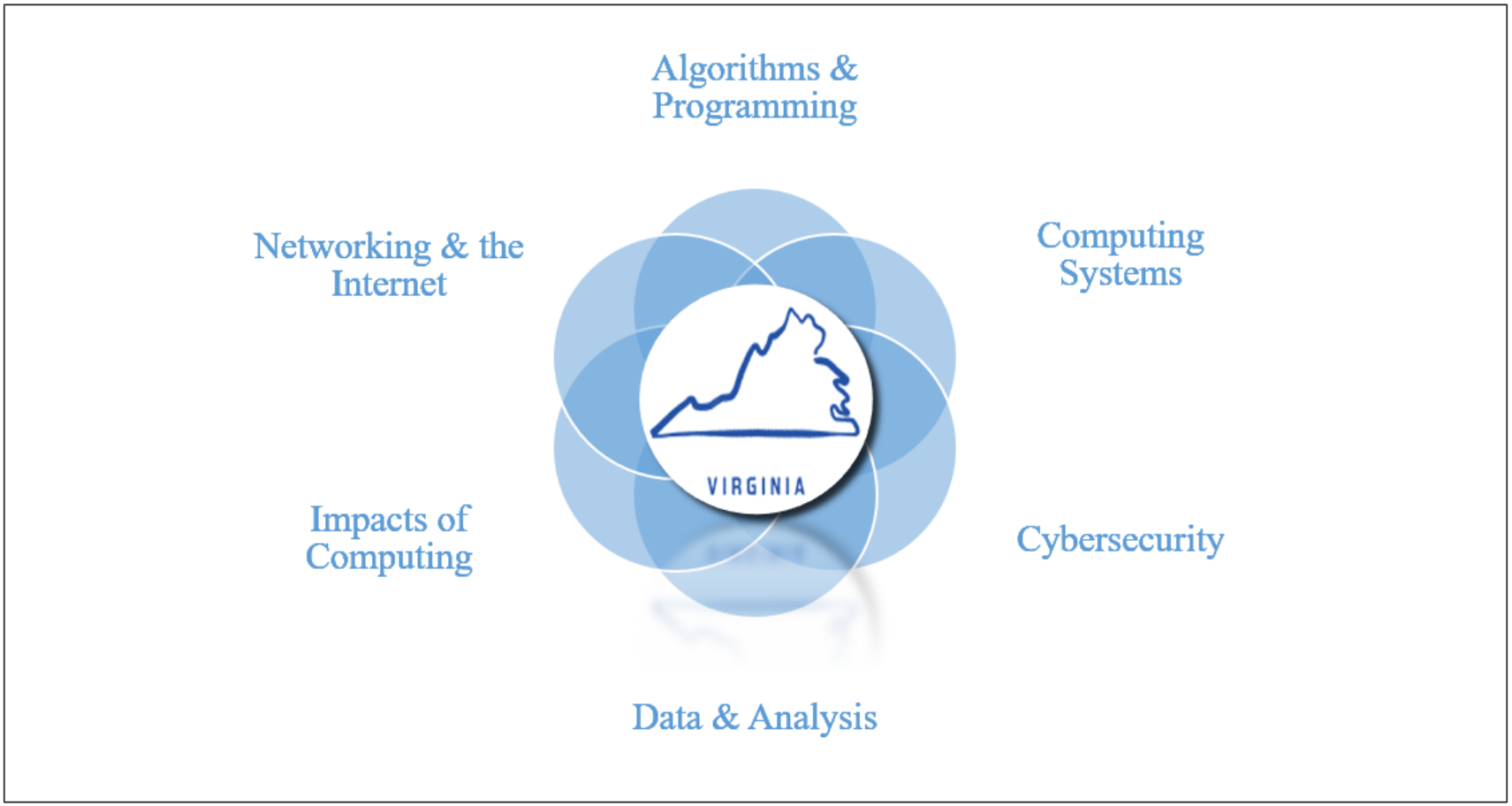
Computer Science Standards of Learning

Curriculum Framework



Board of Education
Commonwealth of Virginia

Copyright © 2019
by the
Virginia Department of Education
P.O. Box 2120
Richmond, Virginia 23218-2120
http://www.doe.virginia.gov

All rights reserved. Reproduction of these materials for instructional purposes in public school classrooms in Virginia is permitted.

Superintendent of Public Instruction
James F. Lane, Ed.D.

Assistant Superintendent of Learning
Gena Keller

Office of Science, Technology, Engineering, and Mathematics
Tina Manglicmot, Ed.D., Director
Anne Petersen, Ph.D., Science Coordinator
Timothy Ellis, Computer Science Specialist
Joshua Bearman, Science Specialist

NOTICE
The Virginia Department of Education does not discriminate on the basis of race, sex, color, national origin, religion, age, political affiliation, veteran status, or against otherwise qualified persons with disabilities in its programs and activities.

The 2017 *Computer Science Curriculum Framework* can be found on the Virginia Department of Education's Web site.

Introduction

The *Computer Science Standards of Learning* Curriculum Framework amplifies the *Computer Science Standards of Learning for Virginia Public Schools* and defines the content knowledge, skills, and understandings that are measured by the Standards of Learning. The Computer Science Curriculum Framework provides additional guidance to school divisions and their teachers as they develop an instructional program appropriate for their students. It assists teachers as they plan their lessons by identifying essential questions and vocabulary to drive instruction and defining the essential skills students should demonstrate. This supplemental framework delineates in greater specificity the minimum content that all teachers should teach and all students should learn.

School divisions should use the *Computer Science Curriculum Framework* as a resource for developing sound curricular and instructional programs. This framework should not limit the scope of instructional programs. Additional knowledge and skills that can enrich instruction and enhance students' understanding of the content identified in the Standards of Learning should be included as part of quality learning experiences.

Each topic in the *Computer Science Standards of Learning* Curriculum Framework is developed around the Standards of Learning. The format of the Curriculum Framework facilitates teacher planning by broadening the context of the standards and identifying essential student skills that should be the focus of instruction for each standard.

Context of the Standard

The Context of the Standard provides educators an explanation of the standard, including a description and the vertical development of the concept. This context will support teachers in incorporating computer science content into discipline-specific lessons. The intention of the Computer Science standards in grades K-8 is that Computer Science principles be integrated throughout content area instruction.

Essential Skills

The Essential Skills define student performance expectations aligned to each standard. The intent of the K-8 computer science standards is that the concepts are integrated into existing disciplines and this will result in these skills being emphasized differently in each content area. The expectation is that these Essential Skills are partnered with content area performance expectations as appropriate in instruction. At the high school level, the expectations in the 2017 *Computer Science Standards of Learning Curriculum Framework* are to be used in the support of standalone computer courses; the essential skills outlined in the document are not intended to be integrated into other coursework unless a teacher chooses to use the content to support discipline practices.

Essential Questions
Each standard has identified key questions to drive classroom instruction. These questions lead teachers and students toward the big ideas of each concept and provide a more holistic viewpoint used to lead instruction relating to the context of each standard.

Essential Vocabulary
In order to effectively communicate Computer Science concepts, essential vocabulary terms are defined in grade-level appropriate terms. These definitions are found in the glossary (Appendix A).

Grade Five

The fifth-grade standards place emphasis on constructing programs and utilizing algorithms to accomplish a task. Students continue to decompose larger problems into smaller tasks and recognize the impacts of computing and computing devices. Students in fifth grade model how computing systems work. The accurate use of terminology as well as the responsible use of technology will continue to be built upon. The foundational understanding of computing and the use of technology will be an integral component of successful acquisition of skills across content areas.

Algorithms and Programming

5.1 The student will construct sets of step-by-step instructions (algorithms) both independently and collaboratively,

a. using sequencing;
b. using loops;
c. using variables to store and process data;
d. performing number calculations on variables (addition, subtraction, multiplication and division); and
e. using conditionals (if-statements).

Context of the Standard
Algorithms are commonly used in school and at home as students engage in step-by-step activities that are done on a routine basis. Students can create algorithms as they describe and sequence tasks that are part of daily activities. When an algorithm or a set of algorithms is tested, a program has been created. Programs use sequencing and may include loops and variables; the use of these are dependent on the intended outcome of the program. Students entering fifth grade should have experience with the construction of loops using a wide variety of patterns to include repeating and growing patterns. In fourth grade, students learn that variables are used to store and press data. Variables in a computer program are analogous to "Buckets" or "Envelopes" where information can be maintained and referenced. On the outside of the bucket is a name. When referring to the bucket, we use the name of the bucket, not the data stored in the bucket. Many programming languages provide variables, which are used to store, modify, and process data. The data type determines the values and operations that can be performed on that data. Examples of operations that may be used on variables include count and sum.

Context of the Standard
In fifth grade, algorithms become more complex through the addition of conditionals, or "if-statements." Conditionals act as gates in programs. They test a true-false condition, if it is true then the code inside the gate, or conditional, runs. If the test is false, then the program skips the code and moves on to the next command. Conditionals refer to statements that require the computer to determine whether to run a specific set of instructions based upon certain criteria being met. Conditionals enable the computer to "make a decision" concerning what set of directions to follow. *Teacher note: the use of the term variable is used across disciplines in fifth grade and students should be aware of how this term can be interpreted or applied differently depending on the discipline context.*

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Construct algorithms to include loops, variables, and conditionals. • Identify a variable in an algorithm. • Apply the use of variables in a math calculation in an algorithm. • Assign one or more variables in a computer program to name or categorize data. • Apply the use of conditionals in an algorithm.	Students should *investigate* these concepts: • When should you use an if-statement in an algorithm? • How do we use variables to complete math problems on a computer? • When do you assign a variable to an expression or a set of data? • When you use an if-statement, how does the computer respond to the directions? • Why are if-statements useful when writing algorithms?	Students should *apply* these terms in context: • Algorithm • Variable • Conditional (if-statement)

5.2 The student will construct programs to accomplish a task as a means of creative expression using a block- or text-based programming language, both independently and collaboratively

a. using sequencing;
b. using loops;
c. using variables;
d. using mathematical operations (addition, subtraction, multiplication and division) variable to manipulate a variable; and
e. using conditionals (if-statements).

Context of the Standard
Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem. Examples of computation artifacts include programs, images, audio, videos, presentations, or web page files. Computing has the potential to provide students' opportunities to extend their creative expression to solve problems, create computational artifacts, and develop new knowledge. As students create block- and text-based programs, they move from being mere consumers of content to engaging in the subject matter by creating computational artifacts. A computational artifact is anything created by a human using a computer. In fifth grade, students are expected to use block-based or text-based programming to develop basic programs that include sequences, loops, variables, and conditional statements.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Use loops, variables, and conditionals when creating block or text-based programs. • Understand that computing devices can be used as a means for creative expression. • Explain different types of creative products that can be generated using a computing device (e.g. computer games, interactive stories, graphic design, programs, music, and movies). • Determine an original problem and create a solution using a text or block-based program.	Students should *investigate* these concepts: • When might you use an if-statement in a program that is designed for creative expression? • What are examples of different creative products that you can make using a program?	Students should *apply* these terms in context: • Algorithm • Variable • Conditional (if-statement)

5.3 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, loops, conditionals, and variables.

Context of the Standard
In order to determine if an algorithm is an appropriate reflection of the steps that must occur in order to complete a task, the students should review the algorithm and its components to ensure it works as intended. During the review stage, the design and implementation are checked for adherence to program requirements, correctness, and usability. This review could lead to changes in implementation and possibly design, which demonstrates the iterative nature of the process. If the algorithm does not work as intended, the students should determine what changes could be made to the algorithm in order to complete the task. These changes

Context of the Standard
may include adding, deleting, rearranging, or changing a step in order to obtain the intended outcome. The process of revising a program so that it works as intended is called debugging.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Describe how an algorithm didn't work (e.g., character is not moving as intended). • Analyze an algorithm that is flawed and determine possible solution(s). • Implement a proposed adjustment to a sequence that did not work as intended. • Explain how a proposed adjustment increases the effectiveness of an algorithm.	Students should *investigate* these concepts: • If your program does not run, how could you correct it? • If your algorithm is not working as intended, how could you fix it? • Once you have found an error in your algorithm, how do you decide what adjustment needs to be made? • How can the sequence of your steps affect the outcome of a program or algorithm?	Students should *apply* these terms in context: • Bug • Debug

5.4 The student will create a plan as part of the iterative design process, both independently and collaboratively using strategies such as pair programming (e.g., storyboard, flowchart, pseudo-code, story map).

Context of the Standard
Many occupations and content areas use an iterative design process, including computer science and engineering. In computer science, the development of programs uses an iterative design process involving design, implementation (programming), and review (debugging) until the program runs correctly. The design stage occurs before beginning to program. The planning stage is when the programmers gather information about the problem and sketch out a solution. This design process may include the use of pseudocode - writing out the steps of a program in English to make sure the flow of control and logic make sense. During the implementation stage, the planned design is expressed in a programming language (code) that can be made to run on a computing device. During the review stage, the design and implementation are checked for adherence to program requirements, correctness, and usability. This is the process of debugging discussed in 5.3. This review could lead to changes in implementation and possibly design, which demonstrates the iterative nature of the process.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Design a program using a planning tool. • Review and revise a plan to better fit the needs of a task. • Communicate how an iterative design process can improve an algorithm.	Students should *investigate* these concepts: • Why is planning out a story or program an important part of the writing process? • Why is reviewing and revising your work important? • What kinds of jobs require the use of iterative problem solving? • How do people in different careers use the iterative process?	Students should *apply* these terms in context: • Planning tool • Storyboard • Pseudocode

Essential Skills	Essential Questions	Essential Vocabulary
	• What is the value in making small, targeted, additions or changes to your algorithm rather than large changes?	

5.5 The student will break down (decompose) a larger problem into smaller sub-problems, both independently and collaboratively.

Context of the Standard
Large programs are often difficult to imagine and create. Large programs can be broken down, or decomposed, into smaller parts in order to facilitate the design, implementation, and review process. These smaller portions of programs are easier to design and implement. They can then be incorporated with other small components to build toward the overall goal. Programs can also be created by incorporating smaller portions of programs that have already been created. Program decomposition also enables different people to work on different parts at the same time. An example of decomposition at this level is creating an animation by separating a story into different scenes. For each scene, a background needs to be selected, characters placed, and actions programmed. The instructions required to program each scene may be similar to instructions in other programs.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Analyze and decompose a problem into subproblems.	Students should *investigate* these concepts: • Why does breaking a problem down into smaller subproblems make the overall task easier?	Students should *apply* these terms in context: • Decompose

Essential Skills	Essential Questions	Essential Vocabulary
• Explain why multiple smaller problems may be easier to solve than one large problem.	• How does decomposing a program into subproblems help programmers when debugging a program? • Why would using subproblems in a program be thought of as a time-saving measure?	

5.6 The student will give credit to sources when borrowing or changing ideas (e.g., using information, pictures created by others, using music created by others, remixing programming projects).

Context of the Standard
As students start to work with different artifacts (reference materials, resources, etc.) they should understand that these sources of information were created by others. Authors, illustrators, and programmers are responsible for the creation of many sources of information that are used in the classroom and at home. As students choose to use some of these sources in their own work, they are expected to recognize the original creator of the source. This practice should be reiterated throughout a student's K-12 education and beyond. Ethical complications arise from the opportunities provided by computing. The ease of sending and receiving copies of media on the Internet, such as video, photos, and music, creates the opportunity for unauthorized use, such as online piracy, and disregard of copyrights, such as lack of attribution. Other topics related to copyright are plagiarism, fair use, and properly citing online sources. Knowledge of specific copyright laws is not an expectation at this level. This standard supports English standards as they learn about plagiarism in writing. *Students are not responsible for specific copyright laws or using citing practices in fifth grade.*

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Review a program they created and identify portions that may have been created by others. • Explain why it is important to give credit to authors. • Describe when it is acceptable to use people's work, and how to give credit to sources. • Recognize that different artifacts, including online, programs, and physical (i.e., books, paintings, webpages) have creators.	Students should *investigate* these concepts: • How can you find the creator of an artifact? • What are examples of artifacts that need to need to have their creators credited? • Why is important to give credit for using someone else's idea, even if you aren't quoting them directly? • If you use a portion of someone else's algorithm, why do you need to give credit?	Students should *apply* these terms in context: • Author • Illustrator • Composer • Source

Computing Systems

5.7 The student will model how a computing system works including input and output, processors, sensors and storage.

Context of the Standard
A system is defined as a regularly interacting or interdependent group of items forming a unified whole. Computing devices are defined as having input, processors, memory and output; these are considered part of a computer system. In computer science, input and output, also referred to as I/O, is the communication between an information processing system, such as a computer, and the outside world, possibly a human or another information processing system. This is how real world information is digitized, or translated in and out of binary. Inputs are the signals or data received by the system. There is a wide variety of digital collection tools used for gathering and inputting digital data. Tools may be chosen based upon the type of data people wish to observe or by the designers of the system. These collection tools include the movements and clicks of your mouse and the keys you type on a keyboard. Sensors are also used in computing systems, such as in robotics, to detect information and serve as input devices for the system. For example, a robotic device depends on sensors, such as a light sensor, to detect changes in brightness. In fifth grade, students are introduced to the concept of storage. Computers store data that can be retrieved later. It is also good practice to save data in multiple locations to protect against loss. The storage capacity of a computing device varies as does the amount of storage required for the saving of different media (pictures, videos, text documents, etc). Data can be stored locally on a hard drive or on the Internet. The connection should be made that variables in programs are how we store and access data when programming. A variable is a name given to a spot in the computer's memory. The programmer can access and change the data stored in that location by using the variable name.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills:	Students should *investigate* these concepts:	Students should *apply* these terms in context:

Essential Skills	Essential Questions	Essential Vocabulary
• Describe how a computing system may use different components to receive input including sensors. • Identify the processor as the component which manipulates input into output. • Describe how a computing system may produce output. • Model a simple computing system indicating inputs and outputs. • Explain how data can be stored in a computer for later use. • Recognize that different types of data require different amounts of storage.	• What are examples of sensors or computer components that take in input? • What kind of input can a computer take in? • What are the different types of output that a computer can produce? • What is storage in regards to a computing device? • How does the amount of storage affect how well a computer functions? • How do storage requirements differ between different media?	• Input • Output • Processor • Sensor • Storage

5.8 The student will identify, using accurate terminology, simple hardware and software problems that may occur during use, and apply strategies for solving problems (e.g., rebooting the device, checking for power, checking network availability, closing and reopening an app).

Context of the Standard
As with any system, there are times that a computer system does not work as intended. Although computing systems may vary, common troubleshooting strategies can be used on them, such as checking connections and power or swapping a working part in place of a potentially defective part. Rebooting a machine is commonly effective because it resets the computer. Since computing devices are composed of an interconnected system of hardware and software, troubleshooting strategies may need to address both. Students in fifth grade are expected to use accurate terminology to describe simple problems with computer hardware and software. Common troubleshooting strategies, such as checking that power is available, checking that physical and

Context of the Standard
wireless connections are working, and clearing out the working memory by restarting programs or devices, are effective for many systems.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Identify when a device or program is not working properly. • Communicate that a device or program is not working. • Perform simple troubleshooting tasks (e.g., rebooting the computer) • Differentiate hardware and software derived problems.	Students should *investigate* these concepts: • How can you find out specifically why your computer is not working? • What are different troubleshooting tactics you should try if a program is not working? • Why is it important to be as specific as possible when you are describing a problem? • How can you tell whether a problem is related to hardware or software? • What are examples of hardware/software problems?	Students should *apply* these terms in context: • Troubleshoot

Cybersecurity

5.9 The student will evaluate and solve problems that relate to inappropriate use of computing devices and networks.

Context of the Standard
Computer networks, including the Internet, can be used to connect people to other people, places, information, and ideas. In order to keep students safe, schools and divisions have rules on the appropriate use of technology. As students increase their use of the networks and interact with others outside of the school or home environment, digital safety is an increasing concern. Students should be aware of what is allowed and not allowed when using division/school technology. Appropriate use of technology as well as school and division rules when using technology should be reviewed with students on a regular basis. Consistent monitoring of students when engaged with technology should be conducted at all times. In fifth grade, students should begin to contemplate their role as members of a larger community of technology users and how they will navigate this world ethically and responsibly.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Identify and explain causes and effects related to inappropriate use of computing devices. • Identify real-life situations they encounter while using computing devices that could cause problems in school or at home. • Describe how a technology-related problem could be avoided or prevented.	Students should *investigate* these concepts: • What is appropriate use of technology? • If you see someone using technology inappropriately in school, how should you notify the proper person? • What are some consequences of inappropriate use of computing technology? • What are examples from the news concerning inappropriate use of technology?	Students should *apply* these terms in context:

Essential Skills	Essential Questions	Essential Vocabulary
	• If you were designing a system to stop inappropriate use of technology, what would it look like and why?	

5.10 The student will determine whether passwords are strong, explain why strong passwords should be used, and demonstrate proper use and protection of personal passwords.

Context of the Standard
Connecting devices to a network or the Internet provides great benefit, but care must be taken to protect private information such as a student's name, phone number, and address. Passwords are used to protect devices and information from unauthorized access. Computer programs can be used to guess passwords; therefore, strong passwords have characteristics that make them more difficult to guess. Many sites have rules as to the length and composition of passwords; these rules help create stronger passwords. The practice of not sharing passwords should be emphasized in the classroom and at home. At the elementary level, students are encouraged to use passwords. These passwords may not be as complex as those used by adults in protecting information. Suggestions for creating strong passwords for students include: • Use uppercase and lowercase letters. • Use numbers. • Use symbols. • Use at least 8 characters. • Don't use words from a dictionary. • Don't use the same password twice. • Don't use personal information.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Explain how a password helps protect the privacy of information. • Respect other students' password privacy. • Explain how logging off devices can protect your information. • Classify passwords as strong or weak. • Create and use strong passwords to be used in school and home.	Students should *investigate* these concepts: • What are the components of a strong password? • Why should you change your password periodically? • Why should you have a different password for different accounts?	Students should *apply* these terms in context: • Password

Data and Analysis

5.11 The student will use a computer to observe, analyze, and manipulate data in order to draw conclusions and make predictions.

Context of the Standard
When answering questions about text in history or English or investigating a question in science, evidence should be used to support your answer. Data are a form of evidence that can be used when answering questions or in making predictions. Data are often sorted or grouped to provide additional clarity. The same data could be manipulated in different ways to emphasize particular aspects or parts of the data set. Computers can be used to obtain, store, and manipulate data. These data can be used to construct tables and graphs from data collected in class; they can also be sources of existing data sets that have been compiled by others. The ability to determine what type of data is needed to answer a question and use a computer to find these data are skills needed in many career and academic fields.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Use a computer to organize data using various forms (i.e., tables, spreadsheets) of data collection. • Conduct manipulations of data using the computer. • Analyze a data set to identify a pattern or make a prediction. • Use the data or prediction to answer a question. • Display the same data on a computer using multiple representations (e.g., tables, bar graphs, line graphs).	Students should *investigate* these concepts: • How can you use the data you have collected to make a prediction or answer a question? • How does a computer help you to look at data in different ways? • What can you learn from looking at your data in different formats? • How can computers be used to view data using a variety of formats? • What does a computer allow you to do with data that is more difficult on paper?	Students should *apply* these terms in context: • Data

5.12 The student will create an artifact using computing systems to model the attributes and behaviors associated with a concept (e.g., plate tectonics).

Context of the Standard
Scientists, computer scientists, mathematicians, and programmers construct and use models to better conceptualize and understand phenomena under investigation or to develop a possible solution to a proposed problem. Models include diagrams, physical replicas, mathematical representations, analogies, and computer simulations. Models are used to represent a system (or parts of a system) under study, to aid in the development of questions and explanations, to generate data that can be used to make predictions, and to communicate ideas to others.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Use a computing system to create an artifact to model a concept. • Describe how a model reflects the attributes or behaviors of a concept.	Students should *investigate* these concepts: • What are examples of models that we see and use regularly? • What are examples of concepts that you can model? • What kinds of things do you need to know before you begin to make a model? • How does a computer model help us learn and predict things about large, small, and complex systems?	Students should *apply* these terms in context: • Model

5.13 The student will use numeric values to represent non-numeric ideas in the computer (e.g., binary, ASCII, pixel attributes such as RGB).

Context of the Standard
Similar to humans, computers need a format in which to receive, interpret, and manipulate information. Computers use numeric values to store information and perform operations. Information inputted into the computer from various components must be converted into numeric values in order for the computer to use the information and perform functions. Once the function is completed, the numeric values must be converted to a form of output that the user can understand. This output may be in the form of words, images, videos, or sounds. Examples of different ways non-numeric information such as letters or colors can be expressed include the use of different protocols such as binary, ASCII, or RGB. *Students are not expected to apply these protocols in fifth grade.*

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Understand that computers use numeric values to represent non-numeric ideas. • Give an example of when numeric values can be used to represent non-numeric ideas. • Apply using numeric values to represent non-numeric ideas to in a real-world example.	Students should *investigate* these concepts: • What is a numeric value? • What are some examples of how numbers are used to represent non-numeric ideas in the computer? • Why are numbers used to represent non-numeric ideas in the computer? • Why does a computer convert input into a different format?	Students should *apply* these terms in context: • Binary • Pixel • ASCII

Impacts of Computing

5.14 The student will give examples and explain how computer science had changed the world and express how computing technologies influence, and are influenced by, cultural practices.

Context of the Standard
The needs and wants of different groups of people will have an effect on the types of computing technology they create and use. People tend to use technologies that will help facilitate the various cultural activities they engage in. In turn, the cultural needs of a group will drive development of new and more effective technologies. These new technologies could be to make communication more efficient, facilitate the sharing of ideas, automate common processes, or meet other societal demands. Increased access to the Internet has greatly increased the communication aspect of computing technology, and has also had an effect on the customs of many groups of people.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Identify computing technologies that have changed the world. • Explain how the technology is influenced by culture. • Explain how the culture can affect the technology. • Brainstorm solutions involving computing technology to solve a problem in your school.	Students should *investigate* these concepts: • What are examples of computing technologies that changed the world? • How has technology, like mobile phones, changed society? • How does society influence the technology that we invent? • If you could design a new computing technology, what would it do, and why?	Students should *apply* these terms in context: • Internet

5.15 The student will evaluate and describe the positive and negative impacts of the pervasiveness of computers and computing in daily life (e.g., downloading videos and audio files, electronic appliances, wireless Internet, mobile computing devices, GPS systems, wearable computing).

Context of the Standard
The use of technology, including computers, has allowed for global communication and has revolutionized the everyday access of information, whether for business, scientific or personal use. Although there are many positive impacts in using technology, there are also times when computer use has impacted us in undesirable ways. As computer technology continues to advance and new generations of machines grow faster and have greater capabilities, the machines become more deeply fixed in daily life, magnifying both the benefits and the downside risks. Positive impacts include easy access to information, automated machinery, and fast and accurate data processing. Negative impacts include an increase in sedentary lifestyles, family and leisure interruption, and loss of privacy.

Essential Skills	Essential Questions	Essential Vocabulary
Students should *demonstrate* these skills: • Identify how the use of computers and computing positively influences daily life. • Identify how the use of computers and computing negatively influences daily life. • Evaluate use of time in activities at school and at home to determine positive and negative impacts of these activities on health and wellbeing.	Students should *investigate* these concepts: • How do computing devices make your life easier? • How have computing devices made people's lives more complicated? • What are ways to limit the negative influences of computing devices? • What do you believe are good rules about technology use to make sure that we can use them wisely?	Students should *apply* these terms in context:

5.16 The student will explain social and ethical issues that relate to computing devices and networks.

Context of the Standard
People can work in different places and at different times to collaborate and share ideas when they use technologies that reach across the globe. These social interactions affect how local and global groups interact with each other. As with any social interaction, there are manners that people should use when interacting with others. The use of manners when collaborating or interacting with others through computing devices or networks is more complex since many times the communication is done without seeing the person on the other side of the communication. For example, communications should be clear and concise and should never represent the words and actions of others as your own. Care should be taken when sharing information so that the intent of the message is not misunderstood by the person on the other end of the communication.

Context of the Standard
In addition, due to the anonymous nature of online communication, intimidating and inappropriate behavior in the form of cyberbullying may occur. Cyberbullying is a form of bullying that occurs when online communications are sent that are intimidating or threatening in nature.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Describe problems that arise from computer use. • Determine solutions to common computer use issues.	Students should *investigate* these concepts: • What is cyberbullying? • How could computing technology make it easier for people to engage in negative behavior? • What should you do if you see other people using a computer to do harm to others?	Students should *apply* these terms in context: • Cyberbullying

Networking and the Internet

5.17 The student will compare and contrast the difference between a local network and a worldwide network.

Context of the Standard
A local network is a collection of computers and devices, such as printers, connected together. Many networks in a school or at home are connected using a combination of wired and wireless devices. When a computer connects to a network, it is online. Networks allow computers to share resources, such as hardware, software, data, and information. The sharing of resources saves time and money and also allows different people throughout your house or school to share resources. The Internet is a worldwide collection of networks that connects millions of businesses, government agencies, educational institutions, and individuals.

Essential Skills	**Essential Questions**	**Essential Vocabulary**
Students should *demonstrate* these skills: • Compare and contrast the difference between a local network and a worldwide network. • Model a network at home or school showing different components (i.e. printers, computers, and server).	Students should *investigate* these concepts: • What is a network? • What is the difference between a local and a worldwide network? • What are examples of local and global networks? • What are the advantages and disadvantages of local and global networks?	Students should *apply* these terms in context: • Network • Local network • Worldwide network

Grade 5

Term	Definition
Algorithm	Sequence of steps that completes a task
ASCII	A conversion chart for representing different characters in numeric form
Author	The creator of a book, image, song, or object
Binary	The number system used by computers to represent all messages and commands
Bug	An error or flaw in a program that causes it to give the wrong answer or crash
Composer	The creator of an audio artifact (e.g., song)
Conditional	A set of actions that only runs if a condition is met
Cyberbullying	The use of electronic communication to bully a person
Data	Individual facts and information
Debug	Find and fix problems in a program
Decompose	Breaking a complex problem into parts that are easier to understand and solve
Graphic organizer	A visual display of facts, terms, and ideas
Illustrator	Creator of a visual artifact (e.g., image or painting)
Input	Data that is taken in by a computer for processing
Internet	A global computer network that allows people to communicate, create, and share content
Local network	A group of computers that are physically located near each other and can communicate directly

Term	Definition
Loop	A set of actions repeated until a condition is met
Model	Creating a representation of an idea, object, or a process
Network	A group of computers that can communicate directly with each other
Output	Data that is produced by a computer as a result of a program
Password	A secret word or phrase that must be used to gain admission to something
Pixel	Small colored dots that make up an image
Planning tool	A document or other resource to help organize thoughts in the creation of a product
Prediction	Making a guess of what will happen based on current facts
Processor	Computing component that performs the manipulation to change input into output
Sensor	Computing component that collects data that would otherwise be difficult to collect by hand
Storage	Computing component that can hold data to be used at a later time
Storyboard	A sequence of drawings that represent the order of a program happening
Troubleshoot	Identify and correct faults in a computing system
Variable	Programming element that can hold a value
Worldwide network	A group of computers that are spread far apart and can communicate with each other