GRADES 6-8

Computer Science Teaching Association Computer Science Standards Level 2

CSTA grade 6-8 Computer Science Standards supported by BlocksCAD FULLY:

Framework Concept: Algorithms & Programming

CSTA Standards	In BlocksCAD	BlocksCAD Intro Series Lessons	BlocksCAD Math Series Lessons
2-AP-10 -- **Algorithms**: Use flowcharts and/or pseudocode to address complex problems as algorithms.	Before starting a program, have students write their strategy for model creation (algorithm) as flowcharts or pseudocode, based off of a student sketch of the desired design.	All	All
2-AP-11 -- **Variables**: Create clearly named variables that represent different data types and perform operations on their values.	Students can declare variables (numbers and strings are implicitly typed, with the type in the declaration enforced elsewhere in the program) and use those values to create parametric models in BlocksCAD.	Any-Size Box (potential variables: length, width, depth, wall thickness)	Sugar Cubes, Pizza Printer, Witch's Cauldron, Ice Cream Machine, Pythagoras on TV
2-AP-12 -- **Control**: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.	Students can build control structures such as nested loops and compound conditionals in BlocksCAD.	Forest, Honeycomb, Patterns	Saving Up, Sous Chef, Pizza Printer, Triangle Targets, Tessellations, Chances
2-AP-13 -- **Modularity**: Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	Complex 3D models often contain repeated submodules. Students can identify these repeated shapes and create modules to better simplify, organize, and maintain their designs.	Spiders (leg module), Forest (tree module)	
2-AP-14 -- **Modularity**: Create procedures with parameters to organize code and make it easier to reuse.	Complex 3D models often contain shapes that, while not repeated exactly, are similar to each other in a way that can be described with parameters. Students can identify these repeated shapes and create modules with inputs to better simplify, organize, and maintain their designs.	Lego (brick module:length and width parameters), Forest (tree module: height, tree type parameters)	Professional Printer, Pizza Printer, Triangle Targets, Witch's Cauldron, Ice Cream Machine, Pythagoras on TV
2-AP-19 -- **Program Development**: Document programs in order to make them easier to follow, test, and debug.	Students should incorporate comments in all BlocksCAD programs and can communicate their process using sketches, design documents, flowcharts, and presentations.	All	All

CSTA grade 6-8 Computer Science Standards supported by BlocksCAD PARTIALLY:

Framework Concept: Computing Systems

CSTA Standards	In BlocksCAD
2-CS-01 -- **Devices**: Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.	Students can learn to identify improvements to 3D printers based on usability testing, and analysis of common printing problems or printer failures.
2-CS-02 -- **Hardware & Software**: Design projects that combine hardware and software components to collect and exchange data.	Students can learn how BlocksCAD work with 3D printing software (slicers) and 3D printers.
2-CS-03 -- **Troubleshooting**: Systematically identify and fix problems with computing devices and their components.	Students can learn to troubleshoot 3D printer issues including things like poor model adhesion to the print bed, jammed nozzles, broken filament, bed leveling, etc.

Framework Concept: Data & Analysis

CSTA Standards	In BlocksCAD
2-DA-07 -- **Storage**: Represent data using multiple encoding schemes.	BlocksCAD provides options for students to represent the same data in multiple ways. For example, students could represent the same color using HSV, RGB values,as well as forms understandable by people such as digital displays of the color (high-level representations). In addition, students can discuss the different ways that a BlocksCAD program can be stored- in block form (.xml), “compiled” into OpenSCAD code (.scad), or pictorially (.jpg).
2-DA-08 -- **Collection Visualization & Organization**: Collect data using computational tools and transform the data to make it more useful and reliable.	BlocksCAD can be used to make physical, manipulable models of collections of data, plots of functions, or physical objects (like molecules) which provides a new way to visualize data and things.

Framework Concept: Algorithms & Programming

CSTA Standards	In BlocksCAD
2-AP-15 -- **Program Development**: Seek and incorporate feedback from team members and users to refine a solution that meets user needs.	Students can design a prototype using BlocksCAD and gather feedback from team members and users to refine the final design that meets user needs.
2-AP-16 -- **Program Development**: Incorporate existing code, media, and libraries into original programs, and give attribution.	BlocksCAD supports BlocksCAD "remixes" to incorporate existing models shared in public repositories and credit original authors. Teachers could create lesson plans which support using citations and outside sources in BlocksCAD.
2-AP-17 -- **Program Development**: Systematically test and refine programs using a range of test cases.	BlocksCAD models often need to test that parts, or pieces, fit together. Students can model “test objects” to test fit within the software, such as modeling coins using actual measurements and testing that they fit a piggy bank model’s slot. Also, individual 3D printers will produce slightly different output based on the same input model. This matters for models with tight clearances between parts. Students can characterize their 3D printers by printing multiple versions

	of models with a systematic range of different clearances to see which works best with their 3D printer.
2-AP-18 -- **Program Development**: Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.	Could be implemented with lesson plans that support collaboration, group problem solving, and project management using BlocksCAD. For example, students could model buildings in a city, rides for an amusement park, or atoms for a molecule building set.

Framework Concept: Impacts of Computing

CSTA Standards	In BlocksCAD
2-IC-20 -- **Culture**: Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.	Could be implemented with a lesson plan on how 3D modeling and 3D printing is influencing the culture and the world (such as making low-cost prototyping and one-off models, promoting maker movement, printing body parts, food, weapons), and the tradeoffs that presents.
2-IC-21 -- **Culture**: Discuss issues of bias and accessibility in the design of existing technologies.	Students can test and discuss the usability of BlocksCAD and 3D printers with the teacher's guidance.
2-IC-22 -- **Social Interactions**: Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact.	Students can create a collection of digital designs by combining their projects. They could gather inputs and feedback from the community using online community and electronic surveys.
2-IC-23 -- **Safety Law & Ethics**: Describe tradeoffs between allowing information to be public and keeping information private and secure.	Discuss the tradeoffs of making BlocksCAD projects public and private.

CSTA grade 6-8 Computer Science Standards NOT supported by BlocksCAD:

Framework Concept: Networks & the Internet

CSTA Standards
2-NI-04 -- **Network Communication & Organization**: Model the role of protocols in transmitting data across networks and the Internet.
2-NI-05 -- **Cybersecurity**: Explain how physical and digital security measures protect electronic information.
2-NI-06 -- **Cybersecurity**: Apply multiple methods of encryption to model the secure transmission of information.

Framework Concept: Data & Analysis

CSTA Standards
2-DA-09 -- **Inference & Models**: Refine computational models based on the data they have generated.