Arkansas K-8 Computer Science Implementation for 2017-2018

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State Director of Computer Science Education

December 13, 2016

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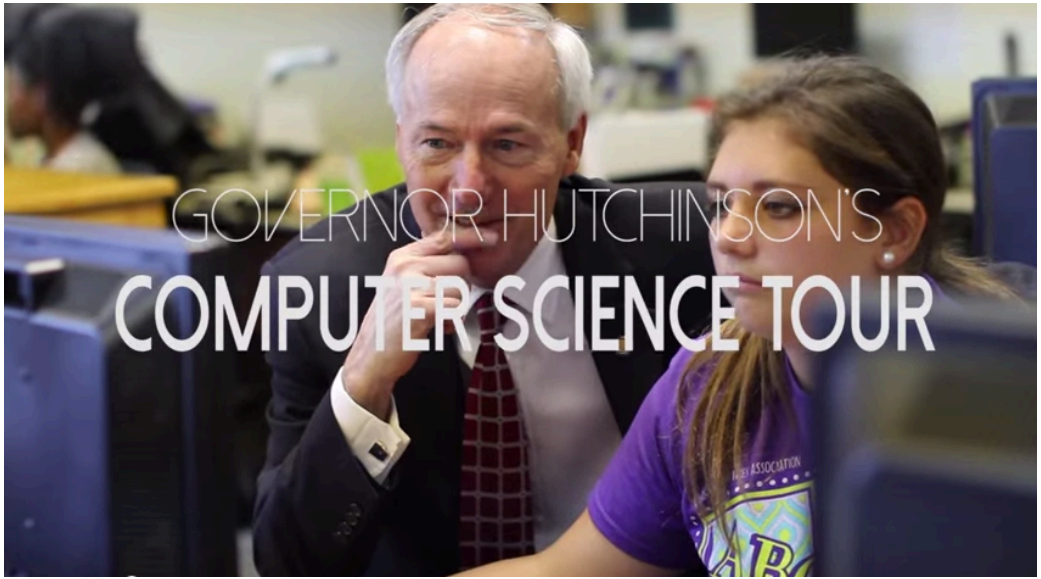
Governor Asa Hutchinson's Leadership



https://goo.gl/GlEKbz

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Additional Reasons for Arkansas's Success

1. **Comprehensive Legislation / Content** - defining standards/student learning expectations and getting schools to offer the content/courses
2. **Central Point of Contact** – as this rolls out, many entities will need to be involved. There needs to exist a POC for CS, with that being their only focus, and given the authority to work as needed to support the initiative
3. **Graduation Credit** – what is in it for the students (other than knowledge); establishing a system that allows CS to count for a required credit
4. **Teacher Capacity** – aligning licensure, PD, and teacher pre-service in a way that supports existing teachers to gain the certification and begins the process of developing a maintaining pipeline of new CS certified teachers
5. **Funding** – funding will need to be allocated to support teacher PD to build capacity in addition to support other issues such as infrastructure and technology needs

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Relevant Educational Experience Through Standards and Policy

- Arkansas passed legislation that requires every Arkansas High school to offer a computer science course Governor Hutchinson worked with both sides of isle to pass this legislation unanimously
- Set aside $5 million to directly support Arkansas students, teachers, and schools
- Co-developed high-school pathways with the Arkansas Department of Career Education
  - Involved industry
  - Involved educators at all levels
  - Will allow credit for internships with local companies and industries
  - Remove Prerequisites
  - Allow Stacking

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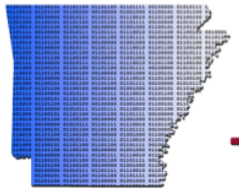
Webpage and Question Submission

- www.arkansas.gov
  - Landing Page
  - CS Fact Sheet, CS Standards/Courses, CS Strategic Plan
- Submit questions at: https://goo.gl/forms/if01ZsXeKdvnimcH2
- Tweet about today:
  - #ARKidsCanCode
  - @AnthonyOwenADE



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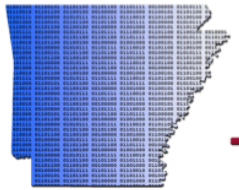
Arkansas Vision for Computer Science

All Arkansas students actively engaging in a superior and appropriate computer science education



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Arkansas Mission for Computer Science

To facilitate Arkansas's transition to becoming and remaining a national leader in computer science education and technology careers

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Apollo 11 Guidance Computer

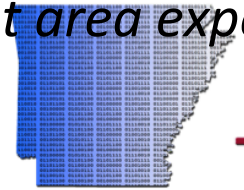
https://www.nasa.gov/apollo11-gallery

- approximately 64Kbyte of memory
- operated at 0.043MHz

AR CS Belief Statements

Arkansas believes that:

- *every K-12 student in Arkansas deserves a premier computer science education that is suitable for his or her needs and can support his or her college and/or career aspirations.*
- *Arkansas will become and remain a national leader in computer technology careers through the implementation of a vertically articulated and comprehensive K-12 computer science education designed to support appropriate technological growth in all Arkansas students.*
- *due to the nature of technology, computer science education development in Arkansas must be adaptable, dynamic, and ongoing and based on research by content area experts.*



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AR CS Belief Statements

Arkansas believes that:

- *professional development opportunities must be provided that meet the grade-band specific technological needs of educators in a modern society.*
- *Arkansas educators must provide their students with an education that will facilitate the advance of useful technological skills and promote their role as digital natives.*
- *appropriate and continued collaboration with stakeholders will lead to a sustainable computer science educational system that is beneficial to students and Arkansas.*

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AR CS Belief Statements

Arkansas believes that:

- *utilizing the wisdom of Arkansas educators who represent all grade levels, content areas, and regions of the state, in the development and periodic revisions of the K-12 Computer Science Standards is fundamental to ongoing successful implementation.*
- *Arkansas's current, potential, and future industries that use computer technology should play a vital role in the development, implementation, and evolution of computer science education in Arkansas.*

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AR CS Belief Statements

Arkansas believes that:

- *the Arkansas Department of Higher Education and Arkansas's institutions of postsecondary education are instrumental in establishing and adapting the goals of secondary computer science education in Arkansas.*
- *the Arkansas Department of Career Education has created a catalog of beneficial computer science courses that should evolve to become a component of this initiative and through which students can access additional areas of specialization.*

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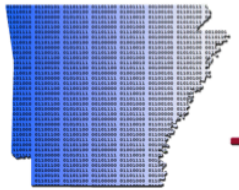
AR CS Belief Statements

Arkansas believes that:

- *parents and other community members should be knowledgeable of the requirements of the Arkansas K-12 Computer Science Standards and be afforded the opportunity to provide feedback prior to adoption and revision of the standards.*



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2017-18 Implementation Quick Look

- K-8 Embedded Computer Science Standards at each grade level
- Coding Block for Grades 7 and 8
- All New ADE/ACE Co-Branded Grid of High School Computer Science Courses
- Computer Science Practices

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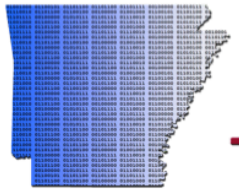
Arkansas Computer Science Practices

The Practices are intended to be habits of mind for all students and were written broadly in order to apply to all grades.

The Practices are not content standards and are not intended to be formally assessed but may be assessed formatively.



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Arkansas Computer Science Practices

Students will exhibit proficiency in computer science through:

- **Perseverance** - Students expect and persist in overcoming the challenges that occur when completing tasks. They recognize that making and correcting mistakes will take place during the learning process and problem solving.
- **Collaboration** - Students effectively work and communicate with others 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.

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Arkansas Computer Science Practices

Students will exhibit proficiency in computer science through:

- **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.
- **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 application programs, programming languages, or appropriate computing devices.

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Arkansas Computer Science Practices

Students will exhibit proficiency in computer science through:

- **Communication -** Students effectively communicate, using accurate and appropriate terminology, when explaining the task completion or problem solving strategies that were used. They recognize that good documentation is an ongoing part of the process, and when appropriate provide accurate documentation of their work in a manner that is understandable to others.

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Arkansas Computer Science Practices

Students will exhibit proficiency in computer science through:

- **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.
- **Problem Solving -** Students exhibit proficiency in Computer Science through identifying and systematically solving problems (e.g., engineering design process). They recognize problem solving as an ongoing process.

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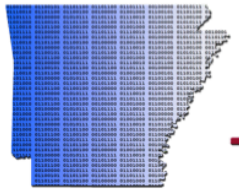
Computer Science K-8 Standards

- Found at: www.arkansased.gov
- Adopted during January 2016 SBE Meeting
- Implementation required beginning in the **2017-2018** school year
- Separated into three documents
  - K-4 Embedded Standards
  - 5-8 Embedded Standards
  - Coding Block for Grades 7 or 8 (Required instruction for every student; not just offered)



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K-8 Embedded Standards

The Arkansas Computer Science Standards for Grades K-8 provide an introduction to computing concepts that are to be embedded across other content areas and are intended to support what is already being done in the classroom. The standards support critical thinking through the essential skills of computational thinking and algorithmic problem solving. The course strands, content clusters, and content standards are to be taught in an integrated manner, not in isolation. Integration of basic computer science skills and knowledge through practical classroom experiences promote connections to all subject areas and to the real world. Formal assessment of these standards is not required; teachers may monitor and measure student learning through normal classroom activities and interactions.

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Computer Science K-8 Standards

- Strand – Content Cluster – Standard
  - The course strands, content clusters, and the content standards are to be taught in an integrated manner, not in isolation.
  - 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.

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Computer Science K-8 Standards

- No specific licensure needed
- Teacher Clarification Statements
  - CT.1.K.1 - Discuss the following basic steps when problem solving: understanding the problem; considering various strategies
  - NOTE for CT.1.K.1 through CT.1.4.1 - *Problems within these standards can be, but are not limited to, real world problems or problems encountered in the student's daily-life. Examples include, but are not limited to, tying shoes and how to get from a classroom to the cafeteria.*

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Computer Science K-8 Standards

Notes found within the document are not approved 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 are subject to change as understandings of the standards evolve.

Let's take a look at the documents: www.arkansased.gov

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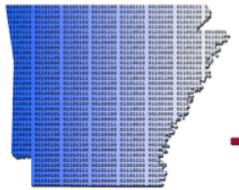
Q&A

- Online Questions Submitted
  - https://goo.gl/forms/if01ZsXeKdvnimcH2
- Studio Audience Questions



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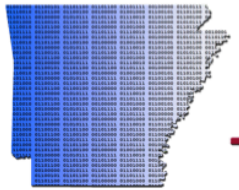
15 Minute Break

When we return, Shawna Polk, Technology Integration Specialist of Springdale Public Schools, will provide a closer look at what schools and teachers will need to know to implement the K-8 embedded standards.

While you are waiting, remember that you can submit questions at: https://goo.gl/forms/if01ZsXeKdvnimcH2



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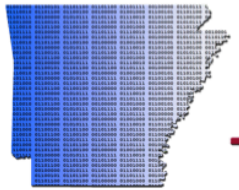
WHAT ARE COMP SCI STANDARDS?

1. Introduction to computer concepts
2. Not a stand alone curriculum
3. Change in thought process



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WHY ARE CS STANDARDS IMPORTANT?

1. Aligns with 21st Century skills
2. Drives innovation
3. Exposes students to potential career opportunities
4. Excitement, interest and engagement increases

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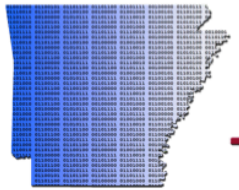
HOW DO WE IMPLEMENT CS STANDARDS?

1. Mindset shift about standards
2. Provide PD & collaboration time amongst educators
3. Make connections for students



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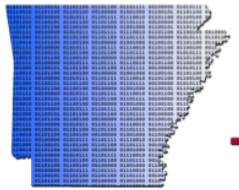
HOW IS SPRINGDALE IMPLEMENTING CS STANDARDS?

1. Usage skills by grade level
2. Integration with coding
3. Integration within curriculum



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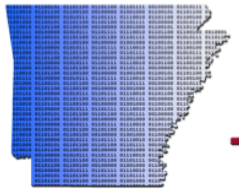
Computational Thinking & Problem Solving

Content Cluster	K-2	3-5	6-8
1 & 3	Math problems • Problem solving strategies Working cooperatively	Math problems • Analyzing strategies Benefits of working collaboratively	Math Problems • Composing/ decomposing • Analyzing strategies Collaboration
2	Language skills of relative positions	Fractions, angles, ordered pairs	Compound statements & relationships



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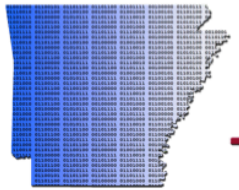
Data & Information

Content Cluster	K-2	3-5	6-8
4, 5, & 6	Data collection, analysis, tools • # of students who ride the bus, car or walk home • Reading graphs	Data collection, analysis, tools • Any set of data • Reading, creating graphs • Sorting by characteristics • Different arrangements and representations	• Standard coding • Data collection, analysis and tools • Simulations



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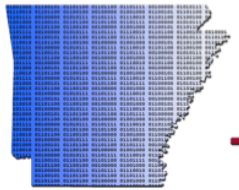
Algorithms & Programs

Content Cluster	K-2	3-5	6-8
7	Sequencing of Events • Literacy • Math problem	Create a sequence, finding & correcting errors • How-to's • Errors in math problems	Create a sequence, finding & correcting errors • How-to's • Errors in math problems
8	• Coding • Non-tech coding	• Coding • http://csunplugged.org/	• Coding



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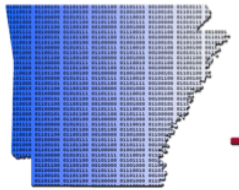
Computers & Communication

Content Cluster	K-2	3-5	6-8
9	Potential Careers	Conversations and examples	Career fields
10	Writing time • Keyboard practice • vocabulary	Anytime students are typing • Model/discuss appropriate technique Classroom Use Policies	Regular classroom projects



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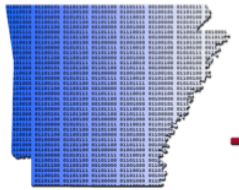
Computers & Communication

Content Cluster	K-2	3-5	6-8
11	Seesaw • Discussions, vocabulary • If, then • Problem solving Presentations	Google Classroom • Discussions, vocabulary • Devices • Problem solving Presentations	Using multimedia tools for presentations



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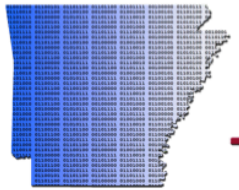
Global & Ethical Impacts

Content Cluster	K-2	3-5	6-8
12	• Digital Citizenship • Research Projects • Library Media Specialists	• Digital Citizenship • Research Projects • Library Media Specialists	Compare changes in technology to changes over time • History Digital citizenship



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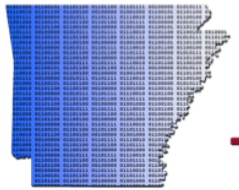
K-2 Integration: Students identify a problem in their school or community

Ex: Too much trash on the playground

CT. 1, CT. 3, D.4, D.5, D.6, A. 7



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Computational Thinking & Problem Solving

- Use problem solving strategies to determine that is a problem
- Work cooperatively and collaboratively to brainstorm solutions
- Create, read, and understand potential solutions

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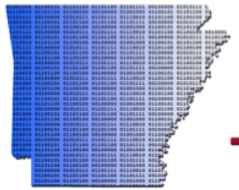
Data & Information

- Identify the type of data that could be collected and why (ex: amount of trash on playground per day to see if it's increasing/ decreasing)
- How are they going to collect and represent the data?



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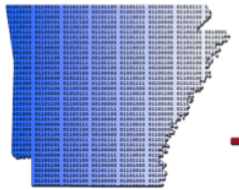
Data & Information

- Collect, organize and display data from trash
- Read (interpret) the data to determine next steps from their original problem



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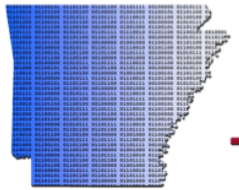
Algorithms & Programs

- Identify the steps to follow to decrease amount of trash on the playground
- Analyze steps to see if they are appropriate
- Follow the steps and collect post-data to determine their effectiveness



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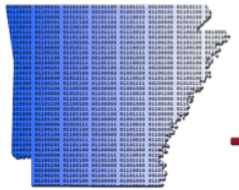
3-5 Integration: Students research famous people in Computer Science history

Ex: Grace Hopper, one of the first females in the Computer Science field

CC.9, CC.10, CC.11, CGE.12



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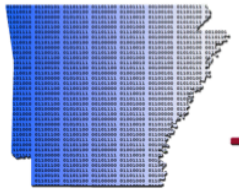
Computers & Communications

- Identify why these people are well-known for their careers in computing and technology and the importance of these careers
- Discuss the input/output process of researching



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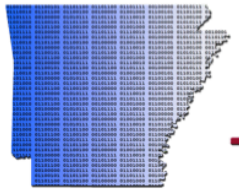
Computers & Communications

- Students will practice proper keyboarding technique while composing their research
- Classroom Use Policies (CUPs) will be in order prior to research project



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Computers & Communications

- Create presentation about their famous person
- Share research with others for review
- Discuss possible devices that could be used for transmitting information
- What do you do if technology isn't working?

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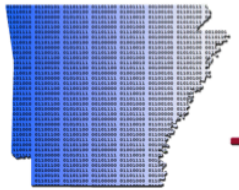
Community, Global & Ethical Impacts

- Discuss the impacts of technology and their research project
- Demonstrate the importance of copyright, fair use and citations when gathering information



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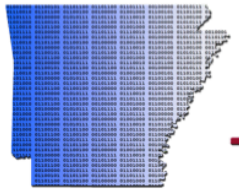
6-8 Integration: Students participate in a coding block

Ex: 5 weeks of coding, 2.5 weeks of Scratch, 2.5 weeks of HTML/CSS

CT.1, CT.2, D.4, A.7, A.8



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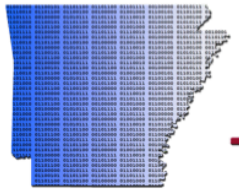
Computational Thinking & Problem Solving

- Identifying the steps to solve the code
- Understand they are using a computer programming language
  - Could be binary numbers, sets or expressions



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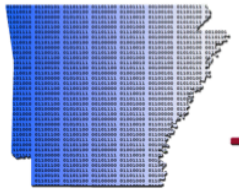
Data & Information

- Analyze the data used to create the code
  - Look under the hood



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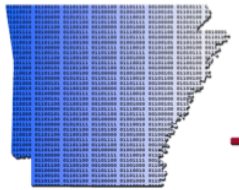
Algorithms & Programs

- Students will follow a sequence of steps to complete the code.
- Identify, test and correct these algorithms to cause the program to function correctly
- Use Blockly, Scratch or Code.org to carry out these tasks



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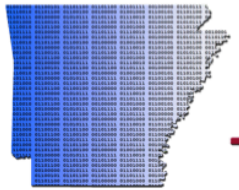
Q&A

- Online Questions Submitted
  - https://goo.gl/forms/if01ZsXeKdvnimcH2
- Studio Audience Questions



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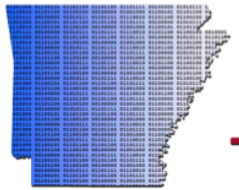
10 Minute Break

When we return, we will provide a closer look at what schools and teachers will need to know to implement the Coding Block for Grades 7 and 8

While you are waiting, remember that you can submit questions at: https://goo.gl/forms/if01ZsXeKdvnimcH2



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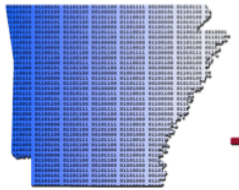
Coding Block for Grades 7 or 8

The computer science 7-8 coding block is designed to be taught during a standalone block of time over a minimum of four to five weeks. As part of this block, students will examine how to formulate algorithms as well as create, analyze, test and debug computer programs in order to solve real-world problems. Students will be required to use a text-based programming language to accomplish these tasks. These standards are not intended to be embedded in activities spread out over multiple courses.



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Coding Block for Grades 7 or 8

Schools are to ensure that every student receives instruction necessary to meet these standards in either their 7th or 8th 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 a 4-5 week module within Keyboarding, business elective, or Career Development during the student's 7th or 8th grade year
- The standards within this block taught as a 4-5 week module within another course or specified period of time during the student's 7th or 8th grade year
- The standards within this block taught as part of a high school level programming course for which the school has received approval to offer to 7th or 8th graders

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Coding Block for Grades 7 or 8

The teacher of record for the Coding Block for Grades 7 or 8 must hold an Arkansas Educator's License in any content area, which allows them to instruct students of the grade level who are taking the block. Though the licensure is open to any content area, 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 block.

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Coding Block for Grades 7 or 8

Course Code	Course Name	
378650	Coding Block (7th & 8th Grade)	— Details
	Subject Area: Computer Science	
	Grade Low: 7	
	Grade High: 8	
	AQT: ✔	
	State Grad Req: ✖ Above State Requirements Only	
	Smart Core: ✖	
	End of Course: ✖	
	Licensure Code: Any 7-8	

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Coding Block for Grades 7 or 8

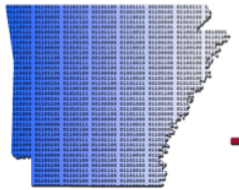
Computational Thinking and Problem Solving

1. Students will examine and formulate algorithms that solve specific problems.

Algorithms and Programs

2. Students will create programs that solve problems.
3. Students will analyze, test, and debug computer programs.

Closer look at the standards: www.arkansased.gov



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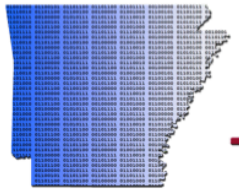
Resources

- Resources on the ADE website: www.arkansased.gov (http://goo.gl/j2Y8Sv)

Today's presentations will be linked on the CS Landing Page when available



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Free Access to Lynda.com at http://ideas.aetn.org/

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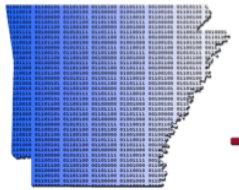
Computer Science Listserv

Use the Google Form found at

http://goo.gl/forms/FqGJ2CtXe1

to join



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Thank You!

- Thank you for:
  - viewing and or attending this session
  - the work you do daily to bring CS to your students
- Beginning at 1:00p.m. today we will continue this live stream with a look at the 2017-2018 High School Computer Science Implementation

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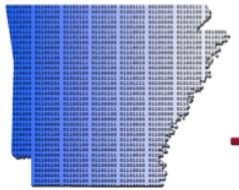
Final Q&A / Contact Information

- Online Questions Submitted https://goo.gl/forms/if01ZsXeKdvnimcH2
- Studio Audience Questions

Anthony Owen - anthony.owen@arkansas.gov

Follow me on Twitter: @AnthonyOwenADE

To be added to the Arkansas Computer Science ListServ, use the form found at: http://goo.gl/forms/FqGJ2CtXe1



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