Code Multiple “mini-games” where students can code their own games or art. *Minecraft game includes lots of loops Coding for loops Vocabulary activity for loop vocabulary. Includes a music video, vocab cards, read and respond, quiz, and music lab. While loops: Complete lesson plan using code.org Getting loopy: Complete 50 minute lesson plan (includes assessment and awesome stand up and dance activity)

DLCS 2. Explain how abstraction is used in a given function. Example: Examine a set of block-based code and explain how abstraction was used.	I can identify how abstraction has been used in a function when given the function.	**Function-** A procedure or routine in programming. **Abstraction**-The act of representing essential features without including the background details or explanations. The process of removing unessential details. **Programming**- The act of writing computer programs.	**Math -** Students will be able to remove unnecessary details from word problems and recognize when abstraction has occurred. **ELA -** Students will be able to remove unnecessary details from passage to answer problems. **Science/SS:** Students will be able to recognize when abstraction has been used in a program or function.	Abstraction with Mad Glibs: Complete 50 minute lesson plan (includes assessment and writing activity) Offline Coding - Good Intro Activity - Page 10-12 Algorithm flow chart activity Abstraction in Everyday life: 45-60 minute complete lesson plan with activities Abstraction Article with definition and usable links for teaching the standard
DLCS 7. Create a program that includes selection, iteration, or abstraction, and initializes, and updates, at least two variables. Examples: Make a game, interactive card, story, or adventure game.	I can create a properly functioning program using selection, iteration, or abstraction that initializes and updates at least two variables.	**Selection** - choosing something carefully to ensure that it is the best option. **Iteration** - repeating a process several times. **Abstraction**-The act of representing essential features without including the background details or explanations. **Initialize**-format **Variables-** a data value that may take on one or more values during the runtime of a program.	**All Subjects:** Students will write a program that includes foundational programming concepts (selection, iteration, abstraction, initialization, and updating variables.)	For Love or Money - Animating a story PBL using Alice for coding Khan Academy Coding Lesson Programming Chatbots - How to build a chatbot
ALGORITHMIC THINKING				

DLCS 3. Create an algorithm using a programming language that includes the use of sequencing, selections, or iterations.	I can create an algorithm that includes sequencing, selections, or iterations.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Sequencing -** something that must be arranged in a particular order to complete a particular goal **Selection** - choosing something carefully to ensure that it is the best option I**teration** - repeating a process several times.	**All Subjects:** Students will create an algorithm or program that includes sequencing, selections, or iterations. **Suggestions:** Use spheros, hummingbird kits, lego robots, etc.	Explaining Algorithms to Kids Article about the relevance of abstraction to kids Offline Coding - Pages 4-5 Algorithm games and activities Real life algorithms - paper airplanes Complete 50 minute lesson plan including a paper airplane activity What is an algorithm? Students create a puzzle that can be solved with an algorithm Fun with sorting Complete lesson plan with sorting activities and optional writing activity. Intro to Java: Self paced introduction to java and basic algorithms
DLCS 4. Create a function to simplify a task. Example: 38 = 3*3*3*3*3*3*3*3; =(Average) used in a spreadsheet to average a given list of grades.	I can create a function that simplifies a task.	**Function-** A procedure or routine in programming.	**All subjects:** Students will create a function to simplify a task. **Suggestions:** **Math:** Operations **ELA/SS:** Simplify the writing process **Science:** Simplify the steps of an experimental procedure.	Creating a function Code.org lesson plan about creating functions Functions with harvester Code.org lesson with journaling activity Introduction to hummingbird coding Lesson plan for using the hummingbird kits Brainpop - functions Brainpop video and lesson plans for using functions
DLCS 5. Discuss the efficiency of an algorithm or technology used to solve complex problems.	I can examine a given artifact used to aid in problem solving.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations.	**Math:** Choose the most effective method to solve a real world problem.	Coding with middle school for beginners - Article and activities for introducing coding

	I can discuss the efficiency of that artifact in problem solving.	**Efficiency** - capable of bringing about a desired result with little waste.	**ELA/SS:** Choose the most efficient way to use different mediums to present a topic. (ALCOS 16) **Science:** Students will design and create an experiment. **Have students discuss the efficiency of their experimental design - possibly compare to other designs within the class.* (ALCOS 4)	to middle schoolers Alice - Hour of Code - Using Alice to code Complexity - It's Simple - Lesson plan and student resources
DLCS 6. Describe how algorithmic processes and automation increase efficiency.	I can explain how algorithms and automation have and can increase efficiency.	**Algorithm** - a process or a set of rules that are used in calculations or problem-solving operations. **Automation** - automatic working of a machine, process, or system by mechanical or electronic devices that take the place of humans. **Efficiency** - capable of bringing about a desired result with little waste.	**Math:** Students will choose the most efficient way to solve a problem. **ELA/SS:** Students will create an argument for how automation and algorithmic processes increase efficiency. **Science:** Students will explain how automation could improve an experimental design so that the process is more efficient.	Processing Lesson Plan - Solving problems with computers lesson plan Processing Lesson Plan - 2 - Complete lesson plan with resources Mazes, Algorithms, and Processes - Lesson plan including differentiation Testing Automation - Article about automation strategies and best practices (real-world connection)
COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 25.Create a model that represents a system. Example: Food chain, supply and demand.	I can select a system or process then construct a mode, either digital or physical, that represents the system process.	**Model-** a three-dimensional representation of a person or thing or of a proposed structure. **Process-** a series of actions	**All Subjects:** Students will create a model to solve a real world problem. **Suggestions:** Create a model in a PBL.	Creating a Representation Code.org lesson-designing a perfect day using binary representation systems Solar System

		or steps taken in order to achieve a particular end. **System-** a set of working things together as part of a mechanism or network.		Discovery Education hands on activity on creating a solar system model
DLCS 26. Create a simulation that tests a specific model. Examples: Demonstrate that pressure changes with temperature in a controlled environment; demonstrate that rocket design affects the height of a rocket's launch; demonstrate that the the amount of water changes the height of a plant.	I can create a simulation that tests a specific model.	**Simulations** - imitation of a process. **Model-**a three-dimensional representation of a person or thing or of a proposed structure.	**All Subjects:** Students will create and implement simulations to test a specific model. **Suggestions:** Test a model made in a PBL. **Math**:Interpret the parameters in a linear or exponential function in terms of a context.	Energy forms and changes Phet Simulation on energy changes that allows students to build and track energy systems. Projectile Motion- Students will predict how varying the initial conditions will affect a projectile's path, and provide an explanation for the prediction.
DESIGN THINKING				
DLCS 23. Design a digital artifact to propose a solution for a content-related problem. Example: Create a presentation outlining how to create a cost-efficient method to melt snow on roads during the winter.	I can design an artifact to propose a solution to an assigned or chosen content.	**Artifact**- a tangible object made by a human being.	**Math**: Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. **SS:** Perspective helps to define the attributes of historical comprehension. **All Subjects:** Students will create a digital artifact to propose a solution for a content-related problem.	Hurricane Relief- Students will collect and analyze data to estimate the probability and likely cost of an event such as the aftermath of a hurricane. Coast to Coast Trip: Travel Agent- Students will design a trip for a family of four.
DATA COLLECTION AND ANALYSIS				

DLCS 21. Differentiate types of data storage and apply the most efficient structure. Examples: Stack, array, queue, table, database.	I can identify which data storage structure is used given a set of data and the intent on using that data.	**Database-**a structured set of data held in a computer. **Array-** a data storage system that is used for block-based, file-based, or object storage. **Queue-**data storage that follows a particular order in which operations are performed. **Table-** a data structure that organizes into rows and columns. **Stack-**data storage structure in which data is removed in a last-in-first-out manner.	**Math:** When given a set of data, students will choose the best method for organizing and storing the data. **ELA/SS:** Students will write arguments to defend the intent on using data and the best way to store that data. (ELA: ALCOS 20) **Science:** Students will collect, organize, and save data from an experiment.	Data Structures—Diving Into Data Structures Data Structures tutorials Introduction to Arrays This lesson introduces arrays as a means of storing lists of information within a program. Google Sheets Various Google Sheets activities
DLCS 22. Encrypt and decrypt various data. Example: Create and decipher a message sent in a secret code.	I can encrypt data to include text or files. I can decrypt data to include text or files.	**Encrypt-** conceal data by converting it into code. **Decrypt-** a text that has been decoded.	**ELA/Science-** Students will create and decipher messages sent in a secret code. **SS -** Students can create a war slogan using Morse code. **Math -** Students can create their own secret code using formulas, other students will have to crack the code by determining which formula to use.	Encryption Puzzle This tool lets you play with text and do Caesar ciphers. You can use this to either encrypt a message or decrypt it. Simple Encryption Students are introduced to the need for encryption and simple techniques for breaking (or cracking) secret messages.

Grades 9-12:
*By the end of Grades 9-12, what will ALL students **know and be able to do**?*

Relevant Standards (*From **Alabama DLCS***)	**What do the Standards Mean?** (*Unpack/ Restate in your own words.*)	**Key Vocabulary** (*Students will KNOW / understand…*)	**What Does it Look Like in Class?** (*Students will be able to DO…*)	**Opportunities to Learn (Lessons, Resources, etc.)**
ABSTRACTION				
DLCS 1. Decompose problems into component parts, extract key information, and develop descriptive models to understand the levels of abstractions in complex systems. DLCS 6. Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects, with parameters, and which return a result.	I can decompose problems into component parts. I can extract key details given in the problem. I can decompose a problem into smaller components. I can abstract a process into simpler processes	**Decompose -** break down into smaller more manageable parts **Abstraction -** the process of removing unnecessary information **Integrated -** the linkage of various parts or systems **Embedded -** designed or built as an integral part of a system or device **Decompose -** break down into smaller more manageable parts	**ELA:** Finding main idea and detail in close reading. **Math:** Breaking down word problems to identify key information, using formulas eg: Pythagorean Theorem, quadratic equation, etc., defining components of formulas. **Science:** Analyze parts of food webs and how they relate to the whole food web, scientific method, breaking down chemical equations **SS:** Identifying key causes behind major historical events, close reading historical documents **CTE:** **Business Ed:**Financial literacy- reading check stubs, calculating overtime and percentages, tax forms. **Agriculture:** Measurements, Identifying different types of animals, *Welding- measuring, scaling, and sketching **Health Science:**	Computational Thinking- Unplugged pre-planned lesson on computational thinking Nearpod Lesson- Creative Problem Solving self paced or teacher directed lesson Trig Nearpod Lesson Engineering and Design Process - Resource Coding Lesson- This lesson gives students the opportunity to practice the four arts of computational thinking (decomposition, pattern matching, abstraction, and algorithms) in one cohesive activity. Robots without Humans Nearpod - Outlines the challenges as well as benefits and problems that arise with the development of autonomous robots. Article- Everyday Objects that Can be Programmed- Article detailing some of the everyday products that humans interact with that are run through programming

			Microbiology, life support, first aid. **FACS:** Cooking measurements, budgeting, childcare, sewing **Engineering/Computer Science:** Relationships between CS, science, engineering and math. Data analysis, algorithms, networking, and impacts of computing . **Law & Public safety:** Provide legal advice, public safety, protective services, and homeland security **Building Science:** Architecture and detailing, budgeting, civil engineering **Emergency & Fire Mgt:** Principles, theories, and practices associated with fire science, tactical fire operations, fire safety, and emergency services.	Real World Examples- Real life examples of embedded systems Read Like a Historian- Graphic organizers to breakdown historical and non-fiction texts STACKIFY - Abstraction explained ABSTRACTION VIDEO- Learn about what abstraction is and how it helps solve problems Developing Evidence Based Arguments from Texts - Premade lesson with resources provided that have students generate evidence based arguments based on various resources.
ALGORITHMIC THINKING				
DLCS 4. Use and adapt classic algorithms to solve computational problems. Examples: Sorting, searching, shortest path, and data compression.	I can compare and contrast pseudocode and programming language. I can differentiate between two different algorithms I can compare and contrast the difference between these types of control structures:	**Pseudocode -** a simplified programming language **Algorithm -** a series of steps **Iteration-** the repetition of a process **Scalability -** the capacity for the size to change	**Math:** Identify and plot a set of ordered pairs on a coordinate plane to re-create a piece of art, determine the shortest path between two points, and use slope to design an object in pieces.. Students can then develop an algorithm to convert between degrees and radians based	Defining What an Algorithm is- Article describing how to explain algorithms to students Agents Cube- Program 3D games online Code a Dance Party- Code.org programming lesson/challenge

	sequential statements, conditional statements, and iteration. I can identify trade-offs associated with using one control structure over another. I can use classic algorithms to solve computational problems.	**Readability -** the quality of decipherability to a compute	on the patterns they used to count their way around the unit circle. Create flow charts to classify numbers, angles, and solving equations. **Science:** Taking the different parts of the human body and sorting the processes of how they all work together, Stoichiometry, RNA replication, and gene analysis. **SS:** Creating summaries of events or historical figures, evaluate decisions made and determine if there was a more time or cost effective decision that could have been made, create the shortest path to get from one location to another on a map **CTE:** **Building Science:** What steps should you take to solve a problem with a building inspection which returns an unexpected problem/expense **Law & Public safety:** Emergency management- link lesson to vocabulary for computational thinking. **Agriculture:** Measurements with building, welding measurements, horticulture	Be an Architect- BlocksCAD 3D design website Models in Social Science- How math models can be used in social sciences

			data **Health Science:** Dosage measurements and procedures for administering meds **FACS:** Recipes, sanitization of food preparation items, food regulations, health codes	
DLCS 9. Demonstrate the ability to verify the correctness of a program. a. Develop and use a series of test cases to verify that a program performs according to its design specifications. b. Collaborate in a code review process to identify correctness, efficiency, scalability and readability of program code. DLCS 10. Resolve or debug errors encountered during testing using iterative design process.	I can apply the problem solving process to a program to verify the correctness of the program. I can troubleshoot errors encountered during testing using an iterative design process. I can resolve or debug errors encountered during testing using an iterative design process.	**Debug -** identify or remove errors from computer hardware or software **Iterative design -** cyclical process of designing a product	**ELA:** Summarizing information, compare and contrast stories and books to movies and identify why the differences are beneficial or harmful to the overall effect of the story, Students program a story with alternative pathways ("Choose your own adventure"), Student collaborate to build a story, identify any "bugs" in the story, and fix those bugs to give the story a more logical flow. Create flow charts for determining point of view, proper punctuation, and mood and tone. **CTE:** **Business Ed:** Calculating pay rate, daily rate of pay to weekly to monthly to yearly, overtime calculations **Engineering/Computer Science:** Debugging, issues with file types, building a webpage	Scratch- Students can create and develop drag and drop programming as well as remix their own codes and classmates code. Fix a Bug in a Scratch Program Lesson- Scratch programming lesson that will walk students through fixing a bu Create.ly - Students are able to create flow charts (creates an algorithm to classify information) Programming Theory-Flowcharts- Students can get a basic understanding of algorithms and how to use flowcharts to show algorithms

			Emergency & Fire Mgt: Measuring response time, solving problems on site.	
COMPUTATIONAL MODELS/SIMULATIONS				
DLCS 37.Evaluate the ability of models and simulations to test and support the refinement of hypotheses. a. Create and utilize models and simulations to help formulate, test, and refine a hypothesis. b. Form a model of a hypothesis, testing the hypothesis by the collection and analysis of data generated by simulations. c. Explore situations where a flawed model provided an incorrect answer.	I can evaluate how models and simulations can be used to examine theories and test and support the refinement of hypotheses. I can create a model or simulation to formulate, test, and refine a hypothesis. I can form a model of a hypothesis. I can be given a flawed model and explore reasons that the outcomes are not as expected or intended.	**Model -** a system used as a representation **Simulation -** imitation of a process **Hypothesis -** an explanation based on limited knowledge used a basis for further investigation	**ELA:** Students will evaluate non-fiction documents for inaccuracies by analyzing information gathered from multiple sources **Math:** Use real-world data to simulate/estimate a true population mean/proportion**,** vector addition, using geometric principles to design and create scaled models, use robots to create a program that can draw any regular polygon of any regular size and explore how slight variations in the program can create fractal shapes, Students use engineering design process to engage in real-world construction process of a bridge in Geometry. **Science:** Design, build, test, and evaluate the effectiveness of model rockets, using virtual simulations to determine how different molecules will interact, Students create simulations and abstractions that model safe and unsafe roller coaster designs. Students use computational models and processes to	PhET Online Simulations TinkerCAD 3D Modeling- 3D design program Blocks CAD3D design with coding - 3D design program

			predict the effects of removing a species from the ecosystem **SS:** Economic (supply and demand), create and test models of inventions and identify weaknesses **CTE:** **Business Ed:**Real world simulation with community members. **Agriculture:** Students participating in land and animals evaluations and using that information to plan a garden or simulation for animal evaluations. **Health Science:** Pair with Law & Public safety/Emergency management classes to simulate emergency response situation **FACS:** Food truck simulation and activity for entire school **Engineering/Computer Science:** 3D printer, utilize printed materials in school for decorations or awards. **Building Science:** Blueprints, Tiny house building	

DATA COLLECTION AND ANALYSIS				
DLCS 32. Use data analysis tools and techniques to identify patterns in data representing complex systems. DLCS 30. Evaluate the tradeoffs involved in choosing methods for the organization of data elements DLCS 31. Create interactive data visualizations using software tools to help others understand real-world phenomena.	I can compare and contrast fundamental data structures and their uses I can develop a model that demonstrates a method used by computing devices to translate digital bits as real-world phenomena.. I can examine how the structure of digital artifacts may be modified when compressed or encrypted. I can research methods of data organization and storage. I can evaluate the tradeoffs involved in choosing methods for the organization of data I can identify patterns in data. use data analysis tools and techniques. I can use data analysis tools and techniques to identify patterns in data	**List -** or sequence is an abstract data type that represents a countable number of ordered values, where the same value may occur more than once **Array -** a data structure consisting of a collection of elements, each identified by at least one array index or key **Model -** a system used as a representation **Compression -** reduction in volume **Metadata -** a set of data that describes and gives information about another set of data **Networked computing -** a generic term to describe multiple computers communicating over the same network or server **Interactive -** influencing or having an effect on each other	**ELA:** Use data to support arguments. Students can self monitor grammar errors in writing assignments using Google Sheets. A Google Sheet created with a list of character traits with drop down boxes of character names, allowing students to compare and contrast characters across different works throughout the year. Collecting and evaluating the reliability of data for research papers, projects, or activities. **Math:** Collect class data to analyze if the data follows a Normal distribution curve, Use data to create a digital histogram or box plot to display the data. Students will collect data from a graph to determine the types of transformations/patterns that occurred. , **CTE:** **Business Ed:** Budgets, calculating tip **Agriculture:** Forecasts and peak seasons for crops **Health Science:** Blood pressure, heart rate **FACS:** Portions, Health scores	Google Sheets Unit - Basics of using Google Sheets Google Sheets Tips and Tricks - Detailed information on different analysis tools embedded in Google Sheets Area of a Parallelogram Using Decomposition- Lesson with video on how to use the computational thinking practice of decomposition to determine the area of a parallelogram. Understanding Data Structures - Example lesson on understanding linear data structure (Could be used as an introduction to understanding data structures.) What does decomposition mean in math?- Article on how to incorporate decomposition in math classes. Land the plane Desmos activity - students practice creating equations of lines to be able to land their airplane on the runway. Vernier Labquest - data analysis with its built-in graphing and analysis application

			Engineering/Computer Science: Big data, sorting filtering, pivot tables **Law & Public safety:** Crime rates, public records **Building Science:** Building code/inspections, blueprints, mark-up **Emergency & Fire Mgt:** Fire codes, ventilation system comparison, water systems,	Desmos | Beautiful, Free Math - graphing tool for math or science class. Digital Breakouts - uses Google for Education to create a breakout game Google Marketing Data Studio - Collaborative Google based site that allows users to transform and visualize data and results. Transformations Desmos Bundle- 7 different exploratory/discovery interactive activities on Transformations on graphs. Using Data Visualization to Engage in Scientific Prctices - What are infographics? Why use infographics? Collecting and Analyzing Data Like a Historian - This article explains how historians word questions in surveys and how they analyze the information gathered from the questions Egg Roulette- Students investigate the differences in independent and conditional probability using the “Egg Roulette” game as scene on Jimmy Falon.

DLCS 31. Create interactive data visualizations using software tools to help others understand real-world phenomena.	I can collect data to depict real-world phenomena. create displays to share collected data. I can create interactive data visualizations using software tools to help others understand real-world phenomena.	**Phenomena** - an observable fact or event	**Science:** Chart local historical weather to analyze trends and anomalies in climate change **SS:** Collect and analyze election data in order to make a prediction of an outcome, using data to predict the outcome of the stock market, and students review data and identify patterns and trends in wars and other historical events. Use of data to study patterns of voting rights in a nation	Using Phenomena in NGSS- Article on how to incorporate Phenomena into science classes. NGSS Rubric: Teaching Channel Video + Rubric finding phenomena that brings science into the real world Economics Lessons that Involve Data Collection and Analysis - This site provides full lessons that have students evaluate and collect data on different aspects of the economy Statistics Lesson Plans For Grades 9-12- Lesson plans for all content areas. Topics include: How to Lie to Congress, Hurricanes, Qualitative Data, Sprint Times, Power, etc.
DESIGN THINKING				
DLCS 40. Use an iterative design process, including learning from mistakes, to gain a better understanding of a problem domain.	I can create, publish, seek feedback on, and revise artifacts.	**Iterative design -** cyclical process of designing a product	Students will be able to DO.. **All Subject:** PBLs, Engineering Design Process implementation, STEAM challenges	Orange Slice Rubric Chrome Extension - Rubric creation extension Google Sites Peergrade Online Peer Feedback Facilitator- Online application that allows students to grade one another and provide feedback