Algorithms & Programming: Variables   Grade Band: K-2

Grade	Standards AP.V.01
K	With guidance, model the way **programs** store and manipulate grade-level data by using numbers or other symbols to represent information (e.g., **encode** or **decode** words using numbers, pictographs or symbols to letters, words, or direction).
1	With guidance, model the way programs store and manipulate grade-level data by using numbers or other symbols to represent information (e.g., encode or decode words using numbers, pictographs or symbols to letters, words, or direction).
2	Model the way programs store and manipulate grade-level data by using numbers or other symbols to represent information (e.g., encode or decode words using numbers, pictographs or symbols to letters, words, or direction).

Grade	Essential Skills
K	Identify and interpret symbols that are used to represent information such as numbers for quantities or letters for sounds. Create and use symbols to represent information such as establishing hand signals for "I agree" or creating emoji-like symbols for feelings.
1	Identify and interpret symbols that are used to represent information such as mathematical operators, pictographs, Create and use symbols to represent information such as comparative quantities, repeating patterns, a series of actions, or directions.
2	**Encode** or **decode** messages that use representations such as arrows, pictographs, etc. when given a key.

Explanation

Students will model the ways computers store information by using representations for real world information. Thumbs up/down can represent yes/no, letters and musical notes represent sounds, arrows represent directions; "secret" codes can be created for letters or words using numbers or other symbols. Note: Despite the name of the standard, it is not essential to use the term variable at this stage.

Think of this as similar to….

Emojis are used to let people know how you are feeling.

Essential Questions

What are examples of symbols we use to give each other information?

Why is it useful to use symbols to represent information?

Implementation Examples—What would this look like in the classroom?

Grade(s)	Title	Description	Link	Content Connection & Notes
K	**The Very Hungry Bee-Bot**	**Grade K**--The class uses a paper version of the robot to find a path from a starting point to a target. Following the algorithm the class created, the students program a robot to reach that target. The students should recognize that the directions given to the paper robot are translated to the arrows on the Bee-bot or Code and Go Mouse (or other "code" on a different type of robot)	[The Very Hungry Bee-Bot](#)	This lesson also aligns with **CS** AP.A.01 and AP.PD.03 and can be used with any robot, despite the title. The lesson assumes students have a basic competence with the robots. An anchor chart with the functionality of the buttons created in a [previous lesson](#) is referenced in this lesson.
K-1	**Happy Maps**	**Grade K**-- Students are given a maze and a character "flurb" and work in teams to get the "flurb" to the fruit. Students will create precise instructions and connect the instructions with the symbols provided. **Grade 1**--Students create their own symbols and define them to others as they provide instructions to move the "flurb" to the fruit.	[Happy Maps](#)	This lesson also aligns with **CS** AP.C.01 and AP.PD.04; similar activities can be done with floor robots see [Code and Go Introduction](#)

Grade(s)	Title	Description	Link	Content Connection & Notes
K-2	**Dancing Alone**	**Grade K**--Students use Scratch Jr. to create a silly dance for Scratch Cat using motion blocks. Students are introduced to creating sequences of code in Scratch Jr. Students should demonstrate an understanding that the coding blocks determine what the Scratch Cat does. **Grade 1**--Students should be able to identify a number of the code blocks and describe what they ""tell"" the Scratch Cat to do. **Grade 2**: Students should look at a sequence of code blocks and describe what the Scratch Cat will do; conversely, they should be able to watch the Scratch Cat do a simple dance and be able to make a reasonable guess of a code that could be used to accomplish that dance. "	Dancing Alone	This lesson also aligns with **CS** AP.C.01, AP.PD.01, AP.PD.03 and AP.PD.04 and is similar to Getting Loopy
1	**My Robotic Friends**	**Grade 1**--Using a set of symbols in place of code, students will design algorithms to instruct a "robot" to stack cups in different patterns. Students will take turns participating as the robot, responding only to the algorithm defined by their peers. This segment teaches students the connection between symbols and actions, the difference between an algorithm and a program, and the valuable skill of debugging.	My Robotic Friends	
2	**Graph Paper Programming**	**Grade 2**-- Student "program" one another to draw pictures by using symbols to instruct each other to color squares on graph paper in an effort to reproduce an existing picture. Each student should get an opportunity to both encode the picture, by translating the picture into symbols, and decode the picture by using the symbols a classmate to try to recreate the original picture.	Graph Paper Programming	
2	**Classroom Map Symbols**	**Grade 2**--Students identify symbols on a map and decode and explain what they represent in the real world, Students then use the symbols, or create their own symbols and create a corresponding legend. They create a map and use the symbols to encode what makes their school community unique. Students write directions for visitors to the school community so they can visit the human-made features of interest.		This lesson also aligns with **SS** 2.2 Geography: Place; 2.6 Skills and Processes: Applying Disciplinary Concepts and Tools

Standard: AP.V.01 Grade Band: K-2
These annotations are a collaboration between Maryland Center for Computing Education and the Maryland State Department of Education.