

CS for
OK

**STRATEGIC
PLAN**

AUGUST 2020

CSFOROK STRATEGIC PLAN

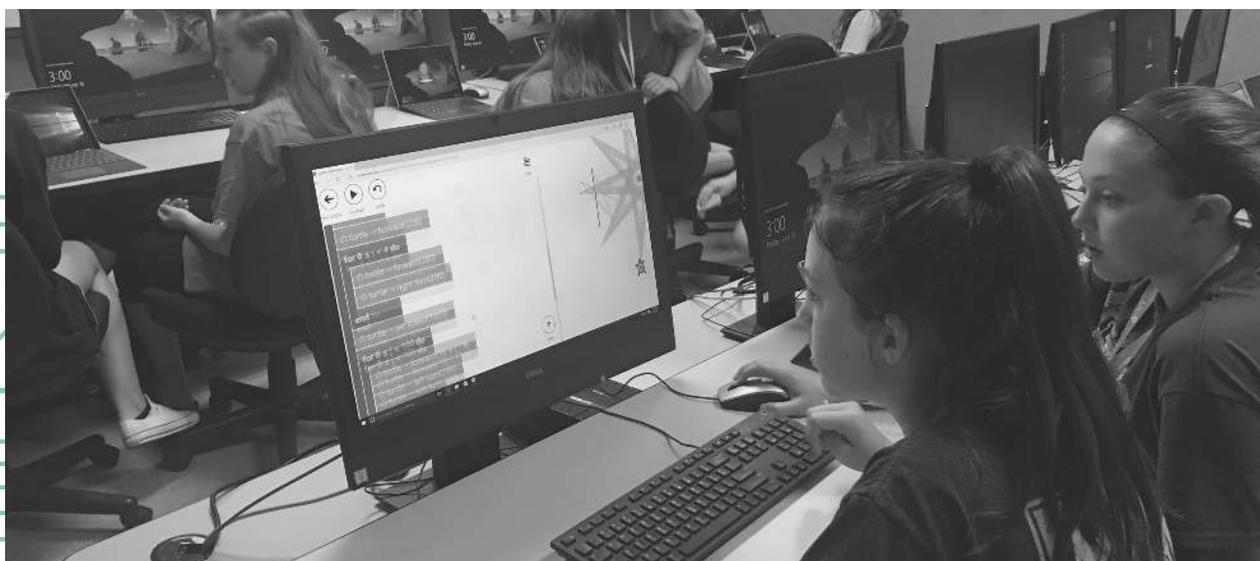
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EXECUTIVE SUMMARY

Computer science (CS) is a driving force behind every innovation in today's society and a pathway for students of every background and region to access rewarding careers. According to Code.org (1), the number one source of all new wages in the United States is computing jobs, and the Oklahoma Talent Pipeline 2019 (2) report shows the growing need for computer science jobs across the state. If we want to attract diverse industry to our state and for our students to be successful, productive, informed citizens who are able to access these high-impact careers, we can no longer relegate computer science to an elective subject intended for only a select few. The Oklahoma State Department of Education recently made a step in the right direction by adopting state computer science standards. However the majority of schools provide few, if any, formal computer science courses and minority and female students make up a very small percentage of those students who are enrolled in CS courses. Together we can do better. We must equip all Oklahoma students with the computer science knowledge and computational thinking skills to become leaders and innovative problem solvers. We recognize that a lack of resources such as time, materials, and teachers is a major barrier to implementing high quality computer science education. By investing in professional development for teachers, cultivating community support and awareness, and supporting districts and schools with tools to prioritize K-12 computer science, we can develop a highly educated, skillful, creative and innovative workforce ready to solve the problems of today and tomorrow.



CSforOK was developed to promote and develop computer science education by connecting K-12 education, higher education, informal education, industry, non-profit, government, and philanthropic organizations. Together we aim to provide all Oklahoma students with age-appropriate computer science experiences and access to knowledgeable and enthusiastic support to develop a more robust Oklahoma STEM workforce. To this end, the following goals have been established: Ensure teachers and informal educators are supported with the necessary training and resources to effectively lead computer science learning experiences. Grow Oklahoma's CS ecosystem through direct CS programs and events, empowering families to facilitate CS learning, and broadening the understanding of the importance of computer science in communities across the state. Support districts and schools with prioritizing K-12 computer science, setting goals, identifying strategies, and accessing aligned resources to support implementation. These goals target areas deemed critical to supporting and sustaining implementation of equitable, robust computer science programs. They were developed by a team brought together by the CSforALL Ecosystems initiative and include members from non-profit organizations, K-12 and higher education, philanthropic and government agencies.



CSFOROK MISSION AND VISION

MISSION STATEMENT

CSforOK is dedicated to providing equitable access to high-quality computer science learning experiences for all students in Oklahoma through collaboration, communication, and cultivation.

VISION STATEMENT

All students in Oklahoma will be equipped with the computer science knowledge and computational thinking skills needed to become leaders and innovative problem solvers with the ability to access high impact careers.



Computer science empowers students to create the world of tomorrow.
-Satya Nadella, CEO of Microsoft



INTRODUCTION

Why Computer Science?

Computer science is recognized across the globe as a necessary skill for the 21st century. If we want to be innovative and creative problem solvers, we must be able to understand and harness the power of computing. Students must understand the science behind computing and become creators rather than just consumers of technology. According to Code.org there are currently over 600,000 open computing jobs nationwide, and computing occupations are the number one source of all new wages in the U.S. 67% of all new jobs in STEM are in computing, but despite the demand, only 11% of STEM bachelor's degrees are in computer science. (3) Although a computer science major can earn 40% more than the college average, the benefits of computational literacy are not exclusively limited to earning potential. (1) Ensuring all students have access to high-quality computer science experiences not only closes the employment gap, but also increases the innovation capacity of our workforce and improves the strength of technology-based solutions that affect all sectors. "Technology is the backbone of commerce, health services, manufacturing, finance and other major industries" (4) and, because many computer science jobs can be performed from anywhere, it provides career opportunities to students in every area of the state.



67%
OF ALL NEW
STEM JOBS
ARE IN
COMPUTING



What is Computer Science?

Many people mistakenly believe that computer science is learning to type or using productivity software such as creating slideshow presentations or spreadsheets, and many parents believe their students understand computer science because they can use a computer or other technical device. Computer science is much deeper than that. Computer science is the study of computers and algorithmic processes and includes the study of computing principles and theories, computational thinking, computer hardware, software design, coding, analytics, and computer applications. Computer science often includes computer programming or coding as a tool to create software, including applications, games, websites, and tools to manage or manipulate data; or development and management of computer hardware and other electronics related to sharing, securing, and using digital information. In addition to coding, the expanding field of computer science emphasizes computational thinking and interdisciplinary problem-solving to equip students with the skills and abilities necessary to apply computation in our digital world. (5)

"Whether you're trying to make a lot of money or whether you just want to change the world, computer programming is an incredibly empowering skill to learn."

-HADI PARTOVI, TECH ENTREPRENEUR AND FOUNDER OF CODE.ORG



Equity

Underrepresented students face both structural and social barriers in access and exposure to computer science that create disparities in opportunities to learn. (6) Our mission is to provide **all** students in Oklahoma access to high-quality computer science learning experiences. To achieve this will require engaging members of every community, focusing practices on curriculum and classroom cultures that support all students regardless of their race, gender, disability, socioeconomic status, or sexual orientation. Failure to provide access to all students widens the diversity gap and “means that the field may not be generating the technological innovations that align with the needs of society’s demographics.” (6)

To make broad participation in computer science a reality, we will need to equip a diverse range of educators with the competence and confidence to facilitate computational learning. By ensuring that teachers and informal educators are supported with the necessary training and resources to effectively lead computer science learning experiences for all students, we will create a more diverse teacher population who can better serve the needs of all students.

The Google Gallup report, *Diversity Gaps in Computer Science*, detailed barriers that lead to the under-representation of female students, black students, and Hispanic students in computer science. Specifically, the report found that:

- Black students are less likely to have access to computer science in school. Female students are less likely to be aware of computer science learning opportunities.
- Male students are more likely than female students to have learned computer science.
- Hispanic students are less likely to know an adult in a computer science field.
- Black and Hispanic students are less likely to have access to a home computer.
- Male students are more likely than females to have been told by a teacher or parent that they would be good at CS.
- Students who don’t see people like themselves “doing CS” in the media are less interested in learning CS. (6)

Clearly there is work to be done to close the equity gap. CSforOK is committed to improving equitable outcomes by providing professional development for teachers, engaging the community and increasing awareness for CS, providing opportunities for students, and supporting school districts.

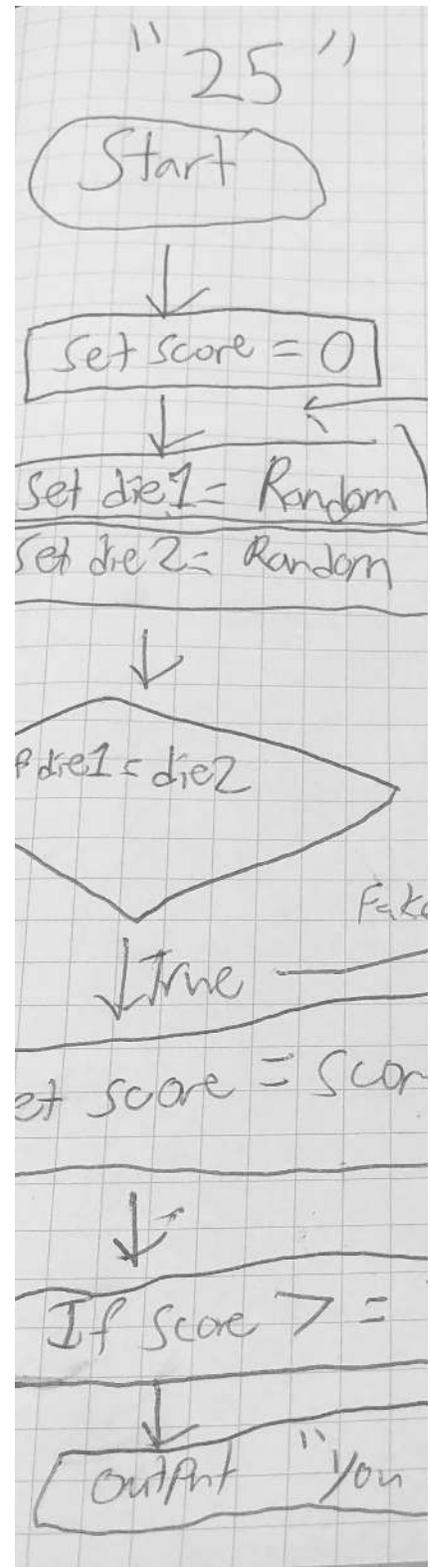
LANDSCAPE ANALYSIS

We have laid a strong foundation with rigorous academic standards that promote opportunities for students to learn to apply computer science concepts across the curriculum. We must build on that momentum. Oklahoma needs to strengthen access to technology and professional development opportunities if we are to ensure that all students are exposed early to the job skills demanded of a 21st-century workforce. (7)

-Joy Hofmeister, Oklahoma State Superintendent of Public Education

The study of computer science in Oklahoma is currently undergoing a transformation. With a more focused effort to increase access to computer science, recent changes have included the creation and approval of K-12 grade-level computer science standards. In the summer of 2019, the state hired a Director of Education Technology and Computer Science who is able to provide a focused concentration on the expansion of computer science in schools. Additionally, an Oklahoma chapter of the Computer Science Teachers Association was formed in 2019 which provides opportunities for teachers to network with and learn from one another.

Oklahoma recently adopted computer science standards but, because they are not mandated, the majority of schools provide very few, if any, formal computer



science courses. According to Code.org statistics, only 29% of all public high schools in the entire state of Oklahoma teach a foundational computer science course. In 2019, only 627 students in the state took AP Computer Science exams. Of those taken, only 26% were female, and less than 20% were taken by non-white students. (3)

Oklahoma state policy is inconsistent and does not uniformly and adequately support sustained CS implementation and expansion. Oklahoma is not only lower than the national average in per pupil spending (8), but also the lowest in the region falling behind Colorado, Kansas, Missouri, Arkansas, Texas, and New Mexico. (9) This correlates to the lack of resources and teachers available for computer science instruction. Additionally, Oklahoma is one of 30 states that does not have dedicated state funding for CS PD, which contributes to the ongoing condition of students being underserved in computer science. According to a recent survey by Google/Gallup, 67% of Oklahoma principals believe CS is just as or more important than required core classes and one of the biggest barriers to offering computer science is the lack of funds for hiring and training teachers. (3) And, although it is a goal of the state to ensure every student has access to computer science courses and the state is working to expand CS classes, there is no formal, approved curriculum available or required statewide. Given the limited access to computer science coursework in high school, the state of Oklahoma produces few college graduates with bachelor's degrees. According to Code.org, only 562 bachelor's degrees in computer science were awarded to students across all colleges and universities in the state. Just 15% of those degrees were earned by women. The supply of computer science graduates is not meeting demand as there are 2,391 current job openings in computing. (3)

Although it's clear that Oklahoma is not where it needs to be, there are bright spots on the horizon. In addition to creating state CS standards, hiring a state Director of Computer Science, and forming an Oklahoma chapter of the Computer Science Teachers Association, there is great interest in promoting CS initiatives from non-profit and philanthropic organizations. Although participation in Oklahoma is low overall, enrollment in Code.org's CS Principles course has more than doubled since 2017, and AP Computer Science participation is on the rise, with an increase in female and minority students, and higher pass rates. Additionally, Code.org research shows that students who take AP Computer Science in high school are more likely to pursue CS in college. (10) CSforOK seeks to build on the national and state momentum in the computer science movement to create more opportunities for teachers and students.

GOALS AND STRATEGIES

The CSforOK team has set three goals to guide its work moving forward. Each of these goals has been developed with the belief that by supporting the systems which surround students, including teachers, schools and communities, we will be able to significantly increase student engagement in age-appropriate computer science experiences with access to knowledgeable and enthusiastic support.

1. PROFESSIONAL DEVELOPMENT AND EDUCATOR SUPPORT

2. COMMUNITY SUPPORT AND AWARENESS

3. SCHOOL DISTRICT SUPPORT

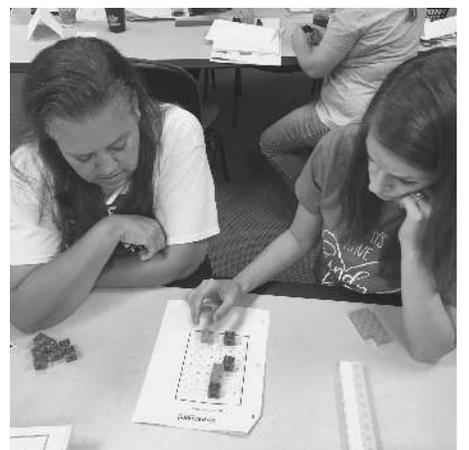


GOAL 1: PROFESSIONAL DEVELOPMENT AND EDUCATOR SUPPORT

Ensure teachers and informal educators are supported with the necessary training and resources to effectively lead computer science learning experiences.

Strategies to accomplish goal:

- Work collaboratively with partners to offer a variety of professional development experiences which engage, equip, and empower teachers to teach computer science in the K-12 environment.
- Work to increase the number of teachers certified to teach computer science by creating a pathway to certification for high school teachers and a badging process for elementary and middle school teachers.
- Create an annual convening of computer science teachers to network and learn from one another as well as industry professionals.



GOAL 2: COMMUNITY SUPPORT AND AWARENESS

Grow Oklahoma's computer science ecosystem through direct CS programs and events, empowering families to facilitate CS learning, and broadening understanding of the importance of computer science in communities across the state.

Strategies to accomplish goal:

- Work collaboratively with partners to offer events for communities, families, and schools.
- Create information for parents to better understand CS opportunities and ways to support student learning.
- Create and disseminate materials for families to facilitate CS learning at home.
- Develop mentorship programs and incorporate computer science into summer camps and afterschool clubs.

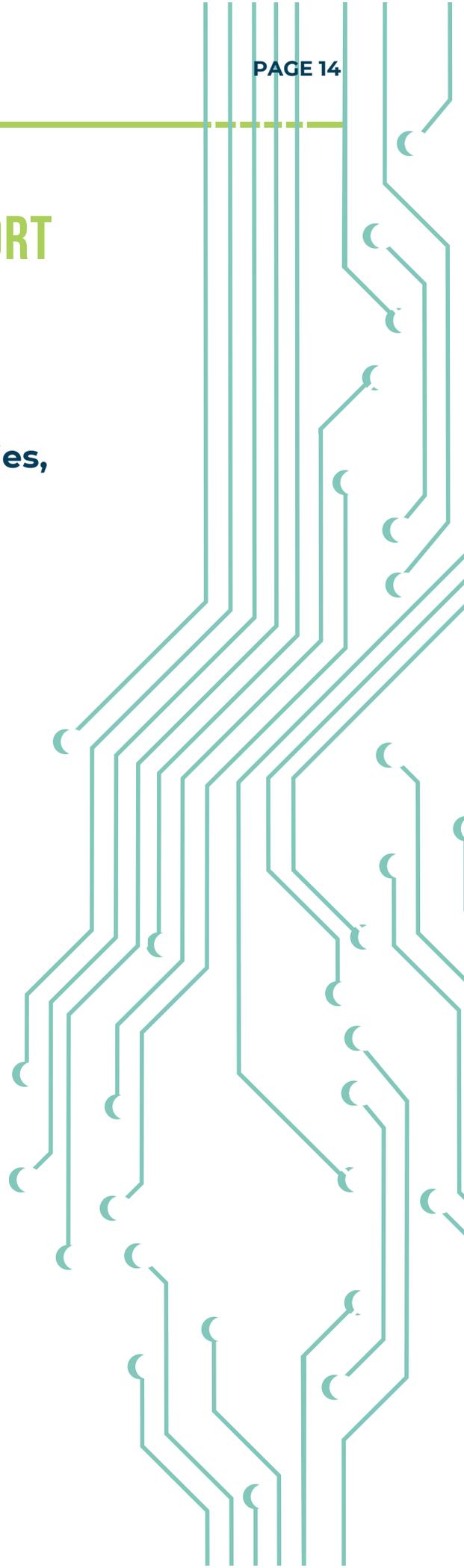


GOAL 3: SCHOOL DISTRICT SUPPORT

Support districts and schools with prioritizing K-12 computer science, setting goals and identifying strategies, and accessing aligned resources to support implementation.

Strategies to accomplish goal:

- Provide districts with a strategic planning tool to aid them in identifying goals and creating a strategy to provide CS for all students in their district.
- Identify and train strategically located facilitators across the state so they can support their local school districts in developing CS goals and strategies.
- Advocate for standards-aligned comprehensive CS curriculum.
- Provide teachers with tools to integrate CS into the regular curriculum.
- Develop and promote a resource bank which includes curriculum, CS professionals, and other CS learning opportunities.



IMPLEMENTATION PLAN

CSforOK will work with partners including K-12, higher education, industry leaders, non-profit organizations, philanthropic organizations, and government agencies to implement programming to meet the needs of stakeholders.

At a minimum, progress towards goals and milestones will be analyzed annually and revised and updated as needed with the following checkpoints:

GOAL 1: PROFESSIONAL DEVELOPMENT AND EDUCATOR SUPPORT:

Offer a variety of engage, equip, and empower levels of professional development to at least 300 educators (December 2021).

Timeline:

- 3 months - analyze needs/resources
- 6 months - identify partners and programs
- 9 months - summer offerings in place
- 12 months - execution and refinement

Responsible Organizations:

- Tulsa Regional STEM Alliance
- Oklahoma Public School Resource Center

Key Performance Metrics:

- Number of formal and informal educators participating in professional development
 - Percentage of educator participants who report an increase in their confidence in teaching computer science
 - Percentage of educator participants who are committed to teaching computer science during the subsequent year
-



GOAL 2: COMMUNITY SUPPORT AND AWARENESS

Design and execute 3 events for schools, families, and other community partners (December 2021).

Timeline:

- 3 months - analyze needs/resources
- 6 months - identify partners and programs
- 9 months - summer offerings in place
- 12 months - execution and refinement

Responsible Organizations:

- Tulsa Regional STEM Alliance
- Oklahoma Public School Resource Center
- Tulsa Public Schools
- CSTA-OK
- University of Tulsa

Key Performance Metrics:

- Number of events successfully executed
- Number of participants at each event
- Percentage of participants who report increased awareness of CS resources and confidence in facilitating CS learning

GOAL 3: SCHOOL DISTRICT SUPPORT

Provide a strategic planning workshop for districts.

Timeline:

- Set a date for workshop and identify local facilitators for specialized training (January 2021)
- Host a district strategic planning workshop (June 2021)

Responsible Organizations:

- CSforALL
- Tulsa Regional STEM Alliance
- Oklahoma Public School Resource Center
- Oklahoma State Department of Education

Key Performance Metrics:

- Number of districts participating in the workshop
- Number of district teams that set CS implementation goals during the workshop
- Number of facilitators trained to independently lead strategic planning workshops

Create, promote, and increase usage of a hub for Oklahoma Academic Standards for Computer Science aligned resources.

Timeline:

- By early summer 2021, share the resource hub with teachers who can begin implementation in SY 2021-2022.

Responsible Organizations:

- Oklahoma State Department of Education
- Tulsa Regional STEM Alliance
- Oklahoma Public School Resource Center

Key Performance Metrics:

- Number of high-quality, OAS-CS aligned computer science learning resources available through the hub
- Number of teachers utilizing the resource hub to implement computer science during the 2021-2022 school year

OUTCOMES MEASUREMENT

CSforOK will measure success by monitoring the following outcomes on an annual basis:

1. Increasing statewide enrollment in K-12 computer science courses. In particular, increasing enrollment among female students, Black students, and Latinx students.
2. Increasing statewide enrollment in AP Computer Science. In particular, increasing enrollment among female students, Black students, and Latinx students.
3. Increasing the number of teachers who are certified to teach K-12 computer science.
4. Increasing the number of districts that have adopted and begun implementation of a K-12 computer science strategic plan.
5. Increasing the number of facilitators who are trained to lead computer science strategic planning workshops.
6. Increasing the number of schools that have adopted high-quality OAS-CS aligned curriculum. Increasing the number of educators that have participated in computer science professional development.



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CSFOROK PARTNERS

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**BISHOP KELLEY SCHOOLS • BROKEN ARROW PUBLIC SCHOOLS •
CENTRAL OKLAHOMA STEM ALLIANCE • CHARLES AND LYNN
SCHUSTERMAN FAMILY FOUNDATION • COMPUTER SCIENCE
TEACHERS ASSOCIATION - OKLAHOMA CHAPTER • CSFORALL •
EDMOND PUBLIC SCHOOLS • HOLLAND HALL SCHOOLS • LEGO
EDUCATION • OKLAHOMA ENGINEERING FOUNDATION •
OKLAHOMA PUBLIC SCHOOL RESOURCE CENTER • OKLAHOMA
STATE DEPARTMENT OF EDUCATION • OKLAHOMA STATE
UNIVERSITY • SAMUELI FOUNDATION • SAND SPRINGS PUBLIC
SCHOOLS • TRUE DIGITAL SECURITY • TULSA HONOR ACADEMY •
TULSA PUBLIC SCHOOLS • TULSA REGIONAL STEM ALLIANCE •
UNIVERSITY OF TULSA**



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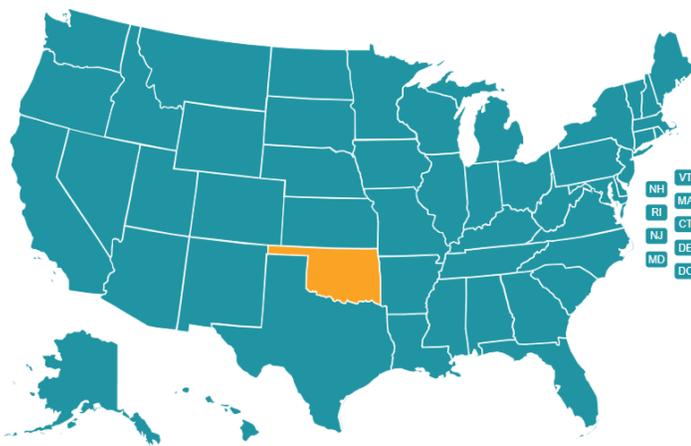


APPENDIX



Advanced Placement Computer Science Across Oklahoma

Schools currently offering the Advanced Placement (AP) Computer Science courses: Blue markers denote schools offering AP Computer Science A. Purple markers denote schools offering AP Computer Science Principles. Retrieved from <https://sde.ok.gov/computer-science> August 21, 2020.



Oklahoma

2,391

Open computing jobs
(2.5x the state average demand rate)

562

Computer science graduates

Policy Environment (**rubric**):

- ✘ **No dedicated state funding for CS PD**
- ✔ **Working towards all high schools to offer CS**
- ✔ **K-12 CS curriculum standards**

▼ AP Stats

- 20% of schools teach AP CS
- 627 AP CS exams were taken last year
 - 26% of them were female
 - 121 were underrepresented minorities

Oklahoma CS Statistics at a Glance Retrieved from <https://code.org/promote/ok> August 21, 2020.

