



2018 Digital Literacy and Computer Science Course of Study

Resources Utilized in the Development of the 2018 *Alabama Course of Study:* *Digital Literacy and Computer Science*

- The 2009 *Alabama Course of Study: Technology Education*
- 2016 International Society for Technology in Education (ISTE) Standards for Students
- Computer Science Teachers Association (CSTA) K-12 Computer Science Standards, Revised 2017
- K-12 Computer Science Framework
- Documents from Other States
- Public and Professional Input



2018 Digital Literacy and Computer Science Course of Study

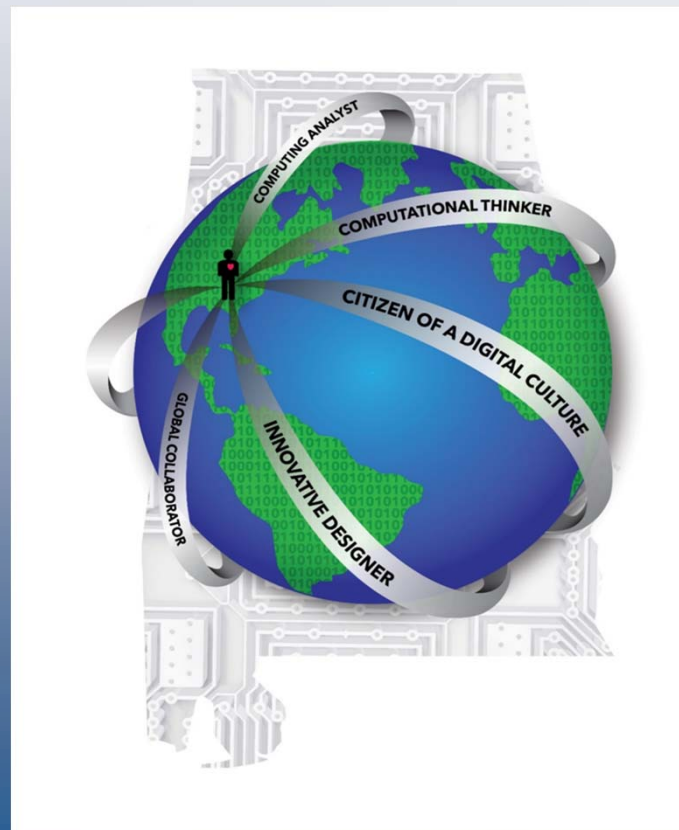
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2018 DIGITAL LITERACY AND COMPUTER SCIENCE COURSE OF STUDY

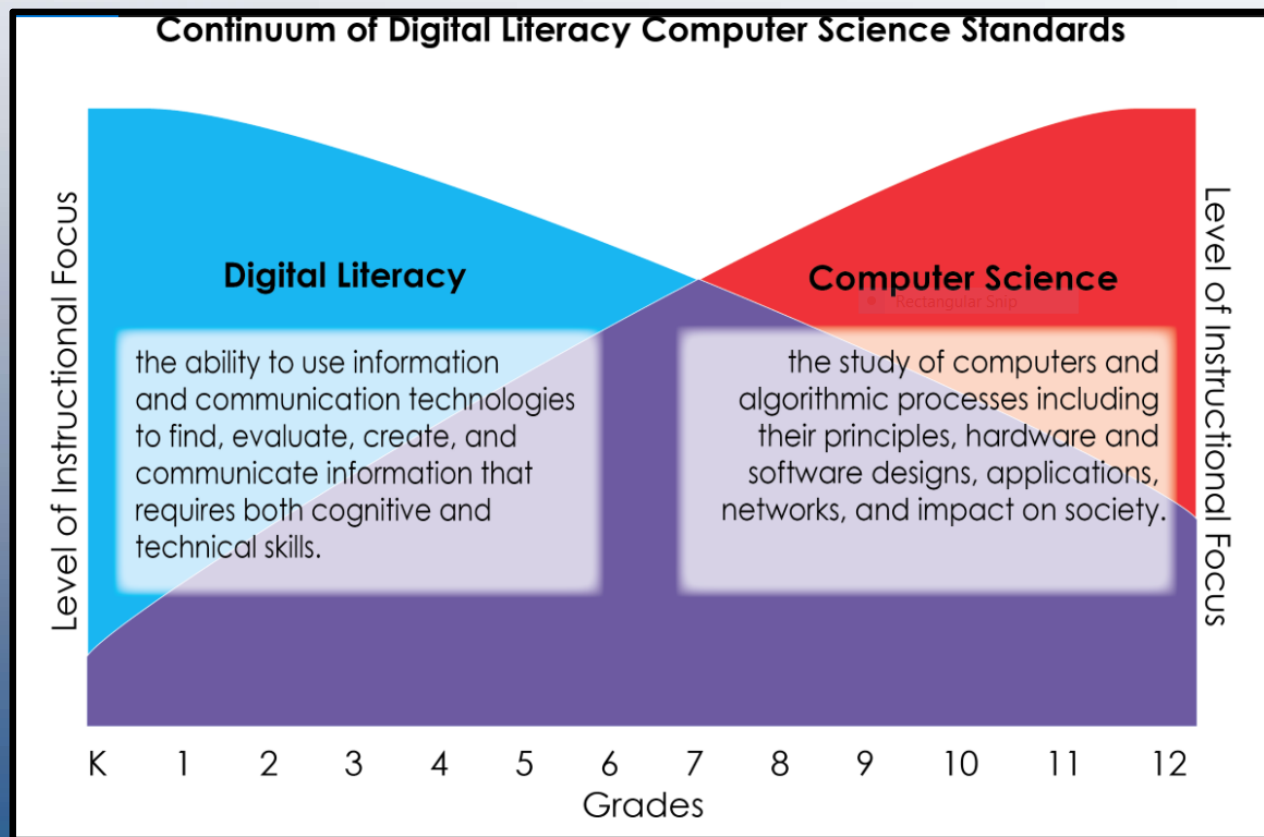


CONCEPTUAL FRAMEWORK

- The State of Alabama
- The Globe
- The Student
- The Five Content Strands
- The Circuit Board and Binary Codes



A Vision for K–12 Digital Literacy and Computer Science for Alabama Students



Recurring Standards for Digital Literacy and Computer Science

Safety, Privacy, and Security

1. Identify, demonstrate, and apply personal safety use of digital devices.

Legal and Ethical Behavior

2. Recognize and demonstrate age-appropriate responsible use of digital devices and resources as outlined in school/district rules.

Impact of Computing

3. Analyze the potential impact of computing.

Systems

4. Identify and employ appropriate troubleshooting techniques used to solve computing or connectivity issues.

Collaborative Research

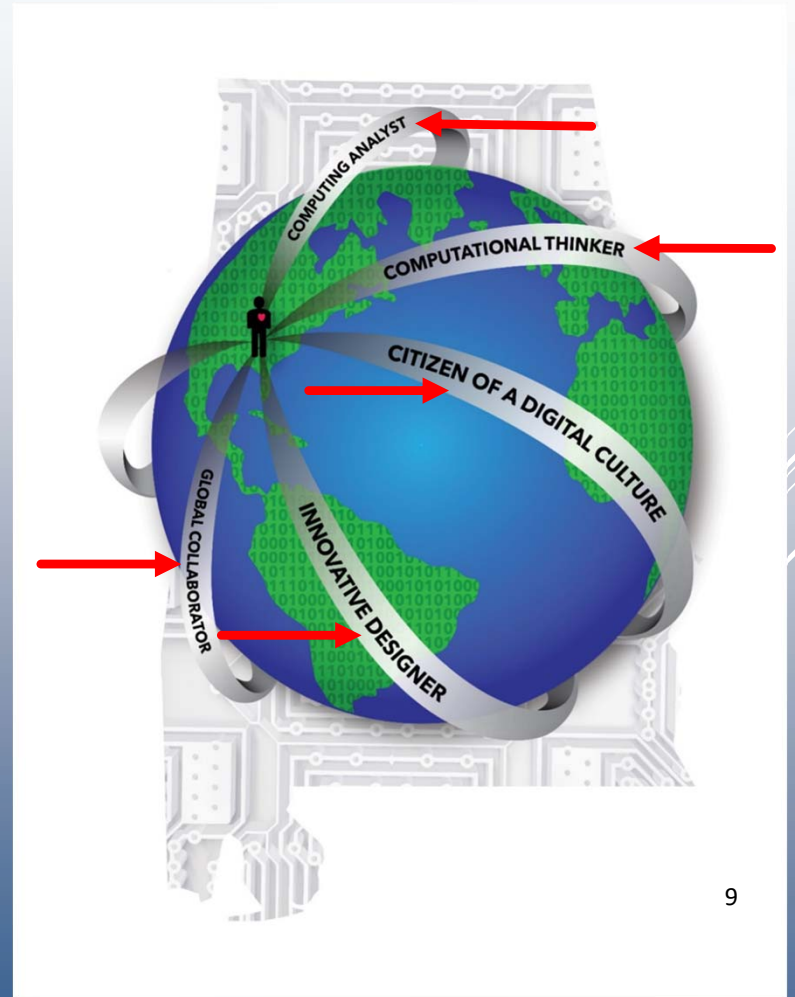
5. Locate, curate, and evaluate information from digital sources to answer research questions.

Digital Tools

6. Produce, review, and revise authentic artifacts using appropriate digital tools.

Digital Literacy and Computer Science Content Standard Strands

- Computational Thinker
- Citizen of a Digital Culture
- Global Collaborator
- Computing Analyst
- Innovative Designer



Overview for Grades K–2

Students in Grades K – 2 will meet the following learning goals:

- As ***Computational Thinkers***, students will explain how computing is an integral part of our world.
- As ***Citizens of a Digital Culture***, students will demonstrate ways to be good digital citizens.
- As ***Global Collaborators***, students will collaborate with other learners and contribute ideas to their joint projects.
- As ***Computing Analysts***, students will use their growing knowledge of computers to create artifacts systematically and efficiently.
- As ***Innovative Designers***, students will undertake challenges and create new ways to address existing problems.



Kindergarten Overview

Kindergarten content for digital literacy and computer science is organized into five strands of focused study outlined below in the column on the left and identified by bold print in shaded bars. Related content standards are grouped by topic below each strand.

The Recurring Standards for Digital Literacy and Computer Science are listed below in the column on the right. These recurring standards should be incorporated into classroom instruction at the appropriate level of rigor in each grade.

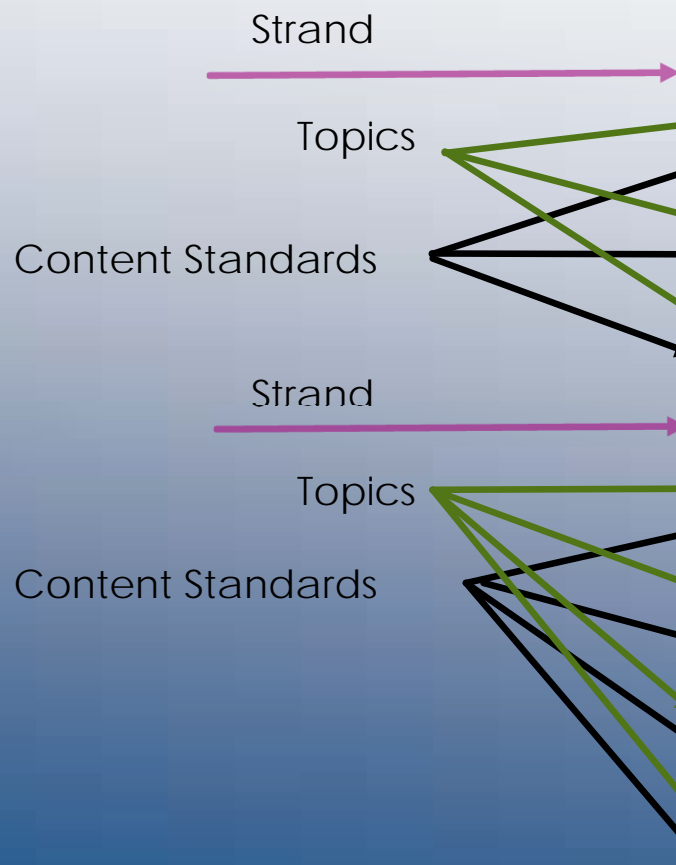
Strands

Topics

Content Standard Strands and Topics	Recurring Standards
<p>Computational Thinker</p> <ul style="list-style-type: none"> Abstraction Algorithms Programming and Development 	<p>Safety, Privacy, and Security</p> <ol style="list-style-type: none"> 1. Identify, demonstrate, and apply personal safe use of digital devices.
<p>Citizen of a Digital Culture</p> <ul style="list-style-type: none"> Safety, Privacy, and Security Legal and Ethical Behavior Digital Identity Impact of Computing 	<p>Legal and Ethical Behavior</p> <ol style="list-style-type: none"> 2. Recognize and demonstrate age-appropriate responsible use of digital devices and resources as outlined in school/district rules.
<p>Global Collaborator</p> <ul style="list-style-type: none"> Communication Digital Tools Collaborative Research 	<p>Impact of Computing</p> <ol style="list-style-type: none"> 3. Assess the validity and identify the purpose of digital content.
<p>Computing Analyst</p> <ul style="list-style-type: none"> Data Systems 	<p>Systems</p> <ol style="list-style-type: none"> 4. Identify and employ appropriate troubleshooting techniques used to solve computing or connectivity issues.
<p>Innovative Designer</p> <ul style="list-style-type: none"> Human/Computer Partnerships Design Thinking 	<p>Collaborative Research</p> <ol style="list-style-type: none"> 5. Locate and curate information from digital sources to answer research questions.
	<p>Digital Tools</p> <ol style="list-style-type: none"> 6. Produce, review, and revise authentic artifacts that include multimedia using appropriate digital tools.



Organization of the Digital Literacy and Computer Science Course of Study



Grade 1

Students in first grade describe and utilize the basic functions of computing devices. They begin to create algorithms collaboratively and start learning keyboarding skills. First graders explore and identify the appropriateness of specific online behaviors. As a class, students communicate and collaborate with people outside their immediate environment to understand how others use technology in their daily lives. Students use digital tools to demonstrate their knowledge to others and use feedback to solve problems.

Underlined words appear in the glossary.

Students can:

Computational Thinker

Abstraction

1. Classify and sort information into logical order with or without a computer.
Examples: Sort by shape, color, or other attribute; sort A-Z.

Algorithms

2. Order events into a logical sequence (algorithm).
Examples: Unplugged coding activities, sequence of instruction.

Programming and Development

3. Construct elements of a simple computer program in collaboration with others.
Examples: Block programming, basic robotics, unplugged programming.

Citizen of a Digital Culture

Safety, Privacy, and Security

4. Demonstrate age-appropriate methods for keeping personal information private.
Example: Keep passwords confidential, use anonymous profile picture or avatar, develop user names that are non-identifying or do not include actual name.

Legal and Ethical Behavior

5. Differentiate between prior knowledge and ideas or thoughts gained from others.
6. Identify appropriate and inappropriate behaviors for communicating in a digital environment.
Examples: Cyberbullying, online etiquette.

Digital Identity

7. Recognize that a person has a digital identity.

Impact of Computing

8. Identify ways in which computing devices have impacted people's lives.
Example: Location services, instantaneous access to information.

OVERVIEW FOR GRADES 3-5

Grades 3 – 5 students will meet the following learning goals:

- As **Computational Thinkers**, students will use problem-solving processes to understand how to write and debug an algorithm and to evaluate and create new informational representation, that successfully reframes an issue.
- As **Citizens of a Digital Culture**, students will demonstrate an understanding of concepts involving safety and security, responsible use of technology, and the influence of technology on its users.
- As **Global Collaborators**, students will collaboratively utilize intermediate research skills to create artifacts and use digital tools to communicate or exchange information.
- As **Computing Analysts**, students will understand and use various computing devices strategically to solve a problem and accomplish a task in the most effective way.
- As **Innovative Designers**, students will pioneer new solutions, products, and processes through design thinking and be familiar with the advantages and limitations of technology.

Grade 3 Overview

Grade 3 content for digital literacy and computer science is organized into five strands of focused study outlined below in the column on the left and identified by bold print in shaded bars. Related content standards are grouped by topic below each strand.

The Recurring Standards for Digital Literacy and Computer Science are listed below in the column on the right. These recurring standards should be incorporated into classroom instruction at the appropriate level of rigor in each grade level.

Strands

Topics

Content Standard Strands and Topics

Computational Thinker

- Abstraction
- Algorithms
- Programming and Development

Citizen of a Digital Culture

- Safety, Privacy, and Security
- Legal and Ethical Behavior
- Digital Identity
- Impact of Computing

Global Collaborator

- Communication
- Digital Tools
- Collaborative Research

Computing Analyst

- Data
- Systems

Innovative Designer

- Human/Computer Partnerships
- Design Thinking

Recurring Standards

Safety, Privacy, and Security

1. Identify, demonstrate, and apply personal safe use of digital devices.

Legal and Ethical Behavior

2. Recognize and demonstrate age-appropriate responsible use of digital devices and resources as outlined in school/district rules.

Impact of Computing

3. Assess the validity and identify the purpose of digital content.

Systems

4. Identify and employ appropriate troubleshooting techniques used to solve computing or connectivity issues.

Collaborative Research

5. Locate and curate information from digital sources to answer research questions.

Digital Tools

6. Produce, review, and revise authentic artifacts that include multimedia using appropriate digital tools.



Grade 4

Fourth graders will delve into more intricate processes of digital literacy and computer science through small group collaboration under the supervision and instruction of the teacher as a facilitator. Working with partners, students will identify and describe the different aspects of computational thinking and global collaboration using various devices.

Underlined words appear in the glossary.

Students can:

Computational Thinker

Abstraction

1. Construct a basic system of numbers, letters, or symbols to represent information (a cipher).
2. Synthesize complex information from multiple sources in different ways to make it more useful and/or relevant.
Examples: Combine data from multiple sources, sorting multi-level.
3. Formulate a list of sub-problems to consider while addressing a larger problem.
Examples: Problem: a multi-step math problem; sub-problem: steps to solve.
Problem: light bulb does not light; sub-problem: steps to resolve why.

Algorithms

4. Show that different solutions exist for the same problem (or sub-problem).
5. Detect and debug logical errors in various basic algorithms.
Example: Trace the path of a set of directions to determine success or failure.
6. Use flowcharts to create a plan or algorithm.
7. Define a simple pseudocode.

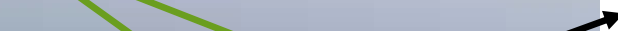
Programming and Development

8. Create a working program in a block-based visual programming environment using arithmetic operators, conditionals, and repetition in programs, in collaboration with others.

Strand



Topics



Content Standards



Overview for Grades 6-8

Grades 6 – 8 students will meet the following learning goals:

- As ***Computational Thinkers***, students will break problems into component parts, identify key pieces of information, and use that information to solve problems.
- As ***Citizens of a Digital Culture***, students will verbalize the impact of computing in a global society while safely, securely, ethically, and legally interacting with digital environments and protecting their digital identities.
- As ***Global Collaborators***, students will use appropriate digital tools to communicate data that informs, persuades, and entertains to collaborate with society locally and globally.
- As ***Computing Analysts***, students will utilize computing systems efficiently in the management and interpretation of data and information.
- As ***Innovative Designers***, students will leverage human and computer partnerships within a design process, creating useful and thoughtful solutions to problems.

Grade 6 Overview

Grade 6 content for digital literacy and computer science is organized into five strands of focused study outlined below in the column on the left and identified by bold print in shaded bars. Related content standards are grouped by topic below each strand.

The Recurring Standards for Digital Literacy and Computer Science are listed below in the column on the right. These recurring standards should be incorporated into classroom instruction at the appropriate level of rigor in each grade level.

Strands

Topics

Content Standard Strands and Topics

Computational Thinker

- Abstraction
- Algorithms
- Programming and Development

Citizen of a Digital Culture

- Safety, Privacy, and Security
- Legal and Ethical Behavior
- Digital Identity
- Impact of Computing

Global Collaborator

- Communication
- Digital Tools
- Collaborative Research

Computing Analyst

- Data
- Systems

Innovative Designer

- Human/Computer Partnerships
- Design Thinking

Recurring Standards

Safety, Privacy, and Security

1. Identify, demonstrate, and apply personal safe use of digital devices.

Legal and Ethical Behavior

2. Recognize and demonstrate age-appropriate responsible use of digital devices and resources as outlined in school/district rules.

Impact of Computing

3. Assess the validity and identify the purpose of digital content.

Systems

4. Identify and employ appropriate troubleshooting techniques used to solve computing or connectivity issues.

Collaborative Research

5. Locate and curate information from digital sources to answer research questions.

Digital Tools

6. Produce, review, and revise authentic artifacts that include multimedia using appropriate digital tools.



Grade 8

During eighth grade, students will expound upon computer science principles and global collaboration experiences. Students will be designers, not just consumers, who will effectively utilize digital tools and articulate the impact of technology on a global society. These standards are written to provide student-centered learning with minimal guidance from the teacher.

Underlined words appear in the glossary.

Students can:

Computational Thinker

Abstraction

1. Design a function using a programming language (block-based or script) that demonstrates abstraction.
Example: Create a program in Game Lab that utilizes functions in an effort remove repetitive sequences of steps.
2. Explain how abstraction is used in a given function.
Example: Examine a set of block-based code and explain how abstraction was used.

Strand

Topic

Content Standards

Overview for Grades 9-12

Grades 9 – 12 students will meet the following learning goals:

- As **Computational Thinkers**, students will demonstrate how to make complex situations simple, developing algorithms that define the systematic processes needed to solve problems encountered in life.
- As **Citizens of a Digital Culture**, students will demonstrate an understanding of concepts involving safety and security, responsible use of technology, and ways it can influence people through social interactions.
- As **Global Collaborators**, students will utilize digital tools to collaborate and communicate with others to solve problems presented in today's technical world.
- As **Computing Analysts**, students will analyze and create solutions to problems and challenges presented in the use of computer systems and data.
- As **Innovative Designers**, students make decisions and create solutions using the various digital tools available in today's technical environments.



Grades 9-12 Overview

Grades 9-12 content for digital literacy and computer science is organized into five strands of focused study outlined below in the column on the left and identified by bold print in shaded bars. Related content standards are grouped by topic below each strand.

The Recurring Standards for Digital Literacy and Computer Science are listed below in the column on the right. These recurring standards should be incorporated into classroom instruction at the appropriate level of rigor in each grade level.

Strands

Topics

Content Standard Strands and Topics

Computational Thinker

- Abstraction
- Algorithms
- Programming and Development

Citizen of a Digital Culture

- Safety, Privacy, and Security
- Legal and Ethical Behavior
- Digital Identity
- Impact of Computing

Global Collaborator

- Communication
- Digital Tools
- Collaborative Research

Computing Analyst

- Data
- Systems

Innovative Designer

- Human/Computer Partnerships
- Design Thinking

Recurring Standards

Safety, Privacy, and Security

1. Identify, demonstrate, and apply personal safe use of digital devices.

Legal and Ethical Behavior

2. Recognize and demonstrate age-appropriate responsible use of digital devices and resources as outlined in school/district rules.

Impact of Computing

3. Analyze the potential impact of computing.

Systems

4. Identify and employ appropriate troubleshooting techniques used to solve computing or connectivity issues.

Collaborative Research

5. Locate, curate, and evaluate information from digital sources to answer research questions.

Digital Tools

6. Produce, review, and revise authentic artifacts that include multimedia using appropriate digital tools.



Grades 9 – 12

Underlined words appear in the glossary.

Students can:

Computational Thinker

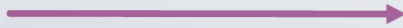
Abstraction

1. Decompose problems into component parts, extract key information, and develop descriptive models to understand the levels of abstractions in complex systems.
2. Explain how computing systems are often integrated with other systems and embedded in ways that may not be apparent to the user.
Examples: A medical device can be embedded inside a patient to monitor and regulate his or her health; millions of lines of code control the subsystems within an automobile (e.g., antilock braking systems, lane detection, and self-parking).

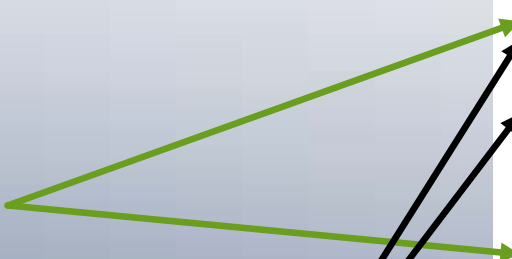
Algorithms

3. Differentiate between a generalized expression of an algorithm in pseudocode and its concrete implementation in a programming language.
 - a. Explain that some algorithms do not lead to exact solutions in a reasonable amount of time and thus approximations are acceptable.
 - b. Compare and contrast the difference between specific control structures (sequential statements, conditional, iteration) and explain the benefits and drawbacks of choices made.
Examples: Tradeoffs involving implementation, readability, and program performance.
 - c. Understand when a problem solution requires decisions to be made among alternatives, such as conditional “if” constructs, or when a solution needs to be iteratively processed to arrive at a result, such as iterative “loop” constructs or recursion.
 - d. Evaluate and select algorithms based on performance, reusability, and ease of implementation.
 - e. Explain how more than one algorithm may solve the same problem and yet be characterized with different priorities.
Examples: All self-driving cars have a common goal of taking a passenger to a designation but may have different priorities such as safety, speed, or conservation; web search engines have their own algorithms for search with their own priorities.
4. Use and adapt classic algorithms to solve computational problems.
Examples: Sorting, searching, shortest path, and data compression.

Strand



Topic



Content Standards



Cross Curricular Implementation: 2nd Grade Example

Content Standards

ELA: 22 Writing	Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. [W.2.1]
Math: 10 Measurement and Data	Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.
Digital Literacy and Computer Science: 1 Abstraction	Create and sort information into useful order using digital tools. Examples: Sort data spreadsheets A-Z, simple filters, and tables.

Cross Curricular Activity: Students will write an opinion piece about a certain choice in their community or school. For example, whether or not students should have uniforms. Students will collect votes on whether or not classmates agree with their position. Using a digital tool, such as Google Sheets, students will compile this collected data and share with a small group.

Cross Curricular Implementation: High School Example

Content Standards

ELA 12.24

Writing

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to on going feedback, including new arguments or information. [W.11-12.6]

SS 12.9

US Government

Trace the impact of the media on the political process and public opinion in the United States, including party press, penny press, print media, yellow journalism, radio, television, and electronic media.

Digital Literacy and Computer Science: 24

Creative Communication

Compare and contrast internet publishing platforms, including suitability for media types, target audience, and feedback mechanism.

Cross Curricular Activity: In small groups, students will choose two policy issues, one at the local or school level, the other at a regional or national level. Students will organize a media campaign to rally support for one side of these issues, including writing copying and creating digital media. Students will determine the best media platforms for each issue, dependent on size, scope, and demographics of the target audience. Issues of media narrative, propaganda, and sensationalism should be addressed and discussed in campaign outline documents.

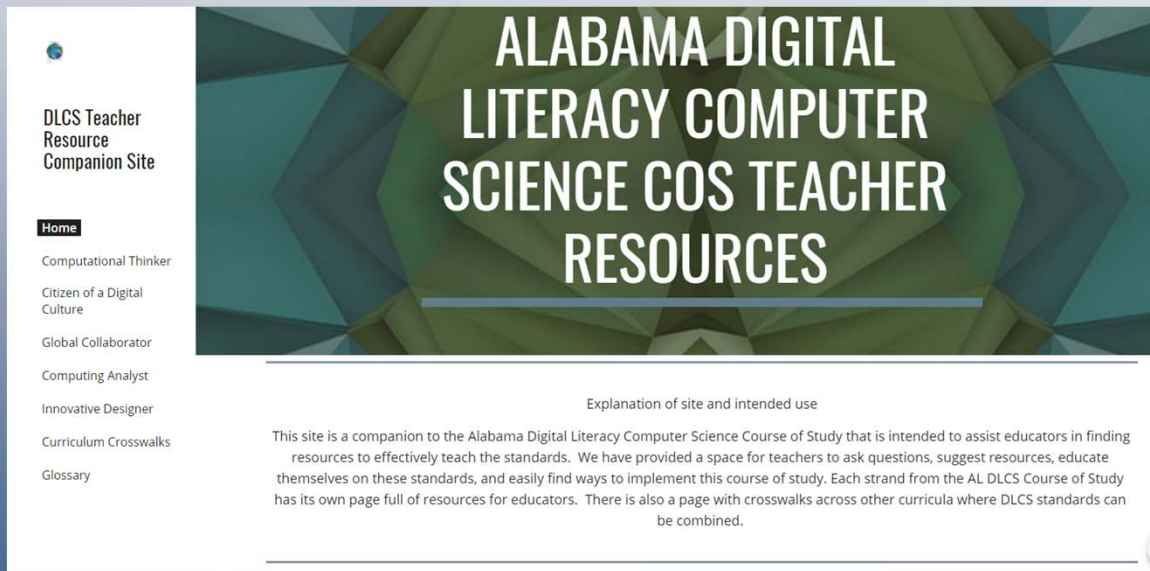
Appendices

- International Society for Technology Education (ISTE) Standards for Students
- Progression of Computer Science Teachers Association (CSTA) K – 12 Computer Science Standards, Revised 2017
- K-12 Computer Science Framework



Available Resources

- Digital Literacy and Computer Science Course of Study Companion website: <https://alex.state.al.us/dlcs>



- ALEX lesson plans, Code.org, CS for All Teachers

2018 DIGITAL LITERACY AND COMPUTER SCIENCE COURSE OF STUDY

Thank You!

