

## The K-12 to Post-Secondary STEM and Computer Science Continuum: Ensuring a Highly Skilled Future Workforce



Tina D. Moore, Ed.D.


Director of STEM/Computer Science Continuum  
Arkansas Department of Education

# Federal STEM Goals

- Build Strong Foundations for STEM Literacy
- Increase Diversity, Equity, and Inclusion in STEM
- Prepare the STEM Workforce for the Future

Committee on STEM Education. National Science and Technology Council. (2018).  
*Charting a Course for Success: America's Strategy for STEM Education.*

**What are considered  
STEM careers?**



# The STEM Labor Force of Today: Scientists, Engineers, and Skilled Technical Workers

National Science Board, National Science Foundation. 2021.  
The STEM Labor Force of Today: Scientists, Engineers and Skilled  
Technical Workers. *Science and Engineering Indicators 2022*.  
NSB-2021-2. Alexandria, VA. Available at  
<https://nces.nsf.gov/pubs/nsb20212>.

# Traditional Definition: STEM Workforce

“

...individuals with at least a bachelor's degree working in S&E occupations.

S&E occupations encompass five major categories:

(1) computer and mathematics scientists; (2) biological, agricultural, and environmental life scientists; (3) physical scientists; (4) social scientists, and (5) engineers.

Analyses of workers who also utilize science and technological expertise may include those employed in S&E-related occupations, including doctors, nurses, engineering managers, computer programmers, and biological technologists.

# New Expanded Definition: STEM Workforce



...the increasing prevalence of advanced technologies in the workplace has raised the importance of understanding workers in occupations that also require significant STEM expertise but do not require a bachelor's degree.

# New Expanded Definition: STEM Workforce



These...*middle-skill occupations...in STEM*, are critical in adapting and maintaining new processes and technologies that are integral to the U.S. S&E enterprise. The expanded definition of the U.S. STEM workforce...recognizes the increasing use of these skills across a broad range of STEM occupational groups—S&E, S&E-related, and middle-skill occupations—by workers at all education levels.





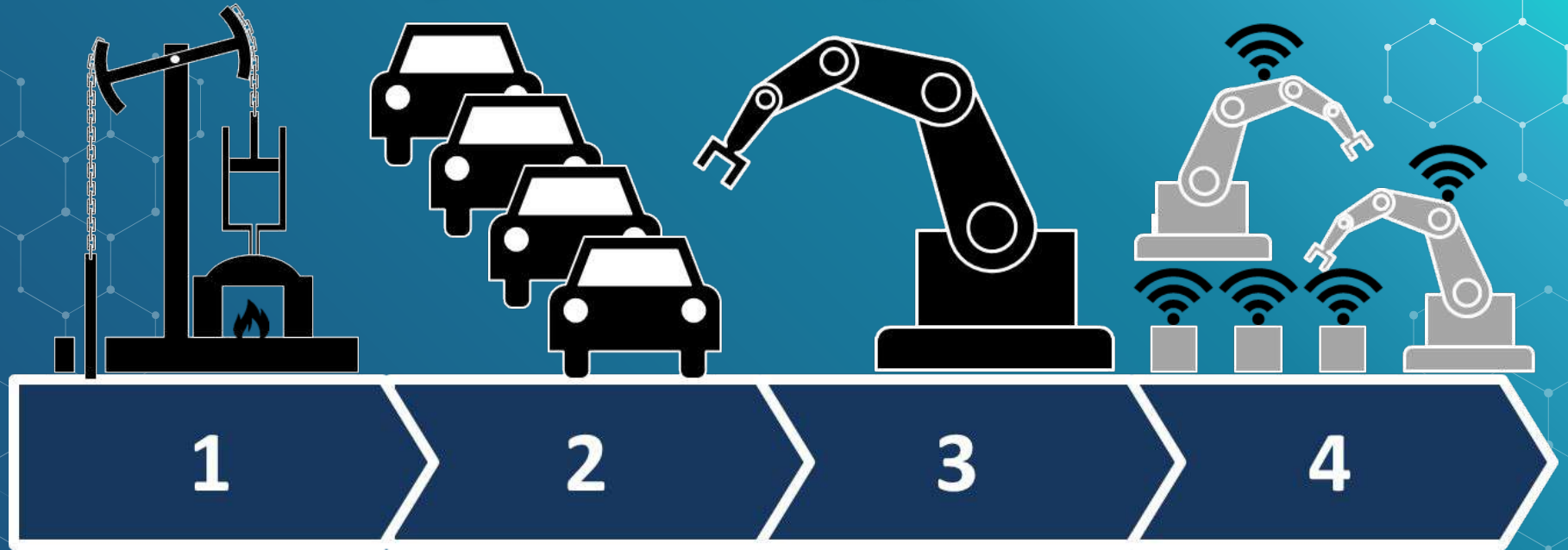
# K-12 >>> workforce pathways

- ◇ HS Coursework
- ◇ Apprenticeships
- ◇ Training Programs
- ◇ Certificate Programs
- ◇ Associate Degrees
- ◇ Bachelor Degrees
- ◇ Graduate Degrees





# Industry 4.0 Technology Transformation



- ◆ Mechanization
- ◆ Water power
- ◆ Steam power

- ◆ Mass production
- ◆ Assembly line
- ◆ Electricity

- ◆ Computers
- ◆ Automation
- ◆ Robotics

- ◆ Cyber-Physical systems
- ◆ Big Data and ML
- ◆ Advanced automation

# 667,600

NEW COMPUTER & IT JOBS PROJECTED BY 2030



# \$91,250

Median annual wage for computer and IT jobs in May 2020 compared to \$41,950 for all jobs.

<https://www.bls.gov/ooh/computer-and-information-technology/home.htm>



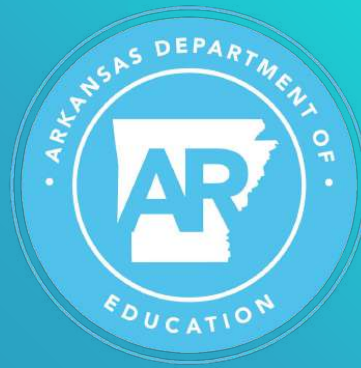
The future of Arkansas' economic development is tied to our ability to succeed in data analytics and computing.

Mike Preston, Secretary of Commerce,  
Executive Director of the Arkansas Economic Development  
Commission, and Co-chair of the Blue-Ribbon Commission

Blue Ribbon Commission. (December 2017). *Recommendations on Advancing the Economic Competitiveness of Data Analytics and Computing in Arkansas*, Executive Summary, p. 4.



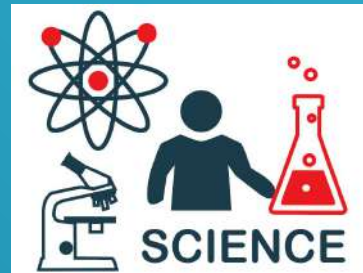
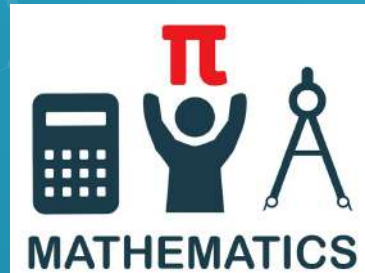
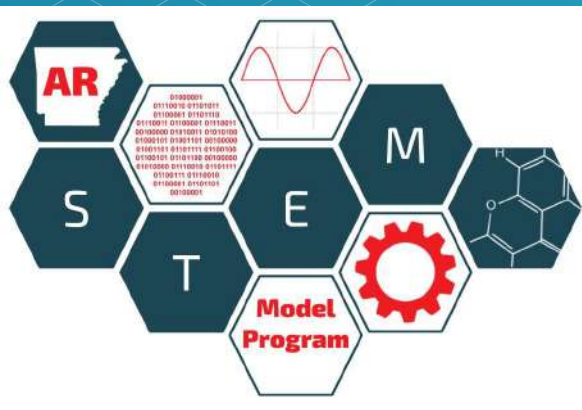




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ARKANSAS DIVISION OF  
HIGHER EDUCATION



DIVISION OF ELEMENTARY  
& SECONDARY EDUCATION



# 4 C's of the 21st Century

## COMMUNICATION

Sharing thoughts,  
ideas, and questions

## COLLABORATION

Working together to  
reach a common goal

Looking at problems  
in a new way

## CRITICAL THINKING

Trying new approaches  
to solve problems

## CREATIVITY



## Computer Science & Computing Practices

- Communication
  - Collaboration
  - Storytelling
- Professionalism
  - Ethics and Impact
  - Inclusion
  - Learning by Failure
  - Perseverance
- Understanding
  - Patterns
  - Problem Solving
  - Research
  - Tools

## Standards for Mathematical Practice

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

## Science & Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

# STEM Practices

# ADE DESE High School Computer Science Standards & Courses

\* Artificial Intelligence & Machine Learning

\* Computer Engineering

\* Cybersecurity      \* Data Science

\* Game Development and Design

\* Mobile Application Development

\* Networking

\* Programming

\* Robotics

# Artificial Intelligence and Machine Learning Industry Recognized Certifications

1. PCAP-Certified Associate in Python Programming
2. CLA-C Programming Language Certified Associate
3. CPA-C++ Certified Associate Programmer
4. Java SE 8 Programmer Certification
5. CJSD-Certified JavaScript Developer
6. CompTIA A+
7. CompTIA Network+
8. CompTIA Security+
9. TensorFlow
10. AWS Certified Machine Learning



## Act 757 of 2021

### Licensed Practical Nurse Pathway Pilot

- East Ark Secondary Career Center
- UACC-Batesville Secondary Career Center
- SouthArk Secondary Technical Center

# Postsecondary STEM/CS Opportunities

- ◇ Provide high school students opportunities for concurrent credit and credentials in STEM/CS
- ◇ Build the STEM/CS educator pipeline
- ◇ Include a Data Science or Computing option in state general education core
- ◇ Engage in postsecondary consortia and collaboration for STEM/CS





# Arkansas Data Science and Computing Ecosystem

is a statewide community of practice from education, government, business, industry, and nonprofits committed to data science and computing economic growth and workforce development through data-informed education and training pathways for Arkansans.



# Postsecondary “CS” Credentials Offered and Awarded in AR since 2015

CIP code = 11 and CIP detail in 0101, 0102, 0103, 0104, 0105, 0199, 0201, 0202, 0203, 0204, 0205, 0299, 0301, 0401, 0501, 0601, 0602, 0699, 0701, 0801, 0802, 0803, 0804, 0899, 0901, 0902, 0999, 1001, 1002, 1003, 1004, 1005, 1006, 1099, 9999

CIP code = 14 and CIP detail in 0901, 0902, 0903, 0999, 1004, 4201, 4701

CIP code = 15 and CIP detail in 0305, 0404, 0405, 0406, 0407, 1201, 1202, 1203, 1204, 1299

CIP code = 26 and CIP detail in 1103, 1104

CIP code = 29 and CIP detail in 0207, 0307, 0406

CIP code = 30 and CIP detail in 0801, 1601, 3001, 4801, 5202, 7001, 7099, 7101, 7102, 7103, 7104, 7199

CIP code = 36 and CIP detail in 0113

CIP code = 43 and CIP detail in 0116

CIP code = 47 and CIP detail in 0104

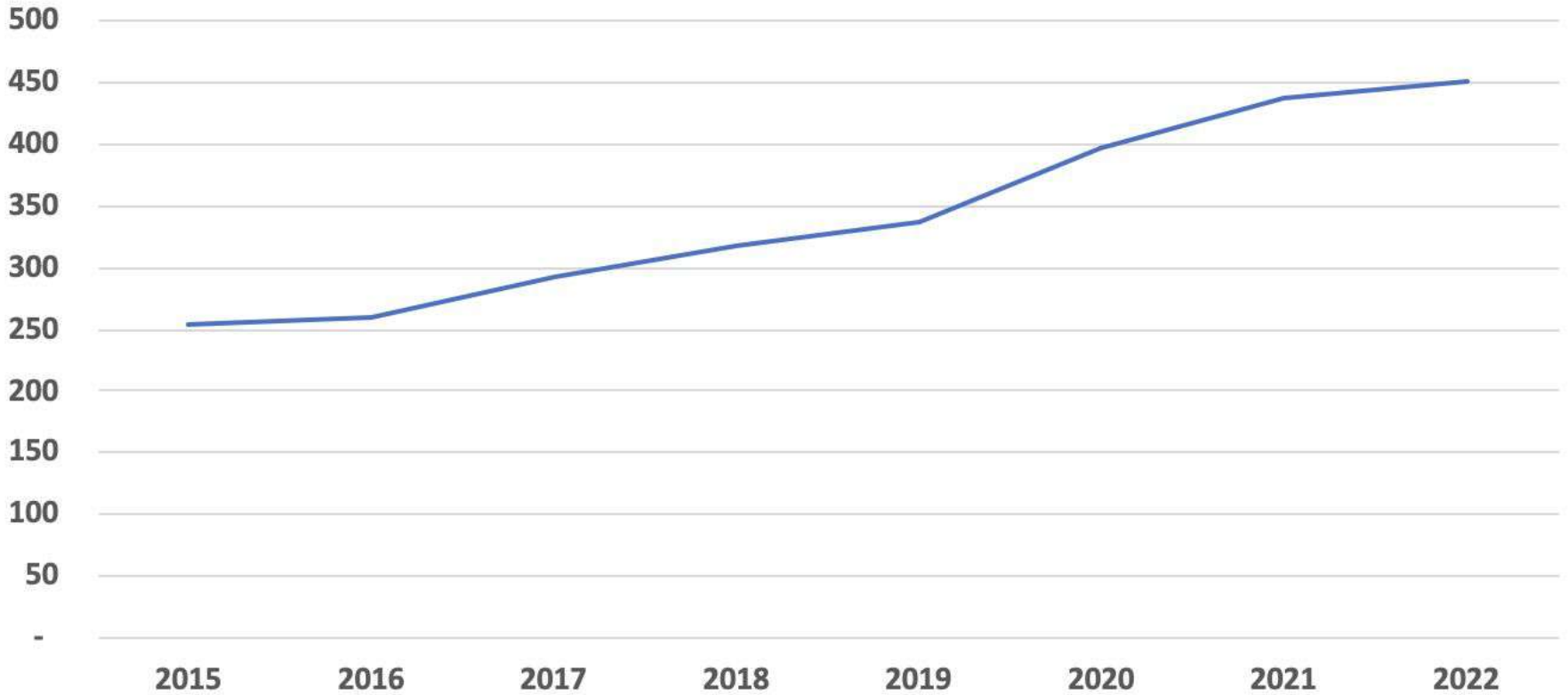
CIP code = 50 and CIP detail in 0411

CIP code = 51 and CIP detail in 2706

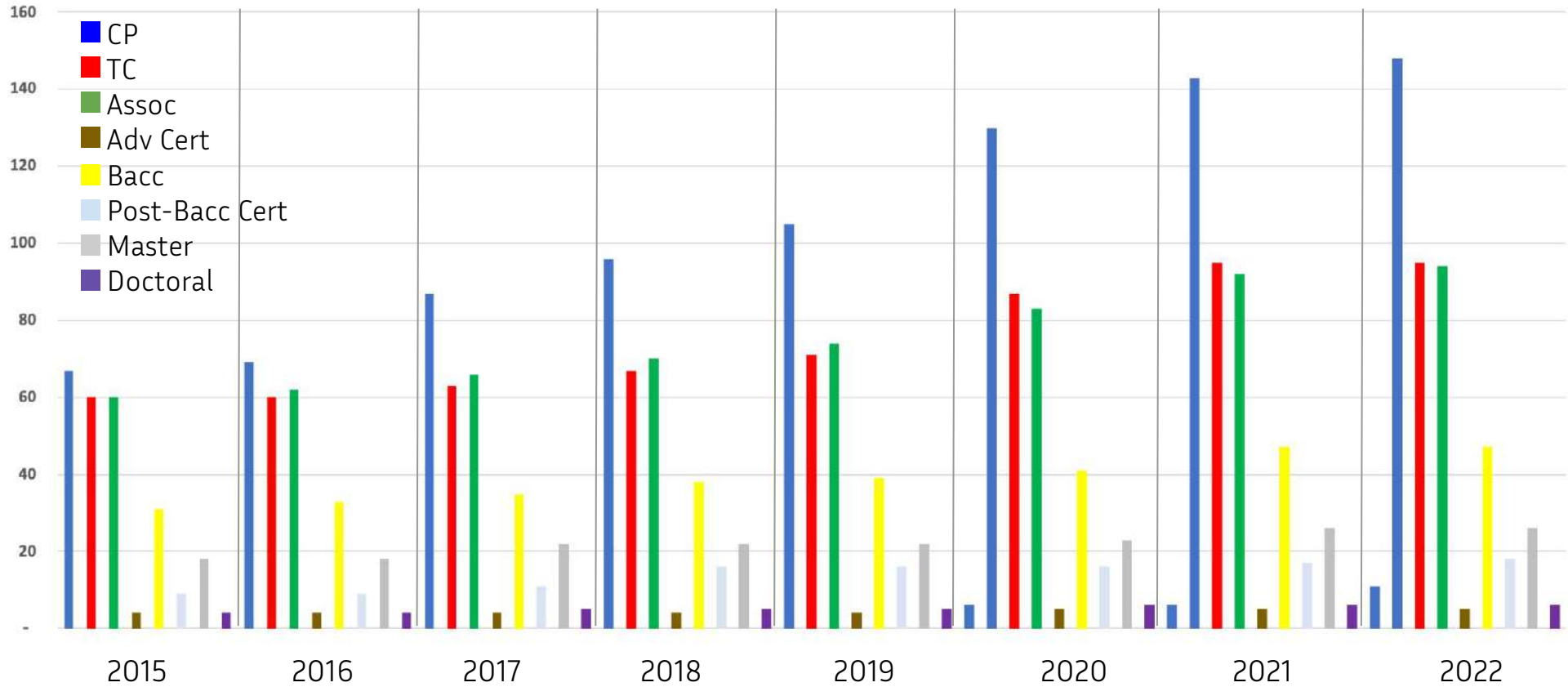
CIP code = 52 and CIP detail in 1201, 1206, 1207, 1299, 1301



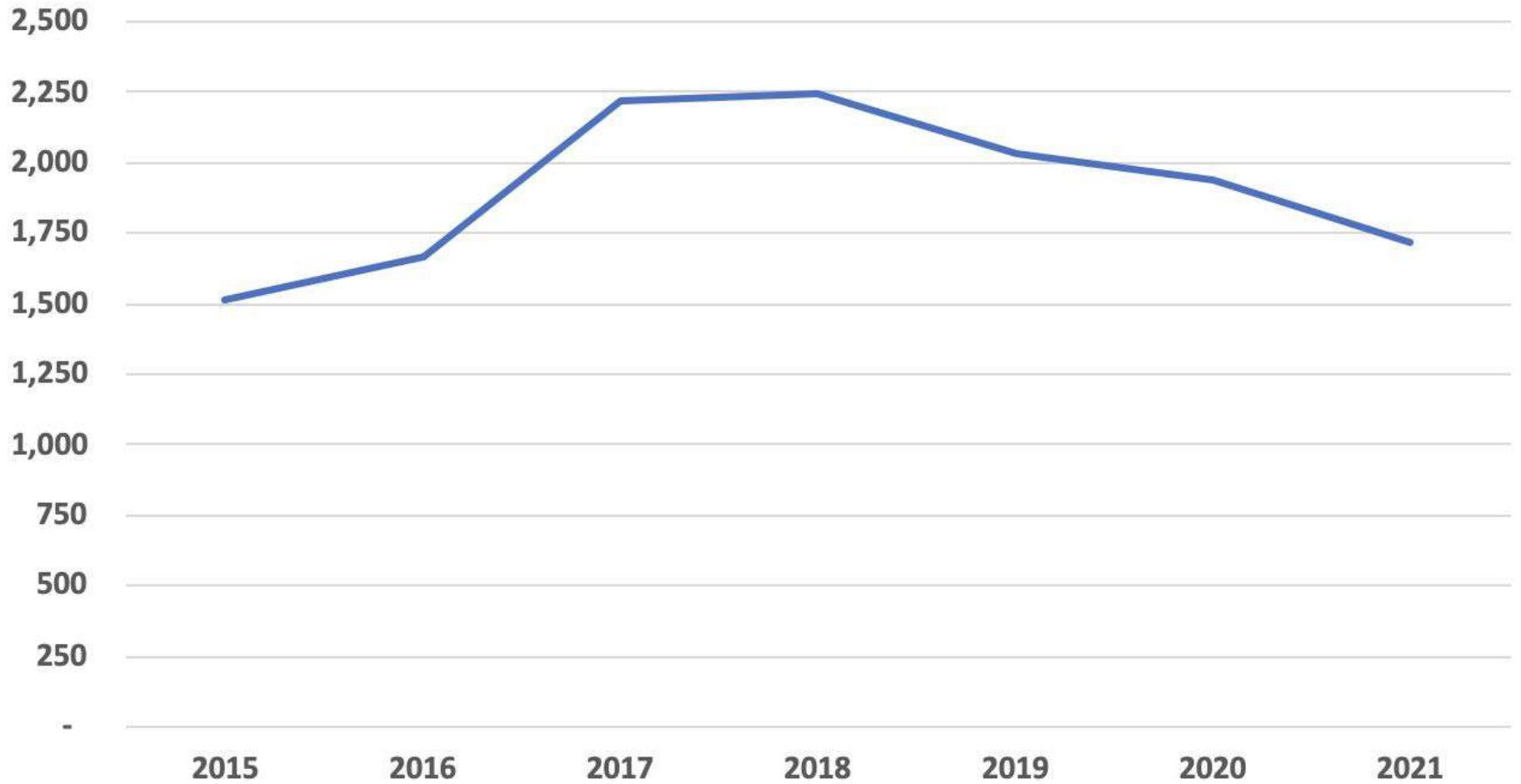
## Annual "CS" Credentials Offered



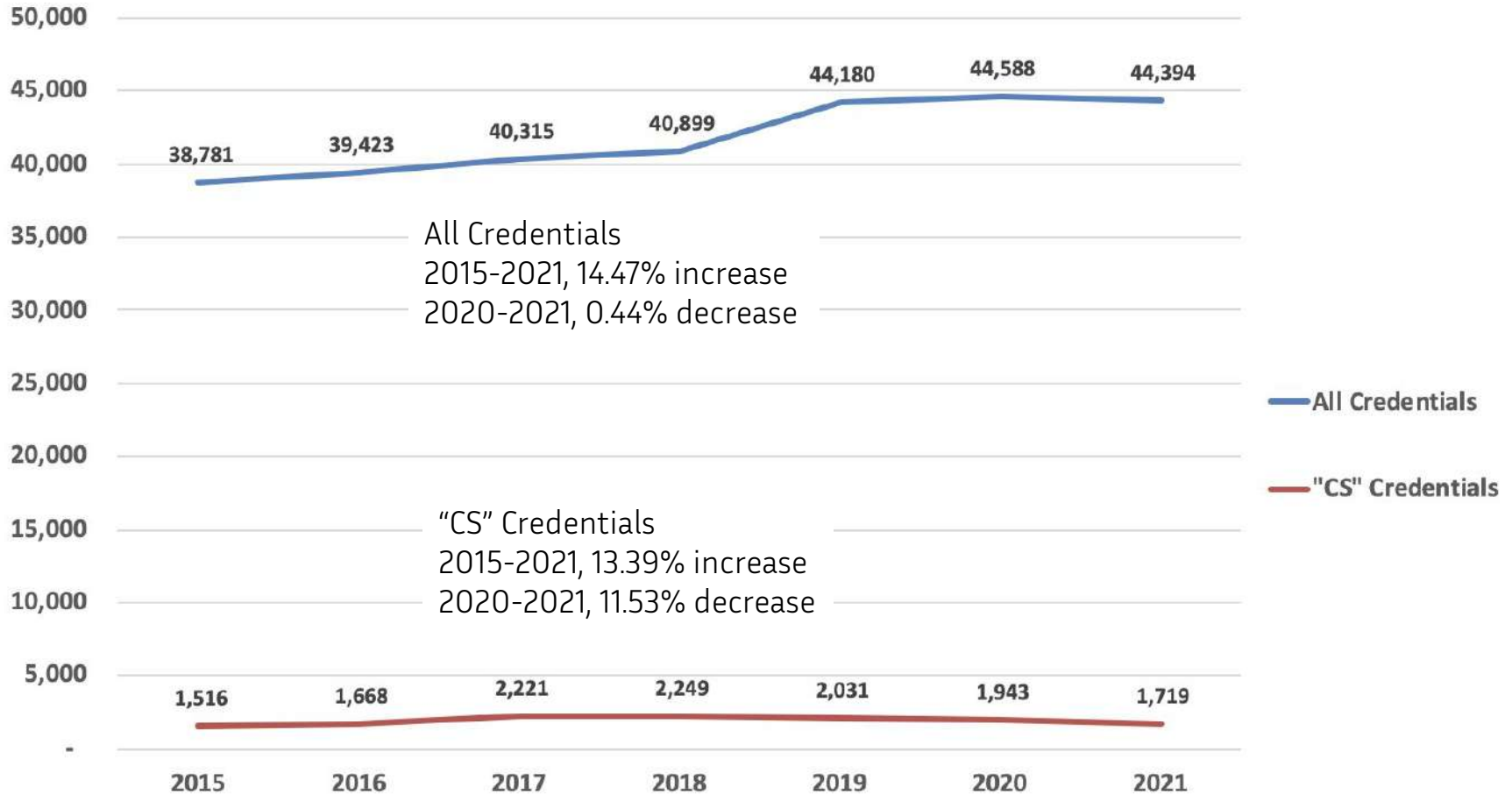
Disaggregated Annual "CS" Credentials Offered



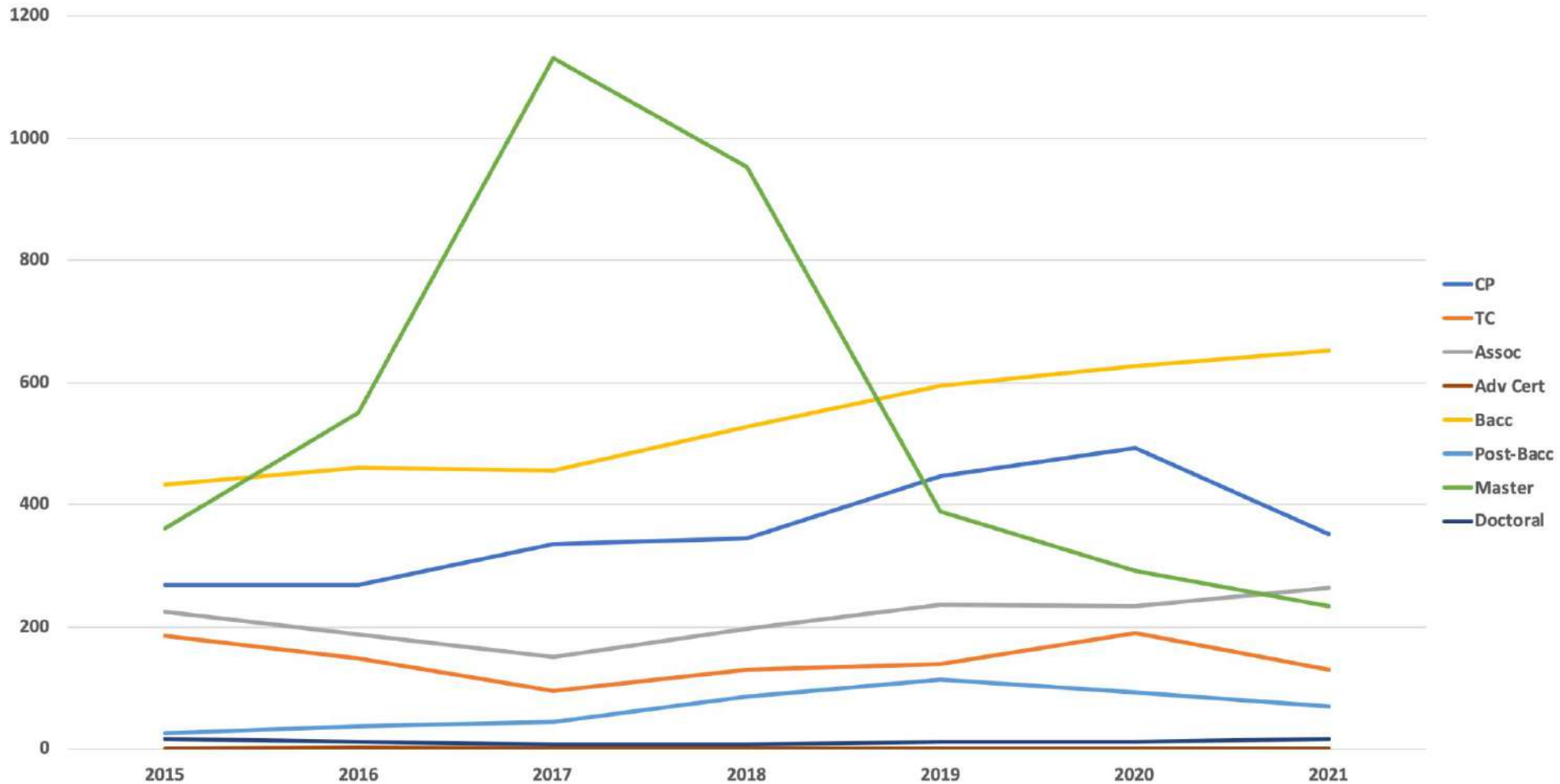
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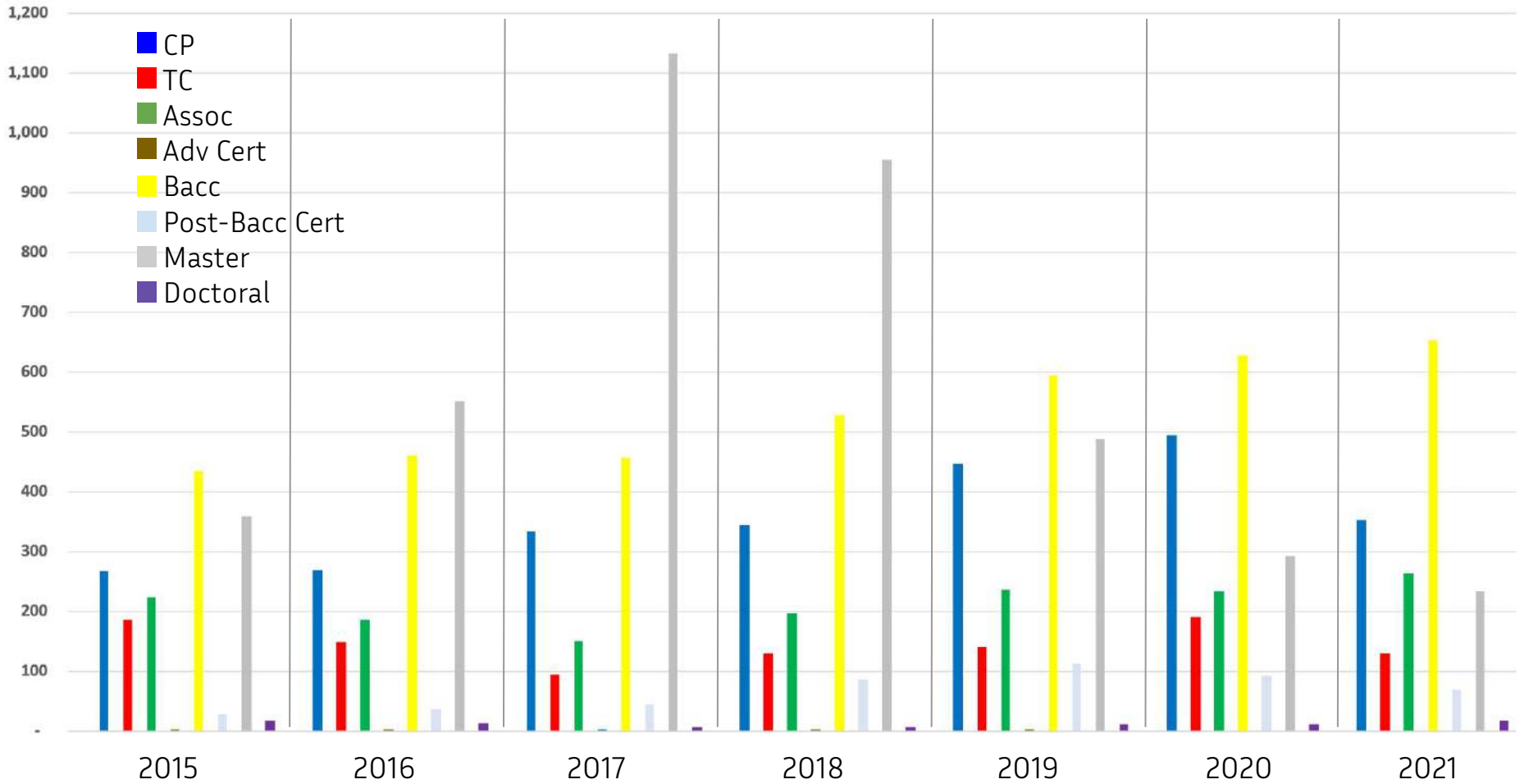
## Annual Credentials Awarded



Disaggregated Annual "CS" Credentials Awarded



Disaggregated Annual "CS" Credentials Awarded





# Questions?

[tina.d.moore@ade.arkansas.gov](mailto:tina.d.moore@ade.arkansas.gov)