{CS4MS}

A 10-YEAR STRATEGIC PLAN FOR COMPUTER SCIENCE EDUCATION IN MISSISSIPPI

MISSISSIPPI DEPARTMENT OF EDUCATION

mdek12.org

MISSISSIPPI DEPARTMENT OF EDUCATION
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ECEP Expanding Computing Education Pathways

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Introduction

According to the U.S. Bureau of Labor Statistics Office of Occupational Statistics and Employment Projections, "*Employment in computer and information technology occupations is projected to grow 13% from 2020 to 2030, faster than the average for all occupations. These occupations are projected to add about 667,600 new jobs. Demand for these workers will stem from greater emphasis on cloud computing, the collection and storage of big data, and information security. The median annual wage for computer and information technology occupations was $91,250 in May 2020, which was higher than the median annual wage for all occupations of $41,950.*"[1] There are currently 2,194 open computing jobs in Mississippi, with an average yearly income of $72,039.

Computer science and the technologies it enables rest at the heart of our economy and the way we live our lives. To be well-educated citizens in a computing-intensive world and to be prepared for careers in the 21st century, our students must have a clear understanding of the principles and practices of computer science. To achieve this preparation for our students, we must have a clearly articulated plan for building and growing computer science education that ensures relevant curricula and well-prepared teachers.

> One of the most important purposes of developing a state plan for computer science in Mississippi will be to create a long-term vision that can serve as guidance when the Mississippi Department of Education (MDE) or state government looks to make decisions on implementation timing, overcoming access barriers, preparing teachers, providing funding, and improving local and state infrastructure.

Background

The MDE sponsored research into the state of computer science education in the United States beginning in fall 2015. Over the course of eight months, this research revealed an enormous shortage in computer scientists across the country and an almost nonexistent K-12 computer science pathway. A Google/Gallup report showed that while 9 out of 10 parents believed it was important for their child to learn about computer science in school, only 1 in 4 schools across the nation offered any computer science courses.[2] As of June 2016, only five states had computer science standards.[3] In Mississippi, less than 10 schools offered any formal computer science instruction.

In response to this information, a steering committee composed of K-12 administrators, technology directors and teachers, postsecondary instructors, and industry leaders was formed to design an action plan to incorporate computer science education in Mississippi's K-12 schools. The committee began meeting in October 2015 and, over the following several months, developed a recommendation to conduct a three-year pilot program during which time the state would explore curricula, teacher licensure, and standards development. Steering committee members and other Mississippi educators reviewed the national K-12 Computer Science Framework development in 2016 and submitted feedback to the writers. Once the national framework was finalized and the national Computer Science Teacher's Association's Computer Science Standards were revised, steering committee members and other Mississippi educators reviewed the national standards and, with only minor editorial changes, recommended adopting the *2018 Mississippi College- and Career-Readiness Standards (MS CCRS) for Computer Science* as a starting place for Mississippi.

Mississippi has made significant strides the past four years in broadening participation in computer science through the Computer Science for Mississippi (CS4MS) initiative. Since 2018, the Center for Cyber Education (CCE) at Mississippi

1. U.S. Bureau of Labor Statistics, Computer and Information Technology Occupations (https://www.bls.gov/ooh/computer-and-information-technology/home.htm)
2. Google/Gallup, 2015: https://services.google.com/fh/files/misc/searching-for-computer-science_report.pdf
3. Tilley-Coulson, Eve, 2016, "Policy Update," National Association of State Boards of Education https://nasbe.nyc3.digitaloceanspaces.com/2016/07/Tilley-Coulson_Computer-Science-Final.pdf

State University and the MDE have written and approved K-12 computer science standards, made computer science count as a graduation credit, created computer science courses/content at every grade level (see figure 1), trained more than 1,500 teachers to teach computer science, impacted more than 65,000 students, seen a more than 200% increase in AP Computer Science Principals exam takers, created two computer science endorsements, and seen legislature dedicate funding specifically for computer science education for two consecutive years.

Industry across the state has also been supportive of the CS4MS initiative. C Spire has been a long-time supporter of education in Mississippi. In addition to building its own initiative to increase computer science awareness through coding competitions and other technology-related student events, C Spire has provided funding for the creation of a C Spire Software Development program for high school students and financial support to train 900 elementary teachers, 230 middle school teachers, and 94 high school teachers. C Spire supports broadening participation in computer science to all students and, to that end, has also committed to funding the audio-visual equipment needed to establish remote learning opportunities between school districts to ensure students in high schools without a qualified teacher will have access to computer science courses.

All of this has been achieved without a long-term plan in place. With the groundwork for establishing interest and demand for computer science education laid, a plan to be purposeful and systematic in creating a contiguous computer science pathway for students, to sustain and scale the current programs, to guide continuity and articulation, to ensure purposeful efforts to broaden participation, and to make computer science available to ALL students was needed. Without documented goals and strategies, it is all too easy to overlook certain populations and inadvertently create a skewed and limited access path with unfunded mandates and unrealistic requirements. A state plan for computer science education will aid state education leaders in making strategic decisions as they consider new programs, teacher licensure, access needs, diversity, and funding.

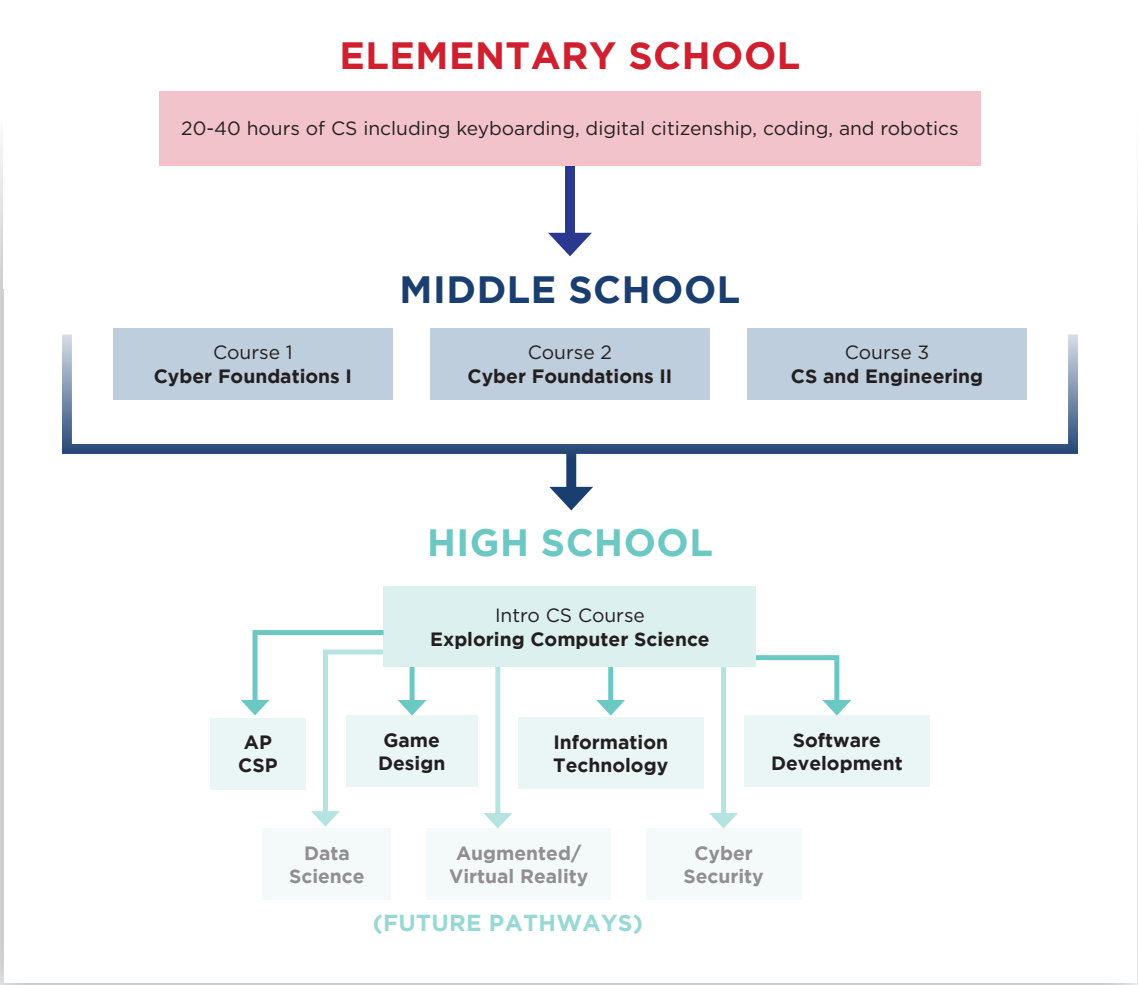


Figure 1: Course Progression in 2020

2022-2032

STRATEGIC VISION

FOR COMPUTER SCIENCE EDUCATION

Strategic Vision and Goals

The first step to creating a long-term vision and plan for computer science education is to understand the status of courses available, level of implementation, teacher preparedness, technology access, and stakeholder perceptions. To that end, the steering committee was brought back together and expanded to include statewide representation from school districts of varying sizes and demographics, postsecondary institutions, industry representatives, and community members. The expanded group is now referred to as the Strategic Planning Taskforce for Computer Science Education. This group created surveys that collected information from school districts, parents, and students about the status of computer science education in their schools, device and internet access at school and home, and the respondent's perceptions of computer science.

What follows is a strategic plan for computer science education in Mississippi based on the data obtained and evaluated from the surveys and reports from MDE. The findings from the surveys and MDE reports are presented in the landscape report included later in this document. The strategic plan for computer science education was developed to be consistent with the goals and vision of the Mississippi State Board of Education (SBE) Strategic Plan for 2018-2022.

MDE Strategic Vision and Goals

> The SBE Strategic Plan for 2018-2022 describes the objectives and strategies the MDE employs to help local school districts achieve the Board's vision and goals. For more details regarding the MDE Strategic Plan, see this link: mdek12.org/MBE/StrategicPlan

MISSISSIPPI COMPUTER SCIENCE
Strategic Vision for 2022-2032

By 2032, prepare all Mississippi students with the skills and knowledge to compete on the global stage of a technology-driven future by providing them engaging and equitable computer science experiences which will equip them to be both users and creators of computing technology by:

- Equipping preservice and in-service teachers with the knowledge and skills needed to deliver high-quality, inquiry-based computer science instruction
- Developing and maintaining engaging and equitable computer science curricula
- Maintaining computer science standards that are consistent with relevant educational and workforce demands
- Developing and maintaining industry partnerships to ensure computer science education meets industry needs
- Identifying, exploring, and preparing for future trends in technology

MISSISSIPPI COMPUTER SCIENCE
Strategic Goals for 2022-2032

1. Ensure at least one teacher delivering high-quality computer science courses (in-person or online) in every middle and high school and at least one teacher in each grade (or serving each grade) in every elementary school. *(Professional Development)*
2. Ensure all teachers providing computer science instruction are certified or endorsed. *(Certification and Licensure)*
3. Establish full certification and teacher endorsements for computer science at the preservice level. *(Educator Preparation Programs)*
4. Ensure local-, state-, and federal-level funding is dedicated to creating and maintaining curricula, professional development, necessary teaching units, and program updates and creation for computer science. *(Funding)*
5. Build and maintain school- and district-level partnerships with regional and local industry to provide expertise on curricula and financial support of programs. *(Funding/Curriculum/Outreach)*
6. Increase the percentage of underrepresented groups enrolled in computer science at the high school level (Grades 9-12) by 75% and increase elementary and middle school exposure to computer science to 100%, using enrollment from the 2020-2021 school year as a baseline. *(Diversity)*
7. Evaluate and update as needed the existing 2018 Mississippi College- and Career-Readiness Standards for Computer Science every three years or sooner if needed. *(Standards)*
8. Build and execute a plan for elementary computer science integration and implementation tracking. *(Curriculum)*
9. Increase awareness of computer science standards, courses, and workforce opportunities among school districts, parents, and community members. *(Outreach)*
10. Establish a model for an online computer science institute that offers professional development opportunities for existing teachers and provides high-quality computer science courses at the middle and high school levels, utilizing exemplary Mississippi teachers. *(Curriculum/Funding)*

2021

LANDSCAPE

OF COMPUTER SCIENCE EDUCATION

2020-2021 Summary of Landscape Survey

This document is meant to fulfill the requirement to provide a strategic plan for statewide computer science education, which includes a description of the current landscape for K-12 computer science education. Therefore, data regarding the status of computer science education in schools, device and internet access at school and home, perceptions of computer science, and enrollment numbers were collected in spring of 2021 from school districts, parents, students, MDE, and postsecondary institutions.

Below is a summary of the findings, with the full report following:

- A total of 8,939 adults from 43 different districts responded to the survey.
- A total of 11,621 students from 100 districts responded to the survey.
- Less than 35% of adult respondents were familiar with the 2018 Computer Science College and Career Readiness Standards.
- A total of 51,038 students were enrolled in nine different middle school and high school computer science courses during 2020-21 in 138 districts.
- More than 50% of adult respondents consider topics/activities such as typing, word processing, email, and creating slide presentations as computer science.
- The top two resources identified as needed to add or build computer science programs are more qualified teachers and funding to add new programs in the budget.
- More than 1,200 teachers have received training since 2018, but less than 50% are implementing training in the classroom.
- Teachers need to be made more aware of training opportunities.
- Of counselors surveyed, 54% believe their school is prepared with the instructional capacity to teach computer science, but only 44% feel their school has the proper curriculum and resources.
- Only 52% of counselors indicated they felt prepared to provide academic and career counseling to students interested in computer science.
- Only 7% of schools reported having any after-school programs related to coding or robotics.
- Technology directors surveyed indicated students have access to devices and reliable internet at school.
- Of parents who responded, 97% reported having internet access at home; however, the top barrier to computer science education identified by district- and school-level personnel was lack of internet access at home.
- Only 319 four-year degrees were awarded in computing fields in 2020, with only 18% of those going to females and only 25% to African Americans.

Mississippi Computer Science and Cyber Education Equality Act

In March 2021, Governor Tate Reeves signed House Bill 633, the Mississippi Computer Science and Cyber Education Equality Act, requiring all public schools in Mississippi to offer computer science education by the 2024-2025 school year (legiscan.com/MS/text/HB633/2021). The bill lays out a phased-in approach for the mandated implementation and came with $1 million in state funding for computer science education and was matched with an additional $1 million with private funding from C Spire In addition to stating the importance and value of computer science education and defining what is meant by the terms computer science and computer science courses, the following bullets summarize the requirements and timeline in the bill:

- In the 2022-2023 school year, all middle schools shall offer a course in computer science and 50% of elementary schools offer a minimum of one (1) hour of computer science instruction each week.
- In the 2023-2024 school year, 50% of high schools shall offer a computer science course and all elementary schools shall offer a minimum of one (1) hour of computer science instruction each week.
- In the 2024-2025 school year, each local school district shall require that all schools in its school system offer computer science instruction.
- The Mississippi Department of Education shall work with the Center for Cyber Education at Mississippi State University to identify and develop K-12 computer science curricula and delivery options.
- The Mississippi Department of Education shall review district-submitted courses, enabling schools to utilize high-quality online computer science courses to meet schools' needs as a result of this act.
- Subject to appropriations made by the Mississippi Legislature, the Mississippi Department of Education shall work with the Center for Cyber Education at Mississippi State University to provide annual training for teachers, counselors, and administrators to phase in the K-12 computer science curriculum.
- The Mississippi Department of Education shall provide a report by January 1, 2022, to the Governor, the Lieutenant Governor, the Speaker of the House of Representatives, the Chairman of the Senate Education Committee, and the Chairman of the House Education Committee. The report shall include a strategic plan for statewide computer science education initiatives, including, but not limited to, the following:
  - » A summary of the current state landscape for K-12 computer science education;
  - » A plan for expanding computer science education opportunities to every school in the state by the 2024-2025 school year;
  - » A plan for developing programs for preservice and in-service teachers seeking a computer science endorsement or course-specific license in order to meet the timeline for course requirements;
  - » The development of a vetted list of approved vendors in computer science education that are recognized as high-quality computer science courses or instruction, which should weigh preference on cost and ease of implementation; and
  - » The identification of approved computer science courses that may fulfill at least four (4) units of academic credit for high school graduation. The Mississippi Department of Education shall work with the Board of Trustees of State Institutions of Higher Learning and the Mississippi Community College Board to approve these courses once identified.
- The Mississippi Board of Trustees of Institutions of Higher Learning shall work with its member institutions to identify preservice teacher preparation programs to allow for certification in the computer science field.

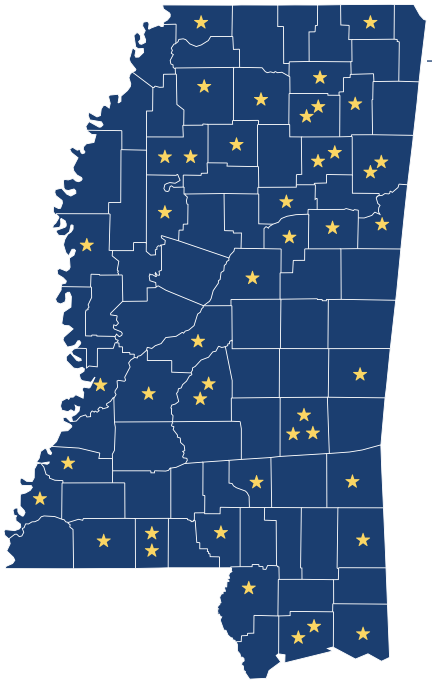
Statewide Survey

MDE-reported data for the 2020-2021 school year documented what courses were being taught, where they were taught, and how many students were enrolled in each, and a landscape survey was conducted in spring 2021 to ascertain the state of computer science across all school districts in Mississippi. The survey was sent to each public school district from State Superintendent Carey Wright's office on March 11, 2021, via the list service for superintendents, and data was collected through the end of April. Questions were asked regarding courses offered, teacher preparation, computer science standards awareness, perceptions of computer science, internet reliability, device access, and barriers to computer science education. The information presented in the following pages document the key findings from the surveys and summarize the data provided by the MDE.

A total of 8,939 adults from 43 different districts responded to the survey in the following groups:

Adult Survey Demographics

Role	Percentage	Count
Superintendent	1.06%	95
Assistant Superintendent	0.58%	52
Curriculum Coordinator	0.65%	58
Special Education Director	0.63%	56
Technology Director	0.89%	80
Principal/CTE Director	4.53%	405
Counselor	3.33%	298
K-12 Teacher	31.11%	2,781
Parent	48.64%	4,348
Other	8.57%	766



Stars on the map indicate the counties in which districts responded to the spring 2021 landscape survey.

Student Survey Demographics

Students in the state received a separate survey, and 11,621 students from 100 districts responded. Student questions focused on perceptions of computer science, self-efficacy evaluations regarding the ability to learn and succeed in computer science content, and a sense of belonging in the field. The table below shows the gender and race breakdown of students who responded to the survey. Total enrollment information was collected from the MDE.

It is important to understand student perceptions about computer science to address misconceptions and stereotypes commonly associated with the field. This is even more important for women and minorities because these groups are underrepresented in computing fields. By 2029, computer occupations are projected to make up two-thirds of all new Science, Technology, Engineering, and Mathematics (STEM) jobs created.[1] In 2020, women made up less than 25% of the computing workforce in major technology companies like Google, Apple, and Facebook,[2] and only 15% of the workforce was African American or Hispanic.[3] Only 18% of all bachelor's degrees earned in computer science are obtained by women.[4]

1. https://www.bls.gov/opub/btn/volume-10/why-computer-occupations-are-behind-strong-stem-employment-growth.htm
2. Lynkova, Darina, "Women in Technology Statistics: What's New in 2021", TechJury, Oct. 3, 2021 https://techjury.net/blog/women-in-technology-statistics/#gref
3. https://codeorg.medium.com/is-diversity-in-computing-jobs-improving-32f30068b7de
4. https://www.computerscience.org/resources/women-in-computer-science/

Student Survey Respondents vs. Total Student Enrollment Demographics								
Student Totals	Male	Female	Other	Caucasian, White	African American, Black	Latino, Latina, Hispanic	Native American, American Indian	Other
Elementary (Grades 3-5)								
Total Respondents: 4,229 Total Enrolled: 97,507	2,007	1,984	238	1,529	1,121	134	86	1,360
Middle School (Grades 6-8)								
Total Respondents: 3,519 Total Enrolled: 109,313	1,529	1,796	194	1,508	1,241	138	53	580
High School (Grades 9-12)								
Total Respondents: 2,191 Total Enrolled: 127,589	975	1,117	99	962	849	84	22	275

2021 Landscape Survey Detail Findings

The following report provides a snapshot of the current status of computer science education in Mississippi following the completion of the 2020-2021 school year. Data has been collected from MDE reports and public posting, training records of the Center for Cyber Education at Mississippi State University, and surveys completed by district administrators, school counselors, K-12 teachers, parents, and students.

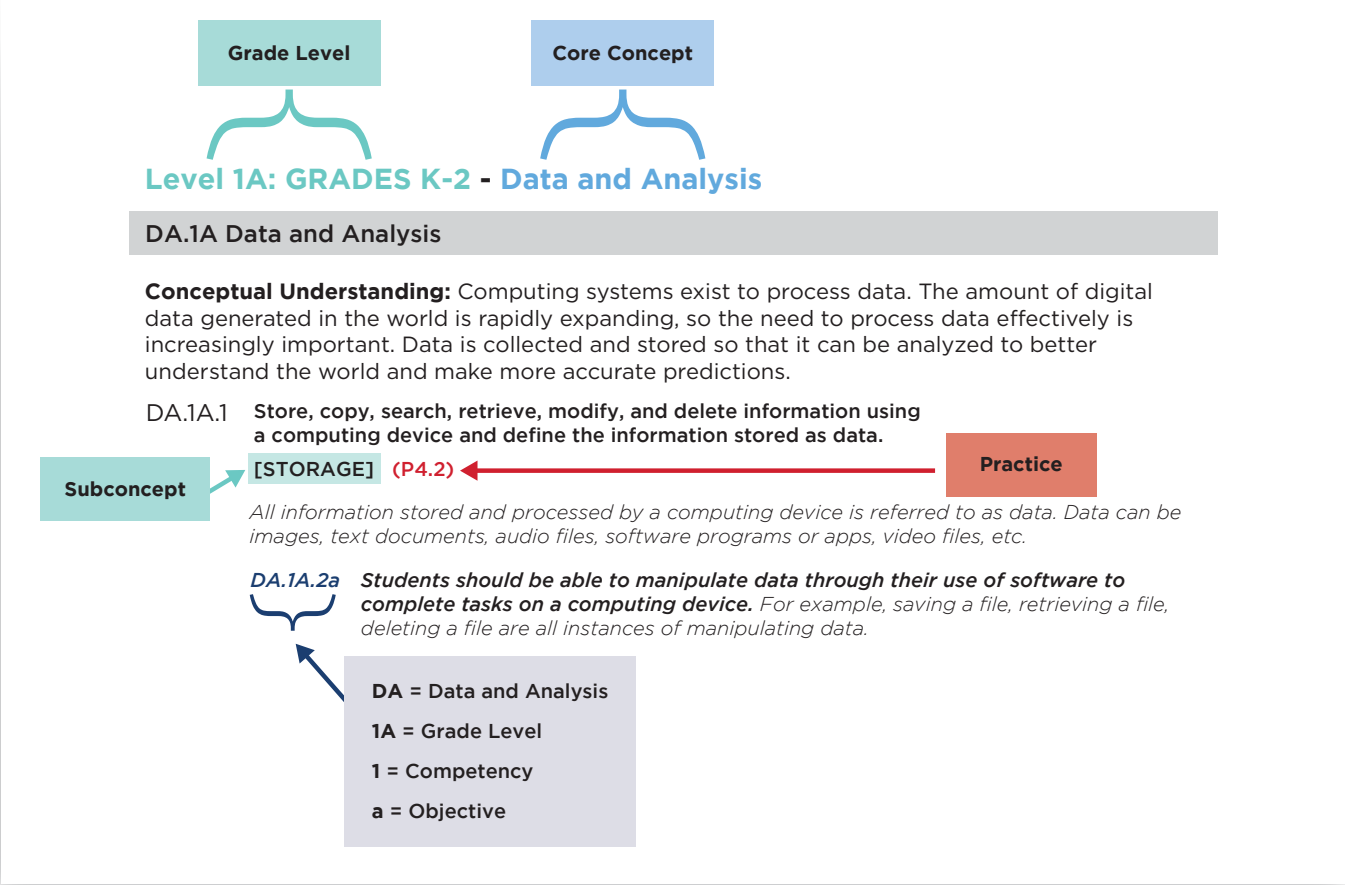
Mississippi Computer Science Standards

One of the first accomplishments of the CS4MS initiative was to adopt computer science standards for Grades K-12. The *2018 MS CCRS for Computer Science* were adapted from the nationally developed *Computer Science Teachers Association's 2017 K-12 Computer Science Standards* (csteachers.org/page/about-csta-s-k-12-nbsp-standards) and delineate a core set of learning objectives designed to provide the foundation for a complete computer science curriculum and its implementation at the K-12 level. The Mississippi standards seek to accomplish the following:

- Introduce the fundamental concepts of computer science to all students, beginning at the elementary school level
- Present computer science at the secondary school level in a way that can fulfill a computer science graduation credit
- Encourage additional secondary-level computer science courses that will allow interested students to study facets of computer science in more depth and prepare them for entry into the workforce or college
- Increase the availability of rigorous computer science for all students, especially those who are members of under-represented groups

The content of the standards centers around five core concepts and seven instructional practices. The core concepts represent major content areas in the computer science field and are delineated by multiple sub-concepts that represent specific ideas within each concept. The learning progressions for each sub-concept provide a thread connecting student learning from kindergarten to 12th grade. The practices are the behaviors that computationally literate students use to fully engage with the core concepts of computer science. Concepts and practices are integrated to provide complete experiences for students engaging in computer science. You can view a complete copy of the standards on the MDE website: mdek12.org/OAE/college-and-career-readiness-standards.

Understanding the Computer Science Standards Format



CORE CONCEPTS	PRACTICES
• Computing systems • Networks and the internet • Data and analysis • Algorithms and programming • Impacts of computing	• Fostering an inclusive computing culture • Collaborating around computing • Recognizing and defining computational problems • Developing and using abstractions • Creating computational artifacts • Testing and refining computational artifacts • Communicating about computing

LEVELS

Levels 1A, 1B, 2, and 3A are the computer science standards for **all** students.

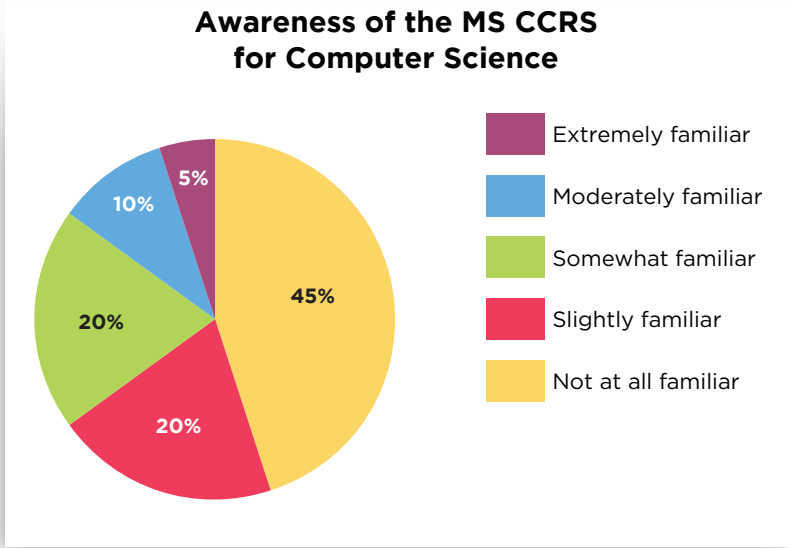
- Level 1A is for kindergarten through Grade 2
- Level 1B is for Grades 3-5
- Level 2 is for Grades 6-8
- Level 3A is for Grades 9-10
- Level 3B is for Grades 11-12

Level 3B standards are intended for students who wish to pursue the study of computer science in high school beyond what is required for all students (specialty or elective courses).

You can find information about the *2018 Mississippi College- and Career- Readiness Standards for Computer Science* at the following link: www.mdek12.org/sites/default/files/Offices/MDE/OAE/SEC/2018_MCCRS_CS.pdf

Computer Science Standards Awareness

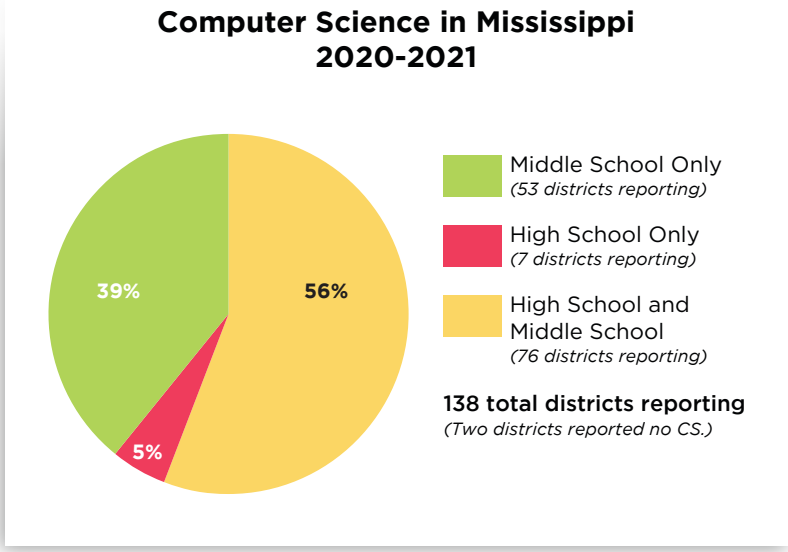
Less than 35% of adult respondents to the landscape survey were even somewhat familiar with the computer science standards that were adopted in 2018.



Curriculum and Courses

The data reported to MDE for the computer science courses offered during the 2020-2021 school year can be found below. Elementary data is not available due to the lack of an adequate method for tracking implementation.

All but nine districts at the middle school level reported replacing the Information and Communications Technology I (ICT I), Information and Communications Technology II (ICT II), and Technology Foundations (TF) curricula with Cyber Foundations I and II (CF I/CF II). The Cyber Foundations curriculum covers coding and web development, and teachers are trained using the Code.org Computer Science Discoveries curriculum.



More than 50,000 Mississippi students were involved in computer science courses during the 2020-2021 school year.

Cyber Foundations I									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
130	32,226	15,929	16,257	339	15,443	1,399	69	914	14,045

Cyber Foundations II									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
47	9,805	4,901	4,900	104	3,916	378	50	313	5,040

Computer Science and Engineering									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
15	1,892	859	1,020	*	839	67	*	313	5,040

Exploring Computer Science									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
65	5,565	2,668	2,873	54	2,638	217	*	153	2,485

AP Computer Science Principles									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
31	493	185	278	21	182	12	0	12	266

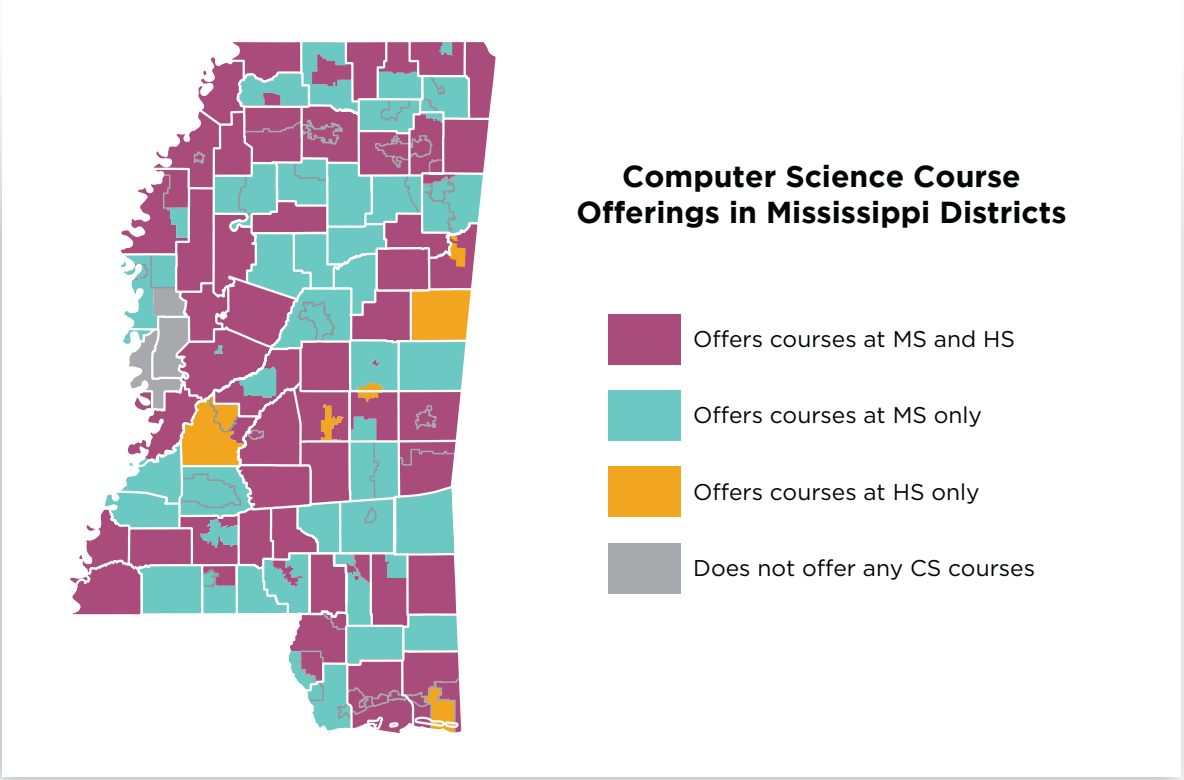
AP Computer Science A									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
6	93	13	64	*	23	*	0	0	60

Software Development									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
8	144	21	85	*	50	*	0	*	69

Information Technology									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
17	626	136	419	*	221	*	*	*	328

Game Design									
Districts Offering	Students Enrolled	Female	Male	Asian	Black	Hispanic	Native American	Two+	White
10	194								

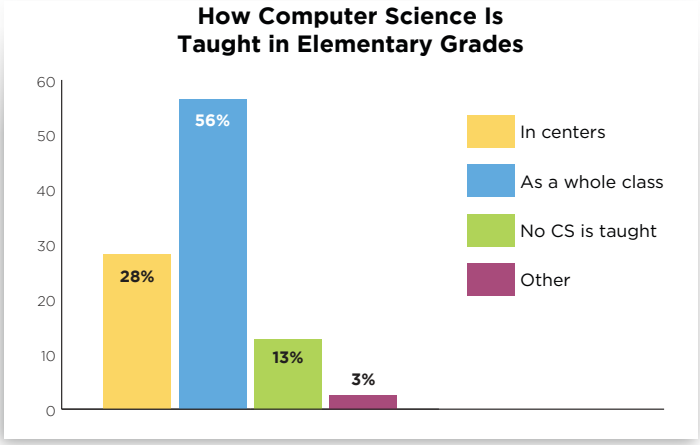
* MDE redacts data where eight or fewer students were enrolled in a course or within a particular demographic.

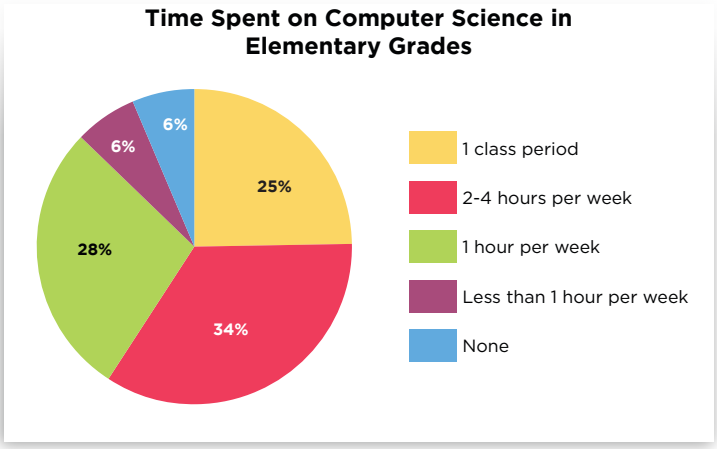


Visit cs4ms.org/k12courses for an interactive map showing which courses are offered in each district.

Elementary School

Currently, no course code is associated with elementary computer science, nor is there any other required method of tracking a student's exposure to computer science activities at the elementary level. Based on feedback from elementary teachers who responded to the landscape survey, only 28.13% indicated they spent approximately one hour per week in their classroom on computer science. When asked what computer science topics were integrated into class time, 10 of the 42 respondents answered programming, and eight indicated robotics. Another 28.6% of respondents indicated computer science topics were integrated during a rotational period outside the regular classroom. Code.org is the primary resource used at the elementary level. The graphs to the right show how computer science is taught and the amount of time spent by Grade 3-5 teacher survey respondents when it is addressed inside the primary classroom:





Middle School

Cyber Foundations I and II and Computer Science and Engineering (CSE) are the primary computer science courses designed for the middle school level.

- **CF I**—This course includes keyboarding, digital citizenship, word processing, spreadsheets, presentation tools, problem-solving, web design, and block-based coding.
- **CF II**—This course includes keyboarding, digital citizenship, graphic design, databases, user experience design, data and computers, and web application development.
- **CSE**—This course is intended to demonstrate how computer science and engineering are interconnected through project-based activities that combine coding, electronics, microprocessors, and robotics. Students become familiar with the engineering design process and the steps needed to create an application-controlled product.

A total of 109,313 students were enrolled in Grades 6-8 in the 2020-2021 school year. The following table reflects that approximately 40% of that total enrollment took computer science courses. Some schools were still offering the ICT I and II and Technology Foundations courses or may have used incorrect course codes when reporting data to MDE.

Course	# of Districts Offering	Students Enrolled
Cyber Foundations I	130	32,322
Cyber Foundations II	47	9,771
Computer Science and Engineering	15	1,997

High School

Four 1-credit courses are taught at the high school level in the state: PLTW Computer Science Essentials, Exploring Computer Science (ECS), Advanced Placement Computer Science Principles (AP CSP), and Advanced Placement Computer Science A (AP CSA). Additionally, three 4-credit CTE programs are offered across the state: C Spire Software Development (SD), Information Technology (IT), and Simulation, Animation, and Design (SAD). The ECS, IT, and SAD curricula are all based on state-developed frameworks. The C Spire SD program is a dual-credit opportunity with local community colleges that uses the community college curriculum. Most teachers offering AP CSP are using curriculum from Code.org or PLTW.

- **ECS**—This survey course for all students covers problem-solving, critical thinking, web design, coding, data science, and robotics.
- **AP CSP**—This entry-level AP course covers the internet, digital information storage, coding, big data, privacy, and web application development and prepares students for the AP CSP exam.
- **AP Computer Science A**—This course introduces students to the concepts and tools of computer science as they learn the Java programming language. Students do hands-on work to design, write, and test programs that solve problems or accomplish tasks.
- **C Spire Software Development**—This four-credit pathway is offered as a dual-credit program with local community colleges and introduces students to the basic concepts used to create mobile and web applications. Students will learn about front- and back-end development, user experience design, and some of the entrepreneurial aspects of a software developer.
- **Game Design**—SAD is a four-credit pathway in the arts, audio-video technology, and communications career cluster. This program is designed for students who wish to develop, design, and implement projects in the ever-expanding field of game design and development.

- **IT**—The four-credit IT pathway is designed to provide the basic foundational skills and knowledge for computer networking, applications, and support. Students will develop the skills necessary to prepare for certification exams and learn how to develop, support, and integrate computing systems.

The following table shows MDE data for the number of districts offering each computer science course and/or four-credit pathway program and the number of students enrolled.

Course	# Of Districts Offering	Students Enrolled
Exploring Computer Science	65	5,565
AP Computer Science Principles	31	493
AP Computer Science A	6	93
Software Development	8	144
Game Design	10	194
Information Technology	17	626

A Carnegie Unit in computer science is currently required for high school graduation. Students can begin earning the credit as early as seventh grade with the completion of the CF I course. The chart below shows what computer science courses count for Carnegie Units according to the *2020-2021 Approved Courses for the Secondary Schools of Mississippi* manual:

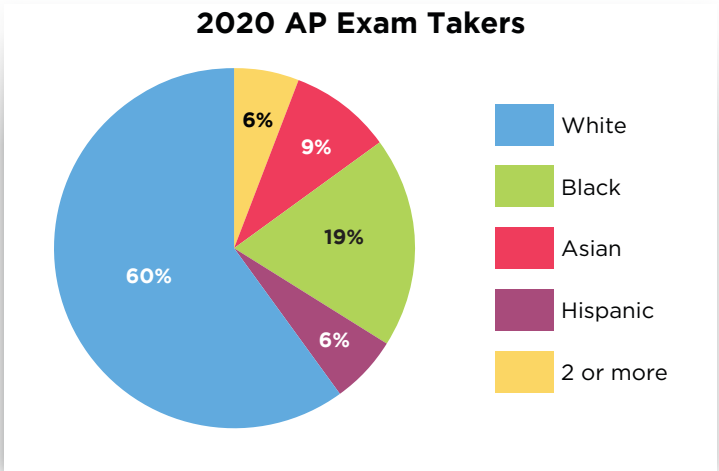
Course	Course Code (CTE/Academic)	CS/Technology Credit	Other Credit
Cyber Foundations I	000284/110143	YES	
Cyber Foundations II	000286/110147	YES	
Computer Science and Engineering	000287	YES	
PLTW: Computer Science Essentials	561053	YES	Math or Science
Exploring Computer Science	000283/110142	YES	
PLTW: Computer Science Principles	232065	YES	
AP Computer Science Principles	110145	YES	Math or Science
PLTW: AP Computer Science Principles	561001	YES	Math or Science
AP Computer Science A	110141	YES	Math or Science
PLTW: AP Computer Science A	561049	YES	Math or Science

Mississippi has two diploma options—the traditional diploma and the alternate diploma—for the 2021-2022 school year according to the *2020-2021 Approved Courses for the Secondary Schools of Mississippi* manual. The traditional diploma is for all students, while the alternate diploma is an option for students with a significant cognitive disability (SCD). The alternate diploma is not equivalent to a traditional high school diploma and is not recognized by postsecondary entities that require a traditional high school diploma. There is no technology or computer science credit requirement for the alternate diploma. Students may earn one of the following endorsements to be added to the traditional diploma: career and technical endorsement, academic endorsement, and/or distinguished academic endorsement. All three endorsements require one Carnegie Unit of computer science/technology for graduation.

2020 AP Exam Results

According to numerous studies, including one by Weston and Dubow at the University of Colorado Boulder,[1] "Programming during high school, taking the CS Advanced Placement exam, and participation in the Aspirations awards program were the best predictors of persistence three years after the high school survey in both CS and other technology-related majors." Therefore, tracking the AP exam information is a good indicator of program impact and growth.

The 2020 AP CSP exam results, as reported by College Board, indicated that 149 out of 292 (51%) students of all gender and ethnicities scored a 3 or better. Females made up 112 of the 292 (38%) AP examinees. Of those 112 females, 13% indicated they are African American and 46% scored a 3 or higher on the exam.



Race		All Students		Males		Females	
		CSA	AP CSP	CSA	AP CSP	CSA	AP CSP
American Indian/Alaska Native	Total	0	1	0	1	0	0
	3+ Score	0	*	0	*	0	0
Asian	Total	4	27	3	18	1	9
	3+ Score	*	16	*	11	*	5
Black	Total	4	53	2	23	2	29
	3+ Score	*	20	*	11	*	8
Hispanic/Latino	Total	1	18	1	13	0	5
	3+ Score	*	9	*	8	0	0
White	Total	11	171	9	110	26	60
	3+ Score	5	91	5	60	*	31
Two or more	Total	3	16	2	9	1	7
	3+ Score	*	9	*	5	*	4
Other	Total	1	6	0	4	1	2
	3+ Score	*	3	0	*	*	*
TOTAL	Total	24	292	17	178	7	112
	3+ Score	10	149	9	97	1	51

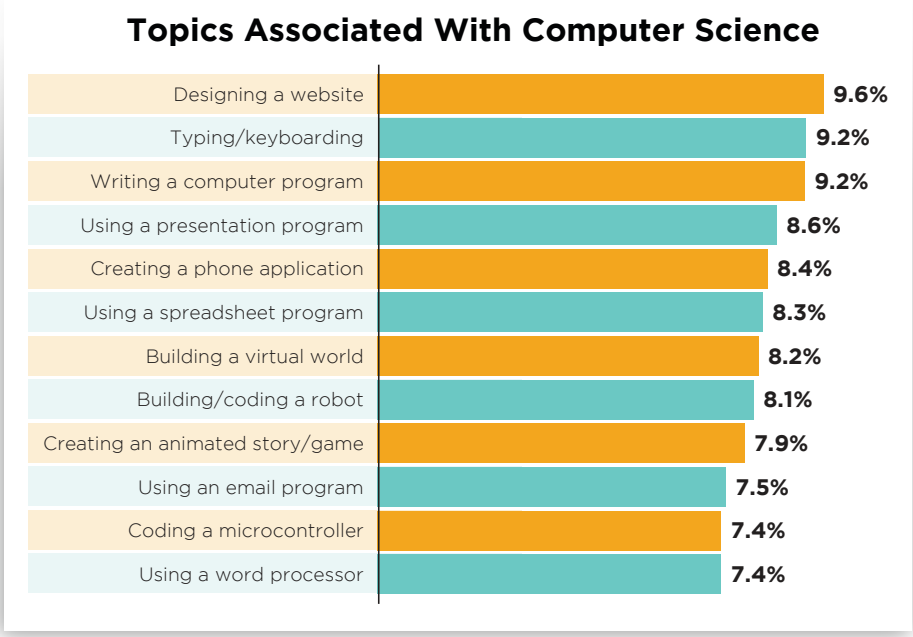
*College Board does not report score distributions when there are less than 5 total participants in a category.

Awareness of What Constitutes Computer Science

In the MS CCRS for Computer Science and the Mississippi Computer Science and Cyber Education Equality Act, computer science has been defined as the "study of computers, algorithmic processes, coding, and logical thinking, including computer principles, their hardware and software designs, their implementation, and their impact on society." More than 50% of all

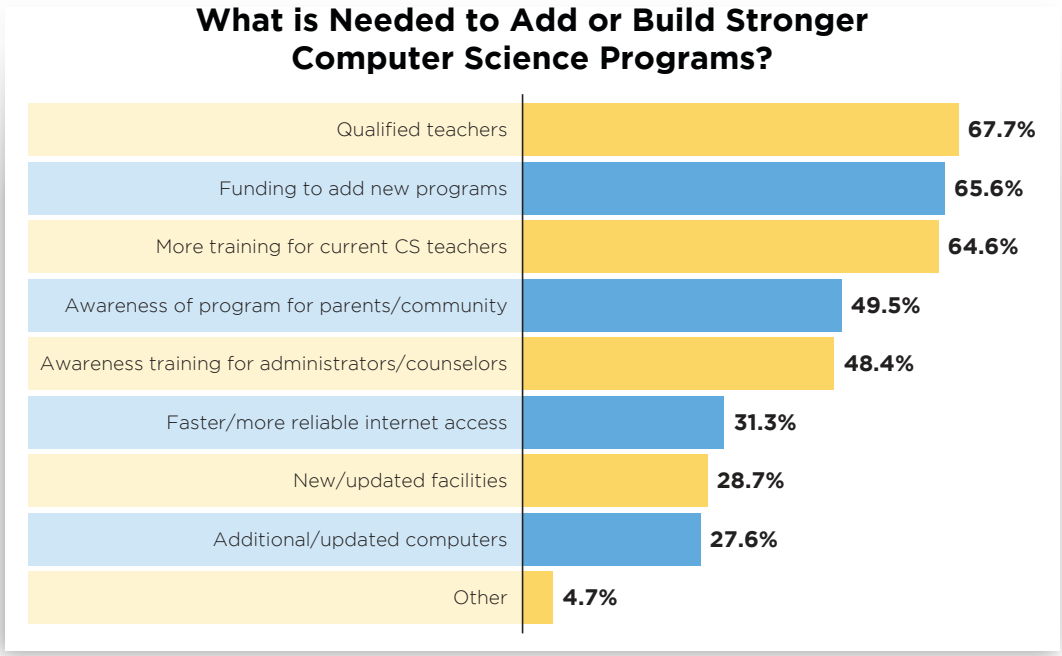
1. Timothy J. Weston, Wendy M. Dubow, and Alexis Kaminsky. 2019. Predicting Women's Persistence in Computer Science- and Technology-Related Majors from High School to College. ACM Trans. Comput. Educ. 20, 1, Article 1 (September 2019), 16 pages. https://doi.org/10.1145/3343195

adult respondents consider topics/activities such as typing, word processing, email, and creating slide presentations as computer science. Respondents were able to choose more than one response to this question.



What does Mississippi need to add or to build stronger computer science programs?

In the landscape survey, superintendents were asked what they believed their districts needed to add or build a stronger computer science program. Respondents were able to choose more than one response. According to the survey, qualified teachers, funding, and more teacher training were identified as the top needs to add or build stronger computer science programs in the state.



Teacher Professional Development

In the landscape survey, teachers who responded were asked to describe any professional development they had received in relation to technology and computer science. This question was posed to understand teacher awareness of computer science training in the state. Their responses are indicated below.

Teacher Professional Development Associated With Technology and/or CS

Question	Yes	Yes—as part of endorsement	No—but I knew about it	No—not aware of it	No—not sure what this is	Total
Code.org CS Fundamentals (elementary) curriculum	14.95%	2.64%	18.46%	45.27%	18.68%	455
Code.org CS Discoveries (middle school) curriculum	9.34%	8.20%	16.17%	44.65%	21.64%	439
Computer Science and Engineering curriculum	5.35%	3.16%	18.00%	55.47%	18.00%	411
Exploring Computer Science curriculum	4.23%	4.48%	13.18%	59.20%	18.91%	402
AP Computer Science curriculum	2.28%	1.78%	14.47%	61.42%	20.05%	394
Project Lead the Way CS	5.53%	1.01%	14.32%	55.28%	23.87%	398
Digital citizenship	33.69%	5.12%	16.42%	34.54%	10.23%	469
Online collaboration (e.g., Google Drive, learning management system [Canvas, Google Classroom], etc.)	64.17%	4.28%	11.05%	16.04%	4.46%	561
Computer programming (e.g., Scratch, Code.org, Python, etc.)	15.17%	6.16%	20.14%	43.60%	14.93%	422
Robotics/microcontrollers (Edison, Lego, Vex, Microbit, Arduino, Circuit Playground, etc.)	10.12%	4.58%	22.17%	46.75%	16.39%	415
Web design (building web pages)	14.90%	4.09%	21.63%	49.76%	9.62%	416
Application development	5.37%	2.30%	18.41%	60.36%	13.55%	391
Artificial intelligence	2.07%	1.04%	16.06%	66.06%	14.77%	386
E-textiles	1.04%	0.78%	6.48%	65.80%	25.91%	386
Data science	4.08%	1.79%	13.52%	64.29%	16.33%	392
Equity and diversity	13.20%	3.81%	13.96%	55.08%	13.96%	394
Problem-solving and critical thinking	21.41%	6.59%	16.71%	45.41%	9.88%	425

The table below reflects the number of teachers who have been trained the past four years in Code.org curriculum resources from elementary through high school. Additionally, the table shows how many teachers who received training went on to implement or offer the course at their school. This data comes from Code.org reports of teachers who used the Code.org platform to create a class, upload students, assign activities, and had students complete the work. After reviewing the data,

a concern at the elementary level is that out of the 318 teachers trained only 27% have implemented the material. This will need to be monitored as the legislative mandate to offer computer science for at least one hour per week goes into effect. Additionally, at the middle and high school levels the number of teachers trained in the past year as compared to the number of teachers implementing the curriculum reduced by almost half. This may be due to COVID-19 shutdowns but is something to monitor in the future.

Teachers Trained From 2018-2021 by Code.org

Code.org Course	Year (June-May)	Number of Teachers Trained	Number of Teachers Implementing
CS Fundamentals (elementary)	2018-2019	119	38
	2019-2020	177	37
	2020-2021	22	11
Computer Science Discoveries (middle school)	2018-2019	169	151
	2019-2020	166	101
	2020-2021	169	90
Computer Science Principles (high school)	2018-2019	31	19
	2019-2020	15	9
	2020-2021	23	11

Professional development provided for courses other than those containing Code.org curriculum includes more than 235 teachers trained to use the ECS curriculum, 103 trained for CSE, and 20 teachers working to complete the two-year C Spire Computer Science Teacher Training Academy through local community colleges. The two-year program prepares teachers to offer the community college courses in the four-credit software development pathway program.

Teacher Endorsement and Preservice Programs

In-service professional development: The table on the following page lists the endorsements currently available for in-service teachers to be considered eligible to teach specific computer science courses and the course-specific training required to receive the endorsement(s). In addition to the course-specific training listed, all teachers must also complete the Certification of Online Learning course (2 C.O.O.L. 4 Teachers) and pass the Internet and Computing Core Certification (IC^3) to demonstrate technology proficiency. Because teachers for Cyber Foundations I and II, Computer Science and Engineering, and Exploring Computer Science can come from any background and level of computing experience, the methods trainings for the 933, 984, and 935 endorsements include content training and pedagogical teaching strategies specific to computer science inquiry-based learning. Additionally, these methods courses cover training on equity, diversity, and culturally relevant lesson planning. Professional development for these endorsements ranges from 5 to 9 days long and is spaced to occur over one year to allow for a just-in-time approach to presenting new content to teachers. This allows them to receive training closer to the time they might be teaching the material.

The career pathway courses require an instructor to have specific educational training, certifications, and/or workforce experience in the topic being taught. Therefore, the methods trainings for career pathway courses focus primarily on classroom management and teaching strategies and do not normally contain instruction in content. Pathway instructors are also required to attend a year-long program for industry professionals entering education to provide a systematic approach to the induction of new career and technical education (CTE) teaching professionals. This program typically takes a year to complete and includes mentoring and classroom observations.

Endorsement Name	Applicable Courses	Specific Training Required
Computer Science *Endorsement # 933*	• Cyber Foundations I (000284) • Cyber Foundations II (000286)	Methods of Cyber Foundations
Science, Technology, Engineering, & Mathematics (STEM) *Endorsement # 984*	• Computer Science and Engineering (000287)	Methods of STEM
Exploring Computer Science (ECS) *Endorsement # 935*	• Exploring Computer Science (000283)	Methods of Exploring Computer Science
Career Pathway: Information Technology (IT) *Endorsement # 954*	• IT Fundamentals I (992208) • IT Fundamentals II (992209) • IT Networking I (992210) • IT Networking II (992211) • IT Associate I (992206) • IT Associate II (992207)	Methods of Information Technology
Career Pathway: Simulation and Animation Design (SAD) *Endorsement # 988*	• Ethics, Design Theory, and Photography (994402) • Design Visualization and Character Development (994403) • Audio and Video Production (994404) • Business, Evaluation, and Development of Simulation and Animation Projects (994405) • SAD I (994400) • SAD II (994401)	Methods of SAD

Preservice programs: The following endorsements will be issued to preservice teachers who complete a prescribed set of coursework prior to graduation:

- Candidates who successfully complete the SBE-approved12 hours of coursework for obtaining the K-8 Computer Science endorsement shall receive K-6 Computer Science (937) and 7-12 Computer Science (933) endorsements.
- Candidates who successfully complete the SBE-approved 21 hours of coursework for obtaining the 7-12 Computer Science endorsement shall receive 7-12 Computer Science (933), ECS (935), and STEM (983) endorsements.
- Candidates who are unconditionally admitted to and successfully complete the SBE-approved requirements for the Master of Arts in Teaching-Secondary (MAT-S) nontraditional pathway to licensure in the area of computer science shall receive the 7-12 Computer Science (933), ECS (935), and STEM (983) endorsements.

The K-8 Computer Science endorsement is awarded upon completion of the following through Mississippi State University:

- TKT 4763/6763.....Digital Tools for 21st Century Teaching and Learning
- TKT 4583/6583..... Graphics and Web Design
- TKT 4333/6333.....Introduction to Computer Science Education
- TKB 4543/6543..... Advanced Information Processing

The 7-12 Computer Science endorsement is awarded upon completion of the following 21 hours of through Mississippi State University:

- CSE/EDS 4323/6323 ..... Computing and Cybersecurity Classroom Integration
- CSE 1284 ..... Introduction to Computer Programming

- CSE 1384 ..... Intermediate Computer Programming
- CSE 2383 ..... Data Structures and Algorithms
- CSE 2813 ..... Discrete Math
- TKT 4333/6333..... Introduction to Computer Science Education

District/School Level of Preparedness

In the landscape survey, counselors were asked a series of questions regarding the preparedness of their prospective schools regarding computer science. Counselor perceptions can potentially influence what courses are placed on the master schedule. Their responses are below.

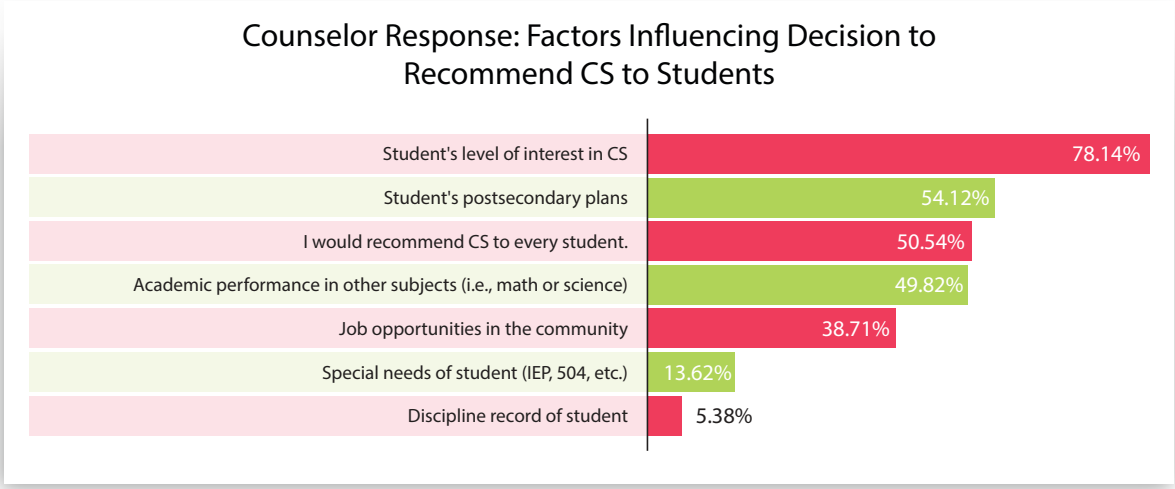
Question	Extremely	Moderately	Somewhat	Slightly	Not at all
How prepared is your school with instructional capacity to teach computer science?	17.56% (49)	36.56% (102)	25.45% (71)	13.98% (39)	6.45% (18)
How prepared is your school with curriculum and resources to teach computer science?	14.34% (40)	30.11% (84)	29.03% (81)	17.20% (48)	9.32% (26)
How prepared is your school with technology and internet access/reliability to teach computer science?	30.82% (86)	37.63% (105)	20.43% (57)	8.96% (25)	2.15% (6)

Counselor Preparedness

In the landscape survey, counselors were asked a series of questions regarding their preparedness to provide student guidance for computer science courses and careers. Counselor perceptions can greatly influence their decision to recommend or encourage students into computer science courses and pathways. Their responses below provide an indicator that counselor awareness training is needed.

Question	Extremely	Moderately	Somewhat	Slightly	Not at all
How prepared do you feel to provide academic and career counseling to students interested in computer science?	15.41% (43)	37.28% (104)	29.39% (82)	10.75% (30)	7.17% (20)
How familiar are you with jobs that require computer science skills?	9.68% (27)	41.22% (115)	31.54% (88)	12.54% (35)	5.02% (14)
How familiar are you with the courses students should take if they are interested in pursuing a degree/career in computer science?	10.39% (29)	34.05% (95)	32.62% (91)	16.49% (46)	6.45% (18)

Counselors' responses to which factors influence their decision to recommend computer science to students were reported on the following page. While a student's level of interest might seem logical for the primary influencer, this could be a barrier to increasing participation in computer science by females and minorities who often self-select out of these fields not really due to lack of interest but a low sense of belonging or self-efficacy with the topic.



After-School/Informal Programs Preparedness

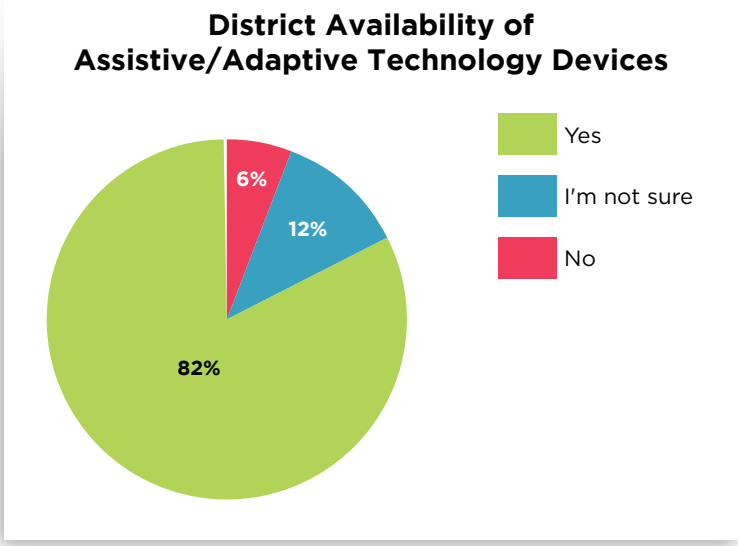
After-school and/or informal programs provide an opportunity for students to experience computer science in an environment that is free of the stress of grades and academic performance. Students often have more creative license to explore coding and robotics. In a makerspace program, students experience a do-it-yourself type of environment where they can let their imaginations lead the way to develop solutions to any problem they identify. The after-school setting also allows more opportunities for students to interact with industry professionals who might not be available during the school day.

Program Type	Number of Programs Reported
Coding	3
Robotics	18
Makerspace	2
Other	5

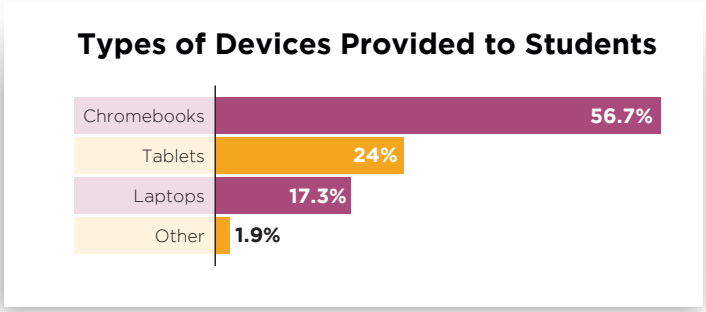
Of parents and teachers who responded to the landscape survey, 93.05% reported no after-school coding or robotics programs available within their districts, while 6.95% indicated their district or school offered informal programs after school. The table to the right lists the type of programs offered:

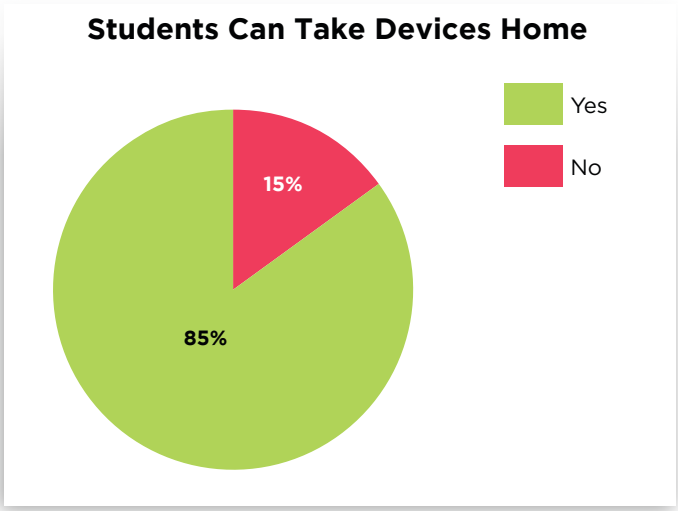
Special Education Preparedness

CS4MS is intended for **all** students regardless of their educational program status: gifted, regular, or special education. For students with physical or learning disabilities, districts must be prepared to provide assistive or adaptive technologies to make computer science courses accessible to all students. The graph to the right shows most districts are already providing assistive/adaptive technology devices for dedicated use by students with an IEP or 504 (e.g., screen readers, text enlargers, special keyboards, specialized mice, etc.):



Technology Preparedness





Student devices:

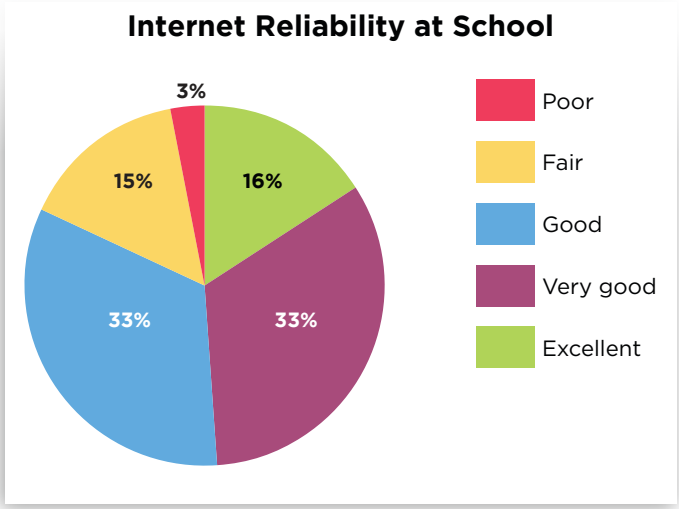
The Mississippi Legislature in July 2020 allocated $200 million to help schools implement virtual learning. Approximately 400,000 MacBooks, Chromebooks, iPads, and other devices were sent to students and teachers across Mississippi that fall. Of the technology directors who responded to the survey, 89.34% indicated all students in their district had access to a device. The remaining 10% who indicated that every student did not have a device may not have received their equipment at the time of the survey.

Most students were provided with Chromebooks which are adequate for all current computer science courses through 10th grade. Once students choose more focused areas of study such as the four-credit CTE computer science pathways, they will need access to more robust equipment with larger internal storage and memory capacities.

While $150 million of the $200 million allocated in July 2020 will go toward helping schools purchase technology and devices, the remaining $50 million will be used to expand broadband access in areas with little or none.

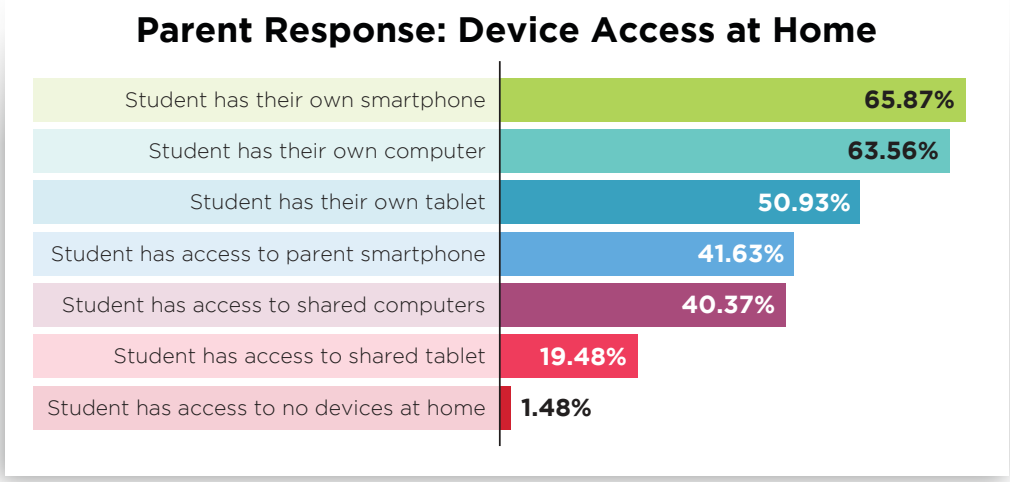
Internet reliability at school:

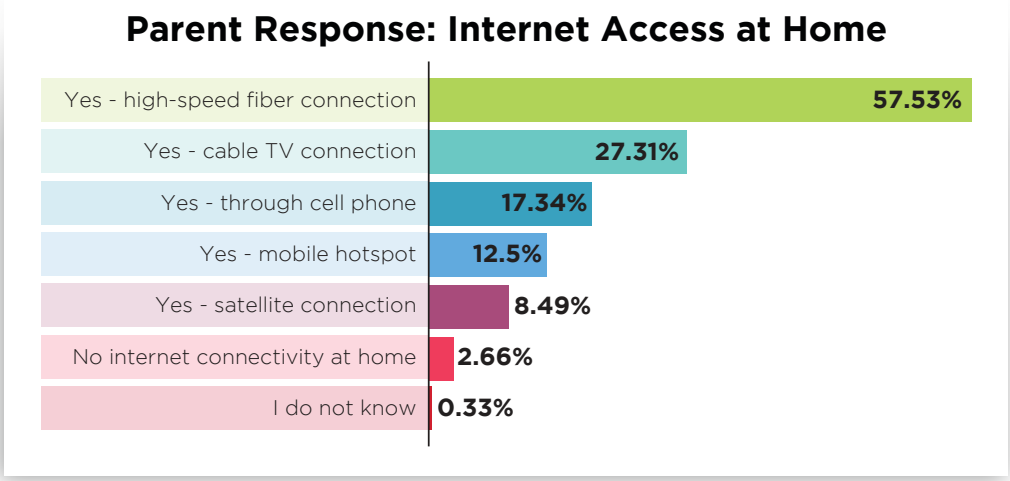
Reliable internet at the school is vital to a successful computer science program. For many students, it may be their only source of connectivity, but it certainly contributes to the learning experience for all students. An unreliable internet connection provides a very frustrating experience for anyone trying to learn new concepts over an online platform.



Technology at home:

Internet access and device availability are important components in increasing parent and community awareness of computer science and the realization that all students can learn basic skills. In addition to providing extended learning experiences for students when they work at home, parents and family members are exposed to the value and importance of the content. The following information represents the parent responses regarding home preparedness from the landscape survey.





Barriers to Computer Science Education Identified in Survey

Across all grade levels, the most notable barriers to computer science education identified in the survey were the lack of internet and equipment at home. This is interesting since only 2.6% of parents reported having no internet at home. The apparent discrepancy may lie in the reliability and speed of the internet access. Less than 60% of the parents responded as having high-speed internet. This could also be a result of the timing of the survey and experience with students learning from home prior to COVID relief funding.

At the elementary level, in addition to lack of internet and equipment access at home, results highlighted state testing pressure (computer science not a priority) as a common barrier. Another obstacle to overcome that is not a barrier to implementation but a concern for measuring success will be the ability to track incorporation of computer science in the classroom. A process for recording how and when computer science topics are covered in each classroom will be critical to evaluating the impact early exposure has on students' persistence and skill levels.

At the high school level, a notable barrier that may surface and is not identified in the following chart is the lack of incentive to take computer science courses in high school due to receiving the Carnegie Unit required for graduation in middle school. This is why early exposure to computer science, which builds confidence and increases interest, is critical to persistence. Purposeful recruitment into computer science classes will be needed to grow enrollment at the high school level.

Reported Barriers for the Computer Science K-12 Standards		
#	Field	Percentage
1	Lack of internet access at home	59.16%
2	Lack of equipment at home	58.54%
3	Lack of awareness by parents	55.45%
4	State testing pressure (CS not a priority)	54.31%
5	Lack of qualified teachers	48.07%
6	Lack of interest/awareness by students	40.89%
7	Lack of time in schedules	39.64%
8	Lack of equipment at school	38.69%
9	Lack of awareness/interest by building administrators	20.16%
10	Not a skill/career seen in our community	19.20%
11	Lack of awareness/education by counselors	18.47%
12	Lack of internet access at district/school	15.71%
13	Other	3.10%

Student Voice

Most students believed learning computer science would be important for their future job, but less than half (less than 25% of middle school students) thought it was important for all students to learn the subject. This supports the hypothesis that more awareness for students is needed on how computer science impacts all careers and, therefore, will be valuable to all students.

Of the more than 10,000 students who responded to the student survey, 43% did not know anyone who uses computer science in their job. This is significant because there are numerous studies like one conducted by Alshahrani[1] which find social support can be a key factor for females, in particular, to pursue computer science. A major concern within today's technology industry is the lack of females and minorities pursuing degrees and entering the workforce in computing fields. To change this lack of diversity, students need to see others who look like them in computer science fields to develop a sense of belonging and belief that they can succeed in these fields. When this sense of belonging and belief of success is developed early, students, especially females and minorities, are more likely to persist in studying computer science.

Grades 9-12 student response: Do you think people of the same race/ethnicity as you have careers in computer science?					
Student Race/Ethnicity	Definitely, yes	Probably, yes	Might or Might Not	Probably, no	Definitely, no
African American	50.77%	23.38%	19.13%	5.08%	1.65%
Asian Pacific/Pacific Islander	40.74%	37.04%	18.52%	3.70%	0%
Indian/South Asian	54.55%	9.09%	27.27%	9.09%	0%

1. Alshahrani, I. Ross, and M. Wood. 2018. Using Social Cognitive Career Theory to Understand Why Students Choose to Study Computer Science. In Proceedings of ACM ICER conference, Espoo, Finland, August 2018 (ICER '18), 10 pages. https://doi.org/10.1145/3230977.3230994

Grades 9-12 student response: Do you think people of the same race/ethnicity as you have careers in computer science?					
Student Race/Ethnicity	Definitely, yes	Probably, yes	Might or Might Not	Probably, no	Definitely, no
Latino/Latina/Hispanic	42.17%	26.51%	18.07%	7.23%	6.02%
Middle Eastern	28.57%	42.86%	0%	14.29%	14.29%
Native American/American Indian	61.90%	19.05%	4.76%	9.52%	4.76%
White/Caucasian	62.12%	24.14%	11.76%	1.46%	0.52%
Two or more	45.13%	27.43%	16.81%	9.73%	0.88%
Other	46.81%	25.53%	19.15%	4.26%	4.26%
Prefer not to answer	52.94%	19.12%	22.06%	4.41%	1.47%

Following are some quotes from the student survey respondents when prompted to provide any additional comments or thoughts related to computer science education in Mississippi:

- "I think computer science is very cool, and I would like to learn it."
  African American, female, fifth grade
- "I feel like you should be able to do computer science in any grade."
  African American, male, fifth grade
- "Well, I would love to design high-tech clothing using computer science."
  African American, female, fifth grade
- "I think it would be helpful for your future job to learn computer science."
  Caucasian, female, fifth grade
- "I think Mississippi should have computer science in every grade from first grade up."
  Caucasian, male, fifth grade
- "I have a really good interest in computer science. I want to do the second part of STEM-Cyber-Computer Science! I am very interested in how to do robotics and programming computers and designing video games!"
  African American, male, eighth grade
- "I would love to create games, including the drawing/modeling, animating, and the planning of how the game, mechanics, and story will work/go, and I'm somewhat interested in the coding since I would be in control of how the game works."
  African American, female, seventh grade

- "There are lots of kids here who would love to learn about computer science, including myself, so Mississippi must take it more seriously."
  Native American, male, eighth grade

- "I think computer science education in Mississippi is really needed because there are many jobs that involve computer science."
  Latina, female, eighth grade

- "I think we should be worried more about stuff like computer science than state tests, especially since this world is becoming more and more reliable on technology."
  Caucasian, female, eighth grade

- "Computer science can help a lot of kids with their future careers."
  Caucasian, female, 10th grade

- "Computer Science should be taught in school."
  African American, female, 10th grade

Postsecondary Enrollment Data

Current enrollment at the postsecondary level is important to consider as the K-12 computer science initiative expands. Enrollment increase in computing-related degree programs at the postsecondary institutions across the state will be viewed as an indicator of progress.

Community College

The information below was taken from the Mississippi Community College Board (MCCB) website and the Mississippi Public Universities Office of Strategic Research website and represents the most current data publicly available at the time of this report.

2018 Mississippi Community College Computer Science Enrollment

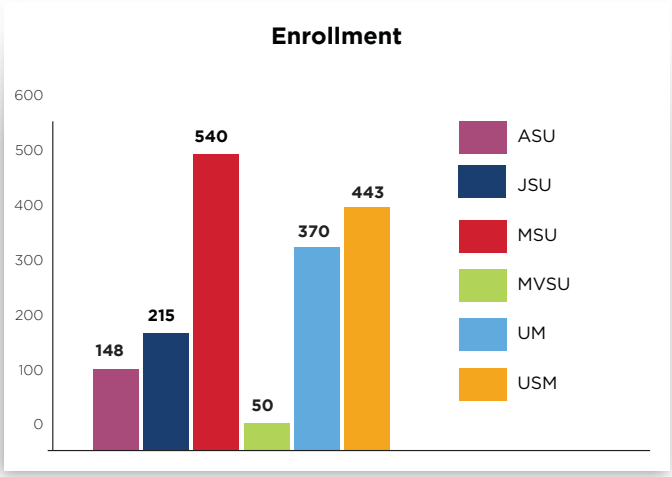
Total First-Time Enrollment	Gender			Race/Ethnicity			Computer Science Enrollment	
	Male	Female	Unknown	African American	Caucasian	All Other	Academic	Career and Technical
16,770	7,683	9,025	86	6,957	8,028	1,809	340	174

This information was collected from the MCCB website: mccb.edu/enrollment-reports

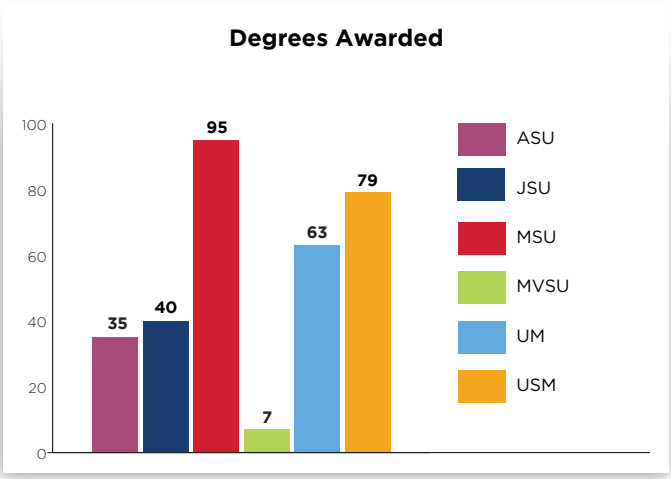
Four-Year Universities

The following information was collected from the Mississippi Public Universities website (mississippi.edu).

Four-Year Universities' Computer and Information Science and Support Services 2020



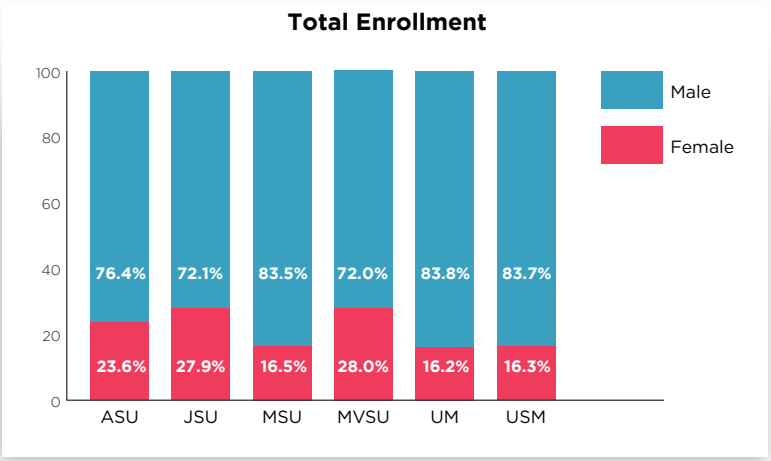
Data from: mississippi.edu/research/IDP_FTE_AYEnr.asp

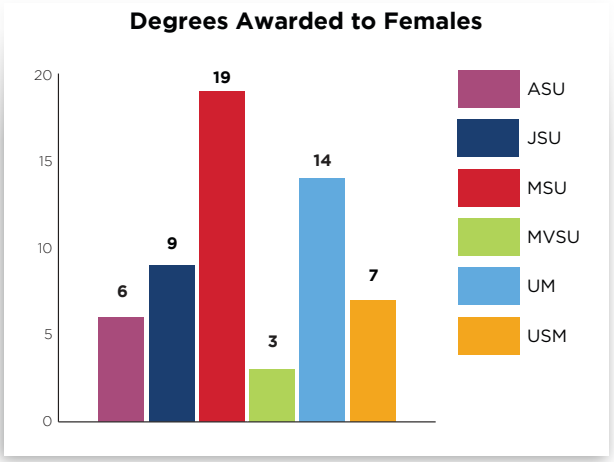


Data from: mississippi.edu/research/IDP_Degrees.asp

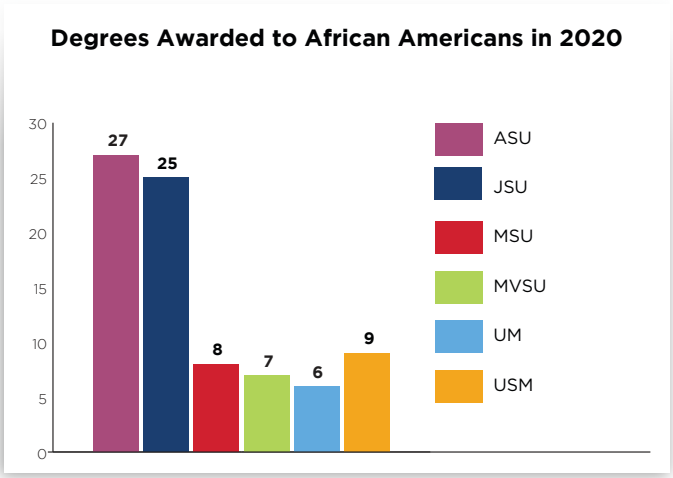
Females only make up 18.2% of the total degrees awarded in 2020. Of the 258 bachelor's degrees awarded in Computer and Information Science (CIS), only 47 went to female students. Only seven of the 50 master's degrees and four of the 11 PhDs were awarded to females.

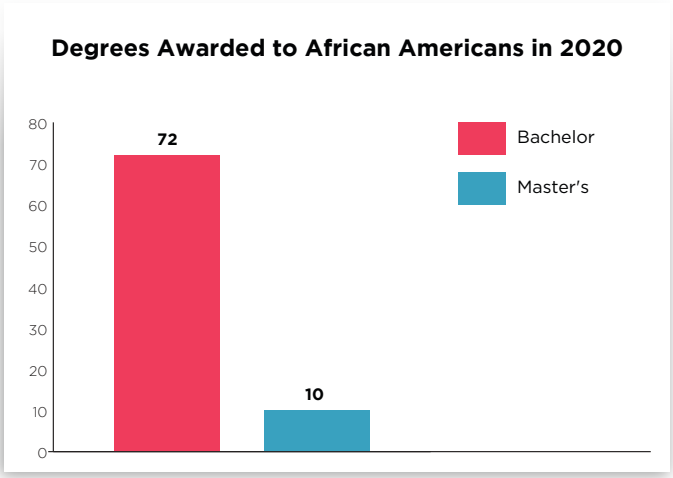
Four-Year Universities' Computer and Information Science and Support Services 2020 by Gender





Four-Year Universities' Computer and Information Science and Support Services 2020 for African Americans





African Americans make up 25.7% of the total degrees awarded in 2020.

2022-2032

STRATEGIC GOALS AND TIMELINE

STRATEGIC GOAL #1

Ensure at least one teacher delivering high-quality computer science courses (in-person or online) in every middle and high school and at least one teacher in each grade (or serving each grade) in every elementary school.

Focus Area: **Professional Development**

Grade Band Goals	
Elementary School	**GOAL 1:** Establish at least one teacher at each grade level to integrate computer science within core subject areas in every elementary school or one teacher servicing all grade levels at least one hour per week by 2023-2024.
Middle School	**GOAL 1:** Establish at least one teacher teaching high-quality computer science courses in every middle school (in-person or online) by 2022-2023.
High School	**GOAL 1:** Establish at least one teacher (per 140 students) teaching high-quality computer science courses in every high school (in-person or online) by 2024-2025. **GOAL 2:** Create ongoing opportunities for in-service teachers to be trained in four-credit pathway programs by 2022-2023. Add a new opportunity each year as needed/allowed by available funding.

Strategies	Begin Date	End Date	Completion Evidence
Provide district-wide trainings for up to 30 teachers annually. If this does not train all K-5 teachers withing the district, a train-the-trainer model will be employed to allow the district to expand the training at a later date. **GRADE BAND:** ES | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	July 2023	Trainings are held within a district.
Hold four 2-day regional workshops across the state, with up to 225 teachers attending each workshop (a total of 900 teachers trained). Each district in the state will be invited to send six teachers (one teacher for each level in Grades 1-5 and an additional person such as a computer lab instructor or media specialist). Each workshop will train six people from each district to go back and provide training to all K-5 teachers in their district. The training will cover: • Free Code.org platform • Elementary integration guide currently being developed • Other classroom resources (e.g., robots, etc.) • Train-the-trainer guidance **GRADE BAND:** ES | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	May 2022 **Trainings will continue after June of 2023 to provide ongoing professional development for new teachers as needed*	June 2023*	Workshops will be held in 4 regions across the state.
Continue providing high-quality training (in-person or online) for computer science endorsement(s) for licensed educators throughout the state. **GRADE BAND:** MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	Endorsement training is held annually for all relevant computer science courses.

STRATEGIC GOAL #2

Ensure all teachers providing computer science instruction are certified or endorsed.

Focus Area: **Certification and Licensure**

Grade Band Goals	
Elementary School	GOAL 1: Establish teacher training opportunities for all in-service teachers to be endorsed in various computer science courses.
Middle School	GOAL 1: Establish teacher training opportunities for all in-service teachers to be endorsed in various computer science courses.
High School	GOAL 1: Establish teacher training opportunities for all in-service teachers to be endorsed in various computer science courses.

Strategies	Begin Date	End Date	Completion Evidence
The Elementary Task Force for Computer Science Education will consider the endorsement needs for elementary teachers and make recommendations to MDE. GRADE BAND: ES | RESPONSIBILITY LEVEL: State (Elementary Task Force, MDE, CCE)	Current	March 2023	Recommendations are made annually in a legislative report.
Continue providing high-quality training (in-person or online) for computer science endorsement(s) for licensed educators throughout the state. GRADE BAND: MS, HS | RESPONSIBILITY LEVEL: State (MDE, CCE)	Current	June 2032	Endorsement training is held annually for all relevant computer science courses.

STRATEGIC GOAL #3

Establish full certification and teacher endorsements for computer science at the preservice level.

Focus Area: **Preparation Programs**

Grade Band Goals	
Elementary School	**GOAL 1:** Establish computer science endorsements for elementary education degree programs for preservice teachers
Middle School	**GOAL 1:** Establish a computer science education emphasis pathway for secondary education degree programs for preservice teachers.
High School	**GOAL 1:** Establish a computer science education emphasis pathway for secondary education degree programs for preservice teachers.

Strategies	Begin Date	End Date	Completion Evidence
The Computer Science Education Strategic Planning Team will present strategies to IHL and the various preservice teacher programs in the state regarding the development of a concentration/specialization degree in computer science education for elementary and secondary education. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (IHL, MDE, CCE, Strategic Planning Team)	Current	May 2023	Progress will be reported annually in a legislative report until a preservice program is developed.

STRATEGIC GOAL #4

Ensure local-, state-, and federal-level funding is dedicated to creating and maintaining curricula, professional development, necessary teaching units, and program updates and creation for computer science.

Focus Area: **Funding**

Grade Band Goals	
Elementary School	GOAL 1: Establish funding with at least three regional, state, or local industries to support computer science programs at the state level.
Middle School	GOAL 2: Secure funding for creation of an online computer science institution at the state level.
	GOAL 3: Work to increase funding for necessary teacher units and program creation at the state level.
High School	GOAL 4: Secure funding within each district to offer at least one four-credit CTE program related to computer science at the high school level as budget and program slots become available.

Strategies	Begin Date	End Date	Completion Evidence
Explore grant opportunities to fund computer science initiatives at the district and state levels. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	New grant funding awarded for computer science initiatives.
Work with legislature to share needs and request continued funding for computer science programs and training. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	Continued appropriations support for computer science programs and teacher training.
Explore ways to braid federal funds to maximize funds for computer science programs and training. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	Where funds are identified they are utilized for computer science programs.
Garner financial support from local, state, and regional industry for computer science programs and teacher training. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	Funding from industry support of computer science programs and teacher training.

STRATEGIC GOAL #5

Build and maintain school- and district-level partnerships with regional and local industry to provide expertise on curricula and financial support of programs.

Focus Area: **Funding/Curriculum/Outreach**

Grade Band Goals	
Elementary School	GOAL 1: Each district should aim to establish at least one new partnership annually with local and regional industry to provide expertise on curriculum and the financial support of programs.
Middle School	GOAL 2: Ensure that each district has at least one technology/computer science industry partner by 2032. GOAL 3: Expand the participation of current partners to other districts outside their local area.
High School	GOAL 4: Maintain and strengthen partnerships with existing regional and local industry to provide expertise on curriculum and the financial support of programs.

Strategies	Begin Date	End Date	Completion Evidence
Develop a marketing plan, including newsletters to schools and public service announcements, that emphasizes the importance and value of a computer science education. This should bring more awareness to parents and community members and increase support for students to enroll in computer science courses. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	Current	January 2022	A marketing plan will be developed to emphasize the importance of computer science education.
Partner with organizations and industry to create and support after-school programs and student organizations that increase diversity by exposing students to computer science in a fun, non-academic-pressure environment. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	2022-2023 School Year	June 2032	Increase in the number of after-school programs
Help build a statewide listing of industry partners districts can access for outreach and funding support. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	2023	June 2025	An online location is created for districts to access to identify industry partners who might support district computer science programs.

STRATEGIC GOAL #6

Increase the percentage of underrepresented groups enrolled in computer science at the high school level (Grades 9-12) by 75% and increase elementary and middle school exposure to computer science to 100%, using enrollment from the 2020-2021 school year as a baseline.

Focus Area: **Diversity**

Grade Band Goals	
Elementary School	**GOAL 1:** Increase exposure to computer science in each elementary grade level to 100% by 2024-2025.
Middle School	**GOAL 1:** Increase middle school exposure to computer science from 85% to 100% by 2022-2023.
High School	**GOAL 1:** Increase the percentage of female students in Grades 9-12 enrolled in secondary computer science courses across the state by 10% each year. **GOAL 2:** Increase the percentage of African American students in Grades 9-12 enrolled in secondary computer science courses across the state by 10% each year. **GOAL 3:** Increase the percentage of Latinx students in Grades 9-12 enrolled in secondary computer science courses across the state by 10% each year. **GOAL 4:** Increase the percentage of Native American students in Grades 9-12 enrolled in secondary computer science courses by 10% each year.

Strategies	Begin Date	End Date	Completion Evidence
Through various professional development opportunities with a train-the-trainer approach, each elementary teacher in Mississippi will be trained to implement computer science in their classroom and provide access to all K-5 students. All elementary schools will have a plan of exposure and implementation in place at the beginning of the 2024-2025 school year. **GRADE BAND:** ES | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District	2022	August 2023	Computer science is integrated into all grade levels in all elementary schools across the state, thereby exposing all K-5 students to computer science content for at least one hour each week. Use course code and an evidence-based tracking system to confirm.
Ensure teacher professional development includes diversity and equity training, equitable practices, best practices, and culturally relevant assignments. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	June 2032	Professional development is created and delivered annually.

Strategies	Begin Date	End Date	Completion Evidence
Partner with organizations to create and support after-school programs and student organizations that increase diversity, persistence, and leadership by providing after-school opportunities to expose students to computer science in a fun, non-academic-pressure environment. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	2022-2023 School Year	June 2032	The number of after-school programs increases.
Develop a marketing plan, including newsletters to schools and public service announcements, that emphasizes the importance and value of a computer science education. This should bring more awareness to parents and community members and increase support for students to enroll in computer science courses. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District	Current	January 2022	A marketing plan is developed, and marketing efforts and impact are documented in an annual legislative report.
Provide more opportunities for students to be exposed to females and minorities in the field as guest speakers in the classroom and create an online space for teachers to find Mississippi computer science professionals who are willing to speak to K-12 classrooms. **GRADE BAND:** ES, MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	2022	June 2032	An online location is created for teachers to access to identify industry professionals who might address their students.
Educate and train counselors and administrators in the value of computer science education for all students in computer science. Include training on diversity, perception of the field, enrollment goals, industry needs, and prior knowledge requirements needed by students. **GRADE BAND:** HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District, School	2022	June 2032	Training is developed and delivered annually. The numbers trained will be reported in an annual legislative report.
Make online courses available in all districts so that every student has an opportunity to take a high school computer science course. **GRADE BAND:** HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE), District	2022	June 2032	An online computer science institute is created, staffed, and made available to districts.

STRATEGIC GOAL #7

Evaluate and update as needed the existing *2018 Mississippi College- and Career-Readiness Standards for Computer Science* every three years or sooner if needed.

Focus Area: **Standards**

Grade Band Goals	
Elementary School	GOAL 1: Review and update the 2018 MS CCRS for Computer Science every three years (or as needed) beginning in 2022.
Middle School	GOAL 1: Review and update the 2018 MS CCRS for Computer Science every three years (or as needed) beginning in 2022.
High School	GOAL 1: Review and update the 2018 MS CCRS for Computer Science every three years (or as needed) beginning in 2022. GOAL 2: Design curricula for at least two new computer science four-credit pathway programs.

Strategies	Begin Date	End Date	Completion Evidence
The Elementary Computer Science Task Force will meet annually to determine the need for revisions and/or modifications to the standards. GRADE BAND: ES | RESPONSIBILITY LEVEL: State (Elementary Task Force, MDE, CCE)	2022	June 2032	Recommended revisions and updates will be incorporated into an updated standards document every three years.
Establish benchmarks third, fifth, and eighth grades to ensure that all students are exposed to coding and computational thinking based on specific benchmarks. GRADE BAND: ES, MS | RESPONSIBILITY LEVEL: State (Elementary Task Force, Middle School Task Force, MDE, CCE)	2022	2025	Benchmarks are created and documented.
The Middle School Computer Science Education Task Force will meet annually to discuss the need for curricula revisions, including, but not limited to, additions, modifications, and deletions. GRADE BAND: MS | RESPONSIBILITY LEVEL: State (Middle School Task Force, MDE, CCE)	2022	June 2032	Recommended revisions and updates will be incorporated into an updated standards document every three years.
The High School Computer Science Education Task Force will meet annually to discuss the need for revisions, including, but not limited to, additions, modifications, and deletions. GRADE BAND: HS | RESPONSIBILITY LEVEL: State (High School Task Force, MDE, CCE)	2022	June 2032	Recommended revisions and updates will be incorporated into an updated standards document every three years.
Work with local industry partners, community colleges, and universities to determine the priority of new program additions and develop the necessary curricula for identified programs. GRADE BAND: HS | RESPONSIBILITY LEVEL: State (High School Task Force, MDE, CCE)	Current	June 2032	New four-credit pathway program curricula will be established.

STRATEGIC GOAL #8

Build and execute a plan for elementary computer science integration and implementation tracking.

Focus Area: **Curriculum**

Grade Band Goals	
Elementary School	GOAL 1: Create framework documents that outline specific computer science objectives for elementary K-5. GOAL 2: Build a plan for elementary computer science curriculum integration and implementation. GOAL 3: Establish a process to track elementary computer science curriculum integration and implementation.
Middle School	N/A
High School	N/A

Strategies	Begin Date	End Date	Completion Evidence
The Elementary Computer Science Task Force will present framework documents to MDE for approval. GRADE BAND: ES | RESPONSIBILITY LEVEL: State (Elementary Task Force, MDE, CCE)	Jan. 2022	May 2022	Framework document approved by the SBE.
The Elementary Task Force will create an integration guide for classroom teachers that will offer 36-40 lessons for each grade level (K-5). GRADE BAND: ES | RESPONSIBILITY LEVEL: State (Elementary Task Force, MDE, CCE)	Current	April 2022	Integration guide developed and published for each K-5 grade.
Create a course code for all elementary computer science. GRADE BAND: ES | RESPONSIBILITY LEVEL: State (MDE)	Current	May 2022	A course code is created and published.
The Elementary Computer Science Task Force will explore the creation of an evidence-based accountability system. GRADE BAND: ES | RESPONSIBILITY LEVEL: State (Elementary Task Force, MDE, CCE)	Current	May 2023	A tracking model is created and ready for pilot during the 2022-2023 school year.

STRATEGIC GOAL #9

Increase awareness of computer science standards, courses, and workforce opportunities among school districts, parents, and community members.

Focus Area: **Outreach**

Grade Band Goals	
Elementary School	GOAL 1: Increase awareness of the computer science standards, courses, and workforce opportunities among school districts annually.
Middle School	GOAL 2: Increase awareness of the computer science standards, courses, and workforce opportunities among parents and community members annually.
High School	

Strategies	Begin Date	End Date	Completion Evidence
Develop a marketing plan, including newsletters to schools, and public service announcements, that emphasizes the importance and value of a computer science education. This should bring more awareness to parents and community members and increase support for students to enroll in computer science courses. GRADE BAND: ES, MS, HS | RESPONSIBILITY LEVEL: State (MDE, CCE), District	Current	January 2022	A marketing plan is developed, and marketing efforts and impact are documented in an annual legislative report.
Help build a statewide listing of industry partners for districts to access for outreach and funding support. GRADE BAND: ES, MS, HS | RESPONSIBILITY LEVEL: State (MDE, CCE), District	Current	August 2022	An online location is created for districts to access to identify industry partners who might support district computer science programs.
Educate and train counselors and administrators in the value of computer science education for all students. Include training on diversity, perception of the field, enrollment goals, industry needs, and prior knowledge requirements needed by students. GRADE BAND: HS | RESPONSIBILITY LEVEL: State (MDE, CCE), District, School	2022	June 2032	Training is developed and delivered annually. The numbers trained will be reported in an annual legislative report.
Educate administrators on the accountability benefits of AP and DC computer science courses. GRADE BAND: HS | RESPONSIBILITY LEVEL: State (MDE, CCE)	2022	June 2032	Awareness training is developed and delivered to administrators. Training will be documented in an annual legislative report.

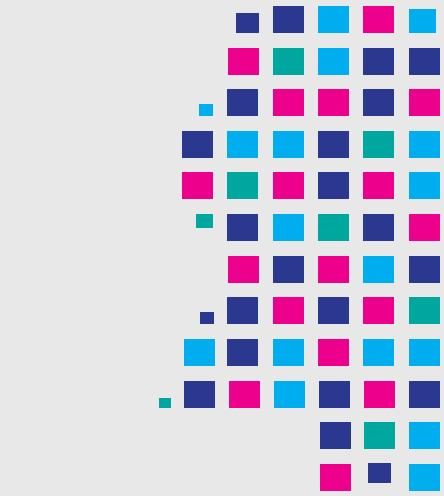
STRATEGIC GOAL #10

Establish a model for an online computer science institute that offers professional development opportunities for existing teachers and provides high-quality computer science courses at the middle and high school levels, utilizing exemplary Mississippi teachers.

Focus Area: **Curriculum/Funding**

Grade Band Goals	
Elementary School	N/A
Middle School	**GOAL 1:** Develop a model for high-quality online computer science instruction through a computer science online institute.
High School	**GOAL 1:** Develop a model for high-quality online computer science instruction through a computer science online institute.

Strategies	Begin Date	End Date	Completion Evidence
The CCE will work with MDE to establish an online computer science institute that will allow existing, qualified Mississippi computer science teachers to stream middle and high school-level courses. **GRADE BAND:** MS, HS | **RESPONSIBILITY LEVEL:** State (MDE, CCE)	Current	August 2023	An online computer science institute is created, staffed, and made available to districts.
The Computer Science Strategic Planning Team will collaborate with MDE and IHL to identify approved computer science courses that may fulfill at least four units of academic credit for high school graduation. **GRADE BAND:** HS | **RESPONSIBILITY LEVEL:** State (IHL, MDE, CCE, Strategic Planning Team)	Current	January 2023	Computer science courses identified in an approved courses manual that may fulfill at least four units of academic credit.



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