

# **Arkansas Computer Science and Computing Standards**

## **Middle School Introduction to Coding Standards**

2020  
(Revised 2022)

# Arkansas Computer Science and Computing Standards

## Middle School Introduction to Coding

### Introduction

The Middle School Introduction to Coding is designed to be taught during a standalone block of time for a minimum of four continuous weeks. Students will examine how to formulate algorithms in addition to creating, analyzing, testing, and debugging computer programs in order to solve real-world problems. Students are required to use a text-based programming language to accomplish these tasks. These standards are not to be embedded in activities spread out over multiple courses, but within a dedicated course section.

Schools are to ensure that every student receives instruction necessary to meet these standards at least one of their 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> grade year. Schools may choose the implementation mechanism that works best for their school and students. Options for implementation include, but are not limited to:

- The standards within this block taught as part of the DCTE Keycode (399320) during the student's 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> grade year
- The standards within this block taught as a module within any course or specified period of time during the student's 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> grade year
- The standards within this block taught as part of a high school level programming course for which the school has received ADE approval to offer at the middle school level
- The standards taught as a standalone or pullout offering during the student's 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> grade year

### Licensure Requirements

- For embedded implementations, the teacher of record must hold an appropriate Arkansas Educator's License for the course in which the Middle School Introduction to Coding standards are being embedded.
- For standalone or pullout implementations, the teacher of record must hold an Arkansas Educator's License in any content area, which allows them to instruct students of the grade level who are enrolled in the standalone or pullout class.
- The teacher of record for Keycode (399320) must hold a 528 Computer Science Endorsement, a 5012 Keyboarding/Key Code Approval Code, or one of the other DCTE licensure codes listed in the Course Code Management system as allowable for Keycode (399320).

Though the licensure is open to multiple content areas, it is the responsibility of the school and teacher of record to ensure that the individual providing the instruction has the requisite knowledge needed to teach the standards.

## Computer Science and Computing Practices

### Students exhibit proficiency in computer science and computing through:

**Communication** - Students effectively communicate, using accurate and appropriate terminology, when explaining the task completion or problem-solving strategies used. They recognize that creating good documentation is an ongoing and important part of the communication process.

**Collaboration** - Students productively work with others while ensuring multiple voices are heard and considered. They understand that diverse thoughts may lead to creative solutions and that some problems may be best solved collaboratively.

**Storytelling** - Students creatively combine multimedia tools, such as graphics, animations, and videos with research, writing, and oral presentations to create ethical, data-driven stories.

**Professionalism** - Students embrace professionalism by demonstrating skills and behaviors necessary for success in technical careers.

**Ethics and Impact** - Students comprehend the ramifications of actions prior to taking them. They are aware of their own digital and cyber presence and its impact on other individuals and society.

**Inclusion** - Students encourage diversity in the field of computer science and computing regardless of race, ethnicity, gender, or other differences.

**Learning by Failure** - Students reflect upon and critique their work while embracing a willingness to seek feedback and constructive instruction from teachers and peers. They utilize the feedback to continually improve current projects, educational experiences, knowledge, and confidence.

**Perseverance** - Students expect difficulties and persist in overcoming challenges that occur when completing tasks. They recognize making and correcting mistakes is necessary for the learning process while problem solving.

**Understanding** - Students recognize patterns, utilize tools, and apply problem solving strategies to build understanding, find solutions, and successfully deliver high-quality work.

**Patterns** - Students understand and utilize the logical structure of information through identifying patterns and creating conceptual models. They decompose complex problems into simpler modules and patterns.

**Problem Solving** - Students exhibit proficiency through the process of identifying and systematically solving problems. They recognize problem solving is an ongoing process.

**Research** - Students purposefully gather information and seek to expand their knowledge through various methods and mediums. They embrace the practice of gaining knowledge to develop novel approaches for solving problems and addressing issues they have not previously encountered, in addition to merely searching for answers.

**Tools** - Students evaluate and select tools to be used when completing tasks and solving problems. They understand that appropriate tools may include, but are not limited to, their mind, pencil and paper, manipulatives, software applications, programming languages, or appropriate computing devices.

**Arkansas Computer Science Standards  
Middle School Introduction to Coding**

Strand	Content Cluster
Computational Thinking and Problem Solving	
	1. Students will analyze and utilize problem-solving strategies.
Data, Information, and Security	
	2. Students will analyze and utilize concepts of cybersecurity.
Algorithms and Programs	
	3. Students will create, evaluate, and modify algorithms.
	4. Students will create programs to solve problems.
Computers and Communications	
	5. Students will analyze communication methods and systems used to transmit information among computing devices.
Professionalism and Impacts of Computing	
	6. Students will analyze the impacts of technology and professionalism within the computing community.

## Understanding the Arkansas Computer Science and Computing Standards Documents:

- This Arkansas Department of Education curriculum standards document is intended to assist in district curriculum development, unit design, and to provide a uniform, comprehensive guide for instruction.
- The goal for each student is proficiency in all academic standards for the course/year in which the student is enrolled.
- The Practice Standards are intended to be habits of mind for all students and were written broadly in order to apply to all grades/levels. The Practice Standards are not content standards and are not intended to be formally assessed.
- Notes (NOTE:) and examples given (e.g.,) found within the document are not mandated by the Arkansas State Board of Education, but are provided for clarification of the standards by the Arkansas Department of Education and/or the standards drafting committee. The notes and examples given are subject to change as understandings of the standards evolve.
- Within the high school documents, the numbering for standards is read as: Course Abbreviation - Year - Content Cluster - Standard. Example: “CSPG.Y1.2.3” would be Computer Science Programming - Year 1 - Content Cluster 2 - Standard 3.
- Within the Introduction to Coding document, the numbering for standards is read as: Course Abbreviation - Content Cluster - Standard. Example: “CSCB.1.2” would be Introduction to Coding, Content Cluster 1, Standard 2.
- Within the K-8 Computer Science Standards documents, the numbering for standards is read as: Course Abbreviation - Grade - Content Cluster - Standard. Example: “CSK8.G1.2.3” would be K-8, Grade 1, Content Cluster 2, Standard 3.
- Ancillary documents and supporting information may be released to assist in further understanding of the standards with possible classroom implementation strategies included.

## “Research” and Learning

The Arkansas Department of Education Office of Computer Science recognizes that the use of the term “research” as an action verb within academic standards is not mainstream, though not unheard of, and exists as a measurable objective within other Arkansas K-12 academic standards. The members of the internal team, composed of the State Director of Computer Science and nine state-wide Computer Science Specialists, discussed this at length amongst ourselves and with many committee members. While there existed varying opinions for various reasons, the internal team opted to keep “research” as an action verb within the standards for the following reasons:

1. The internal team believes that this use of “research” and the skill-building activities students will undertake while performing said research will produce students that have a skillset which industry representatives have identified as missing from workers entering technical job fields.
2. As the field of Computer Science and Computing is ever changing and growing, professionals and students within this field must conduct informal research on an almost daily basis to maintain relevant knowledge and skills.
3. The use of “research” within this document does not determine classroom implementation; however, it is used to indicate that the student should take individual and active efforts to seek out knowledge to develop novel approaches for solving problems and addressing issues they have not previously encountered, in addition to merely searching for answers.
4. The use of “research” should not infer that a student should be required to do an extensive qualitative or quantitative research project from the use of “research” anywhere in this document; however, a more formal research project is not prohibited if the teacher feels it is appropriate.

**Strand:** Computational Thinking and Problem Solving

**Content Cluster 1:** Students will analyze and utilize problem-solving strategies.

CSCB.1.1	Examine traditional programming algorithms, including searches and sorts
CSCB.1.2	Describe the steps needed to efficiently solve a problem
CSCB.1.3	Manually test algorithms with sample data to observe accuracy of anticipated output
CSCB.1.4	Demonstrate appropriate collaborative behaviors (e.g., integrating feedback, providing useful feedback, understanding and accepting multiple perspectives) when solving problems

**Strand:** Data, Information, and Security

**Content Cluster 2:** Students will analyze and utilize concepts of cybersecurity.

CSCB.2.1	Apply strategies to protect personal digital footprints (e.g., game profiles, shares on social media, other online accounts) and the responsibilities and opportunities of living, learning, and working in a digitally connected world
CSCB.2.2	Research and describe real-world cybersecurity problems (e.g., identity theft) as they relate to personal cybersecurity, and how to apply digital and physical methods for protecting and securing personal information

**Strand:** Algorithms and Programs

**Content Cluster 3:** Students will create, evaluate, and modify algorithms.

CSCB.3.1	Explain the logic involved in how a computer program executes (e.g., flow charts, program flow)
CSCB.3.2	Discuss and apply best practices of backend program design (e.g., comments, documentation, whitespace)
CSCB.3.3	Test a computer program with data and evaluate output for accuracy
CSCB.3.4	Find and debug errors in a computer program

**Strand:** Algorithms and Programs

**Content Cluster 4:** Students will create programs to solve problems.

CSCB.4.1	Implement the following programming concepts: <ul style="list-style-type: none"><li>• data types</li><li>• variable creation</li><li>• variable assignment</li><li>• conditional branching (e.g., if, if-else, multi-branch)</li><li>• iteration (e.g., for, while)</li><li>• functions</li></ul>
CSCB.4.2	Create a program using a text-based programming language

**Strand:** Computers and Communication

**Content Cluster 5:** Students will analyze communication methods and systems used to transmit information among computing devices.

CSCB.5.1	Identify major components and functions of computer systems (e.g., hardware, software) and networks (e.g., network components, wired, wireless) and recommend methods to secure computer systems and networks
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**Strand:** Professionalism and Impacts of Computing

**Content Cluster 6:** Students will analyze the impacts of technology and professionalism within the computing community.

CSCB.6.1	Research diverse careers and career opportunities that are influenced by computer science and the technical and soft skills needed for each
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## Contributors

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