OCTAE Program Memorandum 24-5

UNITED STATES DEPARTMENT OF EDUCATION

OFFICE OF CAREER, TECHNICAL, AND ADULT EDUCATION

Renewing Our Efforts to Advance Gender Equity in Career and Technical Education

March 27, 2024

Dear Colleague:

The Biden-Harris Administration's Investing in America agenda is bringing together unprecedented federal and private sector investments to create millions of new, good-paying jobs in key industries such as advanced manufacturing, semiconductors, broadband, electric vehicles and batteries, clean energy, and infrastructure. However, without concerted action to upend the status quo and reverse occupational segregation, many women will be shut out of these opportunities. For example, in 2023, women comprised only 29.5 percent of employed persons working in manufacturing, 24.3 percent of workers in transportation and utilities, and just 10.8 percent of workers in construction.[1] In addition, critical industries that are female-dominated, such as education and health care, will continue to struggle with staffing shortages if they are not able to attract and retain more men. For example, in 20201-21, only 23 percent of public elementary and secondary school teachers were males.[2]

Career and technical educators have a critical role to play in addressing occupational segregation. The gender equity provisions that are an important part of the *Carl D. Perkins Career and Technical Education Act of 2006* (*Perkins V)* can help open doors for more women and girls to pursue more equitable pathways to the good jobs generated by Investing in America and other opportunities in our growing economy. They can also help attract and prepare more men into meaningful and critical occupations. Stronger and more creative leadership by states, local educational agencies (LEAs), and institutions of higher education to strategically implement these provisions can make a difference.

Beginning with the *Federal Vocational Education Act* in 1976,[3] federal career and technical education (CTE) legislation has included a mandate to promote gender equity in student access and success in CTE programs so that youth and adults consider and are able to pursue all options available to them, including careers that are non-traditional for their gender, particularly careers in high-wage, high-growth, and high-demand occupations.[4]

These mandates were established because policymakers wanted to build on the prohibition against sex discrimination in education programs and activities established by Title IX of the *Education Amendments of 1972* in order to promote equitable access by females to CTE, particularly for opportunities to prepare for high-demand, skilled occupations that provide a living wage.[5] Today, focused efforts to advance gender equity in CTE continue to be necessary to break down the occupational segregation that results in lower wages for women,[6] counter subtle or unconscious biases and gender stereotypes, and provide students with accurate information so that their educational and career choices truly reflect their interests, talents, and priorities—and lead them to bright futures.

Unfortunately, during the nearly 50 years that these mandates have been included in CTE legislation, we have made only modest progress. This letter describes two long-term progress benchmarks with disappointing results: CTE course taking by males and females in high school, and advances by women in science, technology, engineering, and mathematics (STEM) careers that do not require a bachelor's or advanced degree. These results underscore the need for continued leadership in this space and an urgent, strategic focus on better engaging females in career pathways that lead to good jobs. CTE programs in some career clusters remain highly segregated by gender, as do the occupations for which they prepare students.

The good news is that we also see bright spots in some state data that segregation by gender in CTE is not impervious to change. If we as a nation are to fulfill our endless potential and continue to raise the bar and lead the world, we need our full workforce to thrive. This letter also highlights path-forging leaders from across the country who are demonstrating that, with bold and creative action, we can make significant gains in advancing gender equity in CTE. I invite and encourage you to join them.

Measuring Our Progress in Advancing Gender Equity

<u>High School Transcript Analysis</u>

One benchmark for measuring our progress in advancing equity, such as by increasing participation by females in a program area like Engineering and Technology and by males in Health Care Sciences and Human Services, can be found in the average CTE credits earned by male and female high school graduates recorded on high school transcripts periodically collected by the National Center for Education Statistics in connection with the National Assessment of Educational Progress. The average number of credits is frequently used to examine patterns and trends in course taking by high school students.[7] Table 1 compares the average number of credits earned by male and female high school graduates by CTE subject area in 1990 and 2019 (the most recent year for which transcript data are available) and indicates with an asterisk the year and subject area in which the average number of credits earned by males were significantly different from those earned by females.[8] Between 1990 and 2019, these data show that:

- ***Females achieved parity with males in average credits earned in Agriculture, Food, and Natural Resources, but they fell behind in Information Technology***. As shown in table 1, there was a large difference in 1990 between the average number of credits earned by males and females in Agriculture, Food, and Natural Resources. After 1990, however, credits earned by females in Agriculture, Food, and Natural Resources increased as credits earned by males held steady. By 2019, there was not a statistically significant difference in the average credits earned by males and females. In Information Technology, there was no statistically significant difference between the average credits earned by males and females in 1990. Between 1990 and 2019, however, the average number of credits earned by males in Information Technology increased while there was no change in the average number of credits earned by females. The difference in 2019 (0.24 credits) was statistically significant.

- ***Gaps narrowed in Architecture and Construction, Manufacturing, and Transportation, Distribution, and Logistics but only because males earned fewer average credits in these***

subjects in 2019 than they did in 1990. Males continued to earn a larger average number of credits than females in these clusters in 2019.

- ***A large gap between males and females in Engineering and Technology continued*.** In 1990, there was a large gap favoring males in the average number of credits earned in Engineering and Technology. The average number of credits earned by both males and females grew between 1990 and 2019, but a large gap favoring males remained in 2019.

- ***The male-female gap in credits in Business and Marketing flipped*.** The average number of credits earned by females in Business and Marketing exceeded those earned by males in 1990. Between 1990 and 2019, the average number of credits in Business and Marketing earned by both males and females declined overall, but the average number earned by males exceeded those earned by females in 2019 by .09 credits.

- ***A male-female gap emerged in Health Care Sciences*.** As table 1 shows, in 1990, the average credits earned by both males and females in Health Care Sciences were negligible, with no statistically significant difference in the credits earned by either. Between 1990 and 2019, there was a large increase in the average credits earned by females. The average number of credits earned by males in 2019 was also greater than in 1990, but to a smaller extent than the credits earned by females, creating a large gap favoring females. This is consistent with the overrepresentation of females in the health care industry, with females comprising 74.6 percent of full-time workers in hospitals and 78.7 percent of workers in other health care settings. [9]

- ***The gap narrowed in Human Services, but females continued to earn a larger average number of credits than males in this cluster in 2019*.** In Human Services, the average number of credits earned by males overall increased between 1990 and 2019 as the average number of credits earned by females decreased, but a large gap favoring females between the average number of credits earned by males and females remained in 2019.

***Table 1*.** *Comparison of Average Number of Carnegie Credits Earned in CTE Subject Areas from 1990 and 2019 By Gender, High School Transcript Study*

	Year	
CTE Subject Area	1990	2019
Agriculture, Food, and Natural Resources		
Males	.29*	.29
Females	**.09**	.22
Architecture and Construction		
Males	**.49***	.28*
Females	.03	.04
Business and Marketing		
Males	**.97***	.45*
Females	**1.78**	.36
Communication and Audio/Video Technology		
Males	**.21**	.30
Females	**.25**	.34

Engineering and Technology		
Males	**.32***	.40*
Females	**.05**	.12
Health Care Sciences		
Males	**.02**	.15*
Females	**.06**	.44
Hospitality and Tourism		
Males	**.04**	.14
Females	**.06**	.19
Human Services		
Males	**.36***	.42*
Females	**.98**	.77
Information Technology		
Males	**.40**	.62*
Females	.38	.38
Manufacturing		
Males	**.40***	.19*
Females	**.07**	.02
Public, Protective, and Government Service		
Males	**.00**	.10
Females	**.00**	.09
Transportation, Distribution, and Logistics		
Males	**.36***	.21*
Females	.02	.02

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Educational Statistics, National Assessment of Educational Progress (NAEP) High School Transcript Study, 1990 and 2019, using online NAEP Data Explorer (NDE) tool. A bolded value indicates a statistically significant difference ($p < .05$) between the 1990 and 2019 values. A value marked with an asterisk indicates that there is statistically significant difference ($p < .05$) between the average credits earned by males and females within the year.

As shown in table 2, between 1990 and 2019, there was no statistically significant difference in the share of female high school graduates who earned at least one credit in Architecture and Construction, Information Technology, and Transportation, Distribution, Logistics—all CTE subject areas which prepare individuals for many occupations that are non-traditional for women.[10] There were modest increases in the percentage of male high school graduates earning at least one credit in Health Care Sciences and Human Services, program areas that prepare students for many occupations in which females predominate.

Table 2. *Percentage of high school graduates who earned at least one Carnegie credit in CTE subject areas, by student gender: 1990 and 2019*.

	1990		2019	
Subject Area	% Female	% Male	% Female	% Male
Architecture and Construction	2	**22**	2	11
Engineering and Technology	**3**	**18**	7	20

Subject Area	% Female	% Male	% Female	% Male
Information Technology	20	**22**	23	34
Manufacturing	**3**	**18**	1	8
Transportation, Distribution, and Logistics	1	**12**	1	8
Health Care Sciences	**2**	**#**	16	7
Human Services	**43**	**19**	34	22

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Educational Statistics, National Assessment of Educational Progress (NAEP) High School Transcript Study, 1990 and 2019. A bolded value indicates a statistically significant difference ($p < .05$) between the 1990 and 2019 values. A hashtag (#) indicates the value rounds to zero.

Preparation for and Employment in Science, Technology, Engineering, and Mathematics Occupations

Another measure of our progress is the representation of women among those prepared for and employed in STEM occupations, which the Bureau of Labor Statistics projects will grow at nearly five times the rate of non-STEM occupations between 2022 and 2032.[11]

According to the National Science Foundation, women comprised 35 percent of the workforce in STEM in 2021, significantly less than their representation in the employed U.S. population (51 percent).[12] Women's participation in the STEM workforce in occupations requiring a baccalaureate or graduate degree was considerably higher—they comprised 45 percent of STEM workers at these educational levels in 2021[13]—and their participation has grown over the last decade, increasing 7 percent between 2010 and 2021.[14] **In sharp contrast, in STEM occupations requiring less than a baccalaureate degree—the jobs for which our CTE system prepares individuals—women comprised just 25 percent of the STEM workforce in 2021.[15]** Unlike women's participation in STEM jobs requiring a baccalaureate degree or higher, which is on the upswing, women's participation in other STEM careers is trending downward. They comprised 26 percent of these workers in these jobs in 2010.[16]

Many STEM careers that do not require a baccalaureate degree pay considerably more than non-STEM careers. The National Science Foundation reports that the median earnings of full-time workers in STEM occupations who did not have a bachelor's degree were 60 percent more than the earnings of full-time workers in non-STEM occupations who did not have a bachelor's degree in 2019.[17] For example, the median annual earnings of women employed full-time as computer support specialists in 2021 was $58,043, while the median annual earnings of women employed full-time as customer service representatives was $37,274 in that year.[18]

Computer and information sciences and support services programs are a good example of the limited progress we are making in reducing gender segregation at the sub-baccalaureate level when compared with the gains women are making in earning higher-level credentials. As table 3 shows, the share of certificates awarded to women in computer and information sciences and support services has declined over the last 10 years and the share of associate degrees has only increased 3.2 percent. In contrast, there have been double-digit percentage increases in the share of baccalaureate and postgraduate degrees attained by women.

Table 3. *Percentage of credentials earned by women in Computer and Information Sciences and Support Services, by award level: 2011-12 and 2021-22.*[19]

Computer and Information Sciences and Support Services Credentials	Percentage earned by Women 2011-12	Percentage earned by Women 2021-22	Percentage Change
Certificate of less than 1 year	30.5%	24.9%	-18.4%
Certificate of at least 1 but less than 2 years	24.6%	23.3%	-6.1%
Associate's	21.6%	22.3%	3.2%
Bachelor's	18.2%	22.6%	24.2%
Master's	27.7%	34.0%	22.7%
Doctor's	21.6%	25.7%	18.5%

This table presents data collected from Title IV degree-granting institutions in the United States. Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Integrated Postsecondary Education Data System, Summary Tables. Retrieved from: https://nces.ed.gov/ipeds/SummaryTables/. Data from 2021-22 are provisional.

Looking Forward: Areas of Progress in State Data on Secondary CTE Concentrators

While progress in advancing gender equity over the past few decades has been predominantly disappointing, there are some areas of progress in the data from some states on the career clusters in which secondary CTE students are concentrating their studies.[20] The Office of Career, Technical, and Adult Education annually collects data on the numbers of students who participated in CTE at the secondary and postsecondary levels by taking one or more CTE courses and for students who are CTE concentrators. The CTE concentrator data are disaggregated by career cluster, gender, race, ethnicity, and special population status.[21]

For the 2021-22 school year, the 50 states and the District of Columbia reported that 2,808,102 high school students concentrated their studies in CTE, and that 46.7 percent of these students were female (about 48.8 percent of public-school students in 2021-22 were female).[22] The percentage of female secondary CTE concentrators who participated in each career cluster is reported in table 4. Career clusters in which males predominated (i.e., males comprised more than two-thirds of the students in the cluster) in 2021-22 were Architecture and Construction; Information Technology; Manufacturing; STEM; and Transportation, Distribution and Logistics. Career clusters in which females predominated (i.e., females comprised more than two-thirds of the students in the cluster) were Education and Training; Health Science; and Human Services. Occupational segregation by gender depresses female wages and contributes to the gender wage gap.[23] For example, economists have found that occupations that employ a larger share of women pay lower wages even after accounting for characteristics of the workers and job, such as education, skills, and experience.[24]

Table 4. *Average National Percentage of Female Secondary Concentrators, by Career Cluster, 2021-22.*

Career Cluster	Percentage of Female Concentrators
Agriculture, Food and Natural Resources	44.6%
Architecture and Construction	16.7%
Arts, Audiovisual Technology and Communications	46.0%
Business Management and Administration	44.6%
Education and Training	82.3%
Finance	42.3%
Government and Public Administration	45.2%
Health Science	76.9%
Hospitality and Tourism	56.3%
Human Services	72.1%
Information Technology	28.4%
Law, Public Safety, Corrections and Security	51.5%
Manufacturing	15.4%
Marketing	42.8%
Science, Technology, Engineering and Mathematics	25.2%
Transportation, Distribution and Logistics	12.2%

This table presents data collected from the 50 states and the District of Columbia. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

What is most striking about the state data on CTE concentrators is the extent to which female and male concentration in these career clusters varies across states. As shown in tables 5 and 6, the range between the highest and lowest percentages is as large as 78.6 percent for some clusters. Complete state-by-state data on male and female participation in the career clusters can be viewed on Perkins Collaborative Network at cte.ed.gov.

Table 5*. Range in the Percentage of Female Secondary CTE Concentrators in Predominantly Male Career Clusters among States, 2021-22.*

Career Cluster	Occupation Examples	Range in Percentage of Female Secondary CTE Concentrators
Architecture and Construction	Carpenter Civil Engineer	6.0% to 50.9%
Information Technology	Computer Support Specialist Web and Digital Interface Designer	9.6% to 44.5%
Manufacturing	Chemical Equipment Operator Wind Turbine Service Technician	6.1% to 31.2%
Science, Technology, Engineering and Mathematics	Biochemist Hydrologic Technician	9.9% to 49.7%

Career Cluster	Occupation Examples	Range in Percentage of Female Secondary CTE Concentrators
Transportation, Distribution and Logistics	Automotive Service Technician Recycling Coordinator	0.0% to 46.6%

This table presents data collected from the 50 states and the District of Columbia for career clusters in which males comprised more than two-thirds of the students in the cluster. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

Table 6. *Range in the Percentage of Male Secondary CTE Concentrators Among Predominantly Female Career Clusters, 2021-22*.

Career Cluster	Occupation Examples	Range in Percentage of Male Secondary CTE Concentrators
Education and Training	Teacher Library Technician	0.0% to 52.9%
Health Science	Nurse Ophthalmic Medical Technologist	9.6% to 32.5%
Human Services	Loan Officer Social Worker	2.6% to 37.3%

This table presents data collected from the 50 states and the District of Columbia for career clusters in which females comprised more than two-thirds of the students in the cluster. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

These wide ranges suggest that female and male participation in career clusters in which the other gender predominates may be highly dependent on the state and local context in which CTE programs in these clusters are offered and implemented. They make clear that greater gender equity in secondary CTE can be achieved.

Noteworthy Strategies

To better understand the context in states in which there are relatively high levels of female concentration in predominantly male career clusters and high levels of male concentration in predominantly female career clusters, we sought insights from the state directors of CTE in two states and the District of Columbia. We learned that these outcomes are the likely results of very different strategies, but that a common denominator among them is a determination to upend the status quo and improve equitable gender representation across all career clusters.

For example, Arkansas leaders are seeking to make student participation in computer science universal and have seen a large increase in the proportion of female students concentrating their studies in information technology. Leaders in the District of Columbia have engaged with a national organization to evaluate its recruitment and program activities with the goal of learning what can reduce male-female participation gaps in programs that prepare students for high-skill, high-wage, and in-demand occupations. Professional development programs for teachers, in-school STEM

learning programs, and increased hiring in programs that are non-traditional for women are attributed to the share of female CTE concentrators in Architecture and Construction and STEM. In Kansas, leaders have seen a significant increase in male concentrators in health care following their implementation of strategies to address the critical shortage of nurses and other health care professionals in their state.

The work of policymakers and CTE leaders in Arkansas, the District of Columbia, and Kansas has gone considerably beyond complying with the *Perkins V* requirement that a state make available $60,000 to $150,000 in state leadership funds for services that prepare individuals for non-traditional fields.[25] These examples help make clear that significant progress in advancing gender equity in CTE is unlikely to happen if efforts are confined to the bare minimum required by law. Improving gender representation will require greater energy, determination, and creativity to make a difference. I encourage you to draw inspiration from these three strategies and consider how you can make your own bold moves to upend the status quo in your state.

Conclusion

The Biden-Harris Administration's Investing in America agenda is a key driver of expanded opportunity for all Americans and can help address long-standing gender gaps in employment. Creative approaches to rethinking CTE is a critical element of fulfilling the promise of this agenda and providing good-paying jobs for every American. Working together, we can have a strong impact on countering the biases and stereotypes that constrain the career choices of students who concentrate their studies in CTE so that all students have the opportunity to pursue a rewarding career. And the steps that you take today in advancing gender equity will lay the foundation for your state's—and our nation's—bright and powerful future.

Sincerely,

/s/

Amy Loyd, Ed.L.D.
Assistant Secretary for Career, Technical, and
Adult Education

ARKANSAS

Arkansas has charted a promising path to significantly increasing the proportion of female high school students who concentrate their CTE studies in Information Technology. As shown in table 7, during the past three program years, the percentage of Information Technology concentrators who were female in Arkansas was 10 to 15 percentage points higher than the national average.

Table 7. *Percentage of Female Secondary CTE Concentrators, by Career Cluster.*

	2019-20 Female Secondary CTE Concentrators		2020-21 Female Secondary CTE Concentrators		2021-22 Female Secondary CTE Concentrators	
Career Cluster	Arkansas	National Average	Arkansas	National Average	Arkansas	National Average
Information Technology	42.4%	30.2%	41.4%	26.9%	42.1%	28.4%

This table presents data collected from the 50 states and the District of Columbia. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

Arkansas Department of Education (ADE) officials attribute the higher percentage of female Information Technology concentrators to the state's national leadership in computer science education.[26] In 2015, Arkansas became the first state in the nation to require and provide funding for all its high schools to offer computer science.[27] The Arkansas State Board of Education also established K12 computer science standards that embed instruction on computational thinking as a cross-curricular subject in elementary school and direct middle schools to provide students with a "block" of instruction on coding.[28] Additionally, the state permits students to use computer science courses to fulfill high school science and mathematics requirements.[29] Starting in the 2022-23 school year, the state established a high school graduation requirement that all students complete one computer science or computer science-related CTE course.[30]

As a result of these initiatives, the number of students in Arkansas enrolled in computer science in grades 8 through 12 has increased dramatically since the 2014-15 school year, growing from 1,104 to 23,544 students in the 2022-23 school year. The number of females enrolled in a computer science course has grown from 223 in the 2014-15 school year to 9,018 in 2022-23.[31] Nationally, 57.5 percent of high schools offered at least one computer science course in 2022-23. In Arkansas, 99 percent of high schools offered computer science in 2022-23.[32]

The state's implementation of its computer science initiatives has also included efforts specifically focused on encouraging females to study and pursue careers in information technology. In 2015, the Arkansas governor joined with the Women's Foundation of Arkansas and Code.org, an organization that promotes the study of computer science, to host the Girls of Promise® Coding Summit.[33] The Women's Foundation of Arkansas made Coding Summits biannual events until they were paused due to the COVID-19 pandemic.[34] In 2016, ADE made available to teachers throughout the state three

documentaries about women pioneers in computer science to schools.[35] In 2017, ADE partnered with AT&T, the Women's Foundation of Arkansas, and others to sponsor a contest that encouraged middle and high school students to develop public service announcements designed to promote female and minority participation in computer science classes. The winning video, "Decide to Strive, Not Hide," was shown in theaters throughout Arkansas.[36] In that same year, ADE also purchased and distributed to every elementary school in the state a children's book that encouraged girls to study coding.[37]

DISTRICT OF COLUMBIA

The District of Columbia (DC) is an example of the power of concerted, strategic action to promote gender equity to influence student decision-making about careers. As shown in table 8, it has achieved a high level of female participation in two clusters: Architecture and Construction and STEM.

Table 8. *Percentage of Female Secondary CTE Concentrators, by Career Cluster.*

	2019-20 Female Secondary CTE Concentrators		2020-21 Female Secondary CTE Concentrators		2021-22 Female Secondary CTE Concentrators	
Career Cluster	DC	National Average	DC	National Average	DC	National Average
Architecture and Construction	33.3%	22.2%	33.3%	21.4%	34.6%	16.7%
STEM	50.3%	23.7%	44.7%	25.4%	49.7%	25.2%

This table presents data collected from the 50 states and the District of Columbia. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

Officials with the DC Office of the State Superintendent of Education and DC Public Schools (DCPS) attribute the higher-than-average levels of concentration of females in these clusters to focused efforts by DCPS to increase the participation of females in programs that are non-traditional for their gender. Concerned about the limited participation of young women in several of their CTE programs of study, DCPS engaged a national organization with expertise in promoting equity in CTE to examine its data and assess its programs to make recommendations for improvement.

Evaluating its recruitment materials with an equity lens, DCPS found that women were not well-represented in the images it used in marketing programs that are non-traditional for women and set about correcting that. Professional development was provided to CTE teachers and school counselors on identifying and addressing biases and implementing strategies to advance equity in DC. DCPS reached out to employers, area institutions of higher education, and non-profit organizations to recruit women in non-traditional careers to serve as mentors. Project Lead the Way programs were also introduced in middle schools to expose more students to engineering. DCPS also examined its hiring practices to identify factors that may have led to the underrepresentation of women among instructors for programs that are non-traditional for women. As a result, for example, one-quarter of its construction program instructors are female.[38]

KANSAS

Kansas stands apart from many other states in the relatively high level of participation of male concentrators in secondary CTE programs in the Health Science cluster, as shown in table 9. The Kansas Board of Regents (KBOR) and the Kansas State Department of Education (KSDE) attribute the surging interest in health careers among young men to a confluence of factors.

Table 9. *Percentage of Male Secondary CTE Concentrators, by Career Cluster.*

	2019-20 Male Secondary CTE Concentrators		2020-21 Male Secondary CTE Concentrators		2021-22 Male Secondary CTE Concentrators	
Career Cluster	Kansas	National Average	Kansas	National Average	Kansas	National Average
Health	49.0%	17.1%	31.5%	17.8%	32.5%	23.1%

This table presents data collected from the 50 states and the District of Columbia. Source: U.S. Department of Education, Office of Career, Technical, and Adult Education, Carl D. Perkins Career and Technical Education Act Consolidated Annual Report. Retrieved from: https://cte.ed.gov/pcrn/explorer/enrollment/perkins-v.

Increasing early career awareness and planning among young people is a state priority. Since the 2017-18 school year, Kansas middle and high schools have been required to work collaboratively with students and their families to develop an "Individual Plan of Study" (IPS) based on students' career interests. The IPS must include "strength finders" and career interest inventories to help students identify a career cluster to focus their studies, course selections for grades 8 through 12 that are based on these career interests, a postsecondary plan, and a portable electronic portfolio.[39] Training for school districts on IPS also has included "Equity and Access Roadshows" to support the development of strategies to assist students who may be interested in nontraditional careers or members of special populations to be successful in CTE programs and postsecondary planning.[40]

Faced with a severe shortage of nursing and other health care professionals throughout the state, KBOR, KSDE, the Kansas Department of Labor, and the Kansas Department of Health and Environment have joined with health care employers to commit significant resources to ensure that students and their families know about and consider health care careers in preparing their IPS, using posters, websites, social media, and other resources to raise awareness. For example, KDSE, the Kansas Chamber, and the Kansas Hospital Association partnered to deliver a virtual statewide health careers fair for students of all ages. The video presentation on nursing careers featured the male Chief Nursing Officer at Hays Medical Center who started his career as a Certified Nurse Aide (CNA) and another male nurse who had more recently entered the profession.[41]

KSDE has been proactive in creating more opportunities for high school students to prepare for health careers. In 2017, KSDE began reaching out to districts that were not offering health care pathway programs to provide support and technical assistance in establishing them. Between the 2017-18 and 2020-21 school years, the number of health care programs available to high school students increased 39 percent, from 150 to 208 programs.[42]

Kansas' early leadership in creating dual and concurrent enrollment opportunities in CTE has made it possible for students to get a head start on earning in-demand credentials in the health care field. Launched in 2012, the Excel in CTE Initiative pays the tuition costs for Kansas high school students. Since 2015, Kansas high school students have earned more than 8,000 CNA credentials through Excel in CTE.[43] Promotional videos and posters developed by the Kansas Department of Commerce to market Excel in CTE to high school students prominently featured a male health care professional with the tagline "Break the Mold."[44] Students interested in pursuing health care credentials after graduation are eligible for financial aid under the Kansas Promise Scholarship program, which assists students attending Kansas community colleges and technical colleges who enroll in programs that provide preparation for high-wage, high-demand, or critical need fields. Scholarship recipients must agree to work in Kansas for at least two years after earning their credentials.[45]

Kansas state leaders speculated that another factor that may have influenced the increase in male participation in health care pathway programs is that, between 2018 and 2020, the advisor for the state's health care career and technical student organization was male, as were some state officers, and that they were visible and active in recruiting students to consider health care as a career. Some researchers have found evidence that exposure to same-gender role models who are working in non-traditional career areas influences the career aspirations and choices of children and youth.[46]

KSDE initiatives to advance equity and access in CTE also may have played a role.[47] In 2019, KSDE used *Perkins V* state reserve funds to award Access and Equity grants to support the formation of local school teams to evaluate current school practices and data. In 2021, KSDE offered districts professional development opportunities provided by a national organization with expertise in promoting equity in CTE.[48]

[1] Bureau of Labor Statistics, U.S. Department of Labor, Labor Force Statistics from the Current Population Survey (2023), Table 18, Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Retrieved from: https://www.bls.gov/cps/tables.htm#annual

[2] National Center for Education Statistics. (2023) Characteristics of Public School Teachers, Condition of Education. U.S. Department of Education, Institute of Education Sciences. Retrieved from https://nces.ed.gov/programs/coe/indicator/clr.

[3] Mertens, D.M. (1984), "Federal Policy for Sex Equity in Vocational Education." *Educational Evaluation and Policy Analysis*, Vol. 6, No. 4 (Winter, 1984), pp. 401-409. Retrieved from: https://www.jstor.org/stable/1163979.

[4] Lufkin, Mary E., Wiberg, Mary, et al. (2007), *Gender Equity in Career and Technical Education, Handbook for Achieving Gender Equity Through Education*. Retrieved from: https://www.napequity.org/nape-content/uploads/CH-20-GE-in-Career-Tech-Ed.pdf and *Carl D. Perkins Career and Technical Education Act of 2006*. Retrieved from: https://www.govinfo.gov/content/pkg/COMPS-3096/pdf/COMPS-3096.pdf.

[5] Mertens op. cit.

[6] Foster, Thomas B., Murray-Close, Marta, et al. (2020) *An Evaluation of the Gender Wage Gap Using Linked Survey and Administrative Data*. U.S. Census Bureau, Center for Economic Studies. Retrieved from: https://www2.census.gov/ces/wp/2020/CES-WP-20-34.pdf. See also Blau, Francine D. and Kahn, Lawrence M. (2016), *The Gender Wage Gap: Extent, Trends, and Explanations*. National Bureau of Economic Research Working Paper 21913. Retrieved from: https://www.nber.org/papers/w21913.

[7] See, for example, National Center for Education Statistics. (2022). High School Mathematics and Science Course Completion. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences. Retrieved from: https://nces.ed.gov/programs/coe/indicator/sod.

[8] The values reported in table 1 were calculated using the National Assessment of Educational Progress (NAEP) Data Explorer made available by the National Center for Education Statistics (NCES) to analyze the average number of credits earned by high school graduates and grade point averages in each year the NAEP High School Transcript Study (HSTS) was conducted. HSTS periodically collects high school transcripts from a nationally representative sample of public and private schools that have been selected to participate in NAEP grade 12 assessments. Transcripts are collected for a representative sample of graduating seniors within each school. The HSTS standardizes course credits using Carnegie credits. One Carnegie credit is defined as 120 hours of class instruction over the course of a secondary school year. For the purposes of the HSTS, 1 Carnegie credit is equivalent to a year-long school course. The HSTS identifies 12 subject areas for CTE as: Agriculture, Food, and Natural resources; Architecture and Construction; Business and Marketing; Communication and Audio/Video Technology; Engineering and Technology; Health Care Sciences; Hospitality and Tourism; Human Services; Information Technology; Manufacturing; Public, Protective, and Government Service; and Transportation.

[9] Bureau of Labor Statistics, U.S. Department of Labor, Labor Force Statistics from the Current Population Survey (2023), Table 18, Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Retrieved from: https://www.bls.gov/cps/tables.htm#annual

[10] Section 3(33) of Perkins V defines "non-traditional fields" to mean "occupations or fields of work, such as careers in computer science, technology, and other current and emerging high skill occupations, for which individuals from one gender comprise less than 25 percent of the individuals employed in each such occupation or field of work."

[11] Bureau of Labor Statistics (2023), Table 1.11 Employment in STEM occupations, 2022 and projected 2032 (Numbers in thousands). Retrieved from: https://www.bls.gov/emp/tables/stem-employment.htm

[12] National Center for Science and Engineering Statistics (2023), National Science Foundation, *Diversity and STEM: Women, Minorities, and Persons with Disabilities*. Figure 1-1. Retrieved from: https://ncses.nsf.gov/pubs/nsf23315/report

[13] Ibid., Figure 2-4.

[14] Ibid., Figure 2-3, and National Center for Science and Engineering Statistics (2022), National Science Foundation, *The State of U.S. Science and Engineering 2022*. Retrieved from: https://ncses.nsf.gov/pubs/nsb20221.
[15] *Diversity and STEM*, Figure 3-4.
[16] *The State of U.S. Science and Engineering 2022*.
[17] National Science Board, National Science Foundation (2021), *The STEM Labor Force of Today: Scientists, Engineers, and Skilled Technical Workers* (NSB-2021-2). Retrieved from: https://ncses.nsf.gov/pubs/nsb20212/
[18] U.S Census Bureau, Full-Time, Year-Round Workers and Median Earnings by Sex and Occupation: 2021. Retrieved from: https://www.census.gov/data/tables/time-series/demo/industry-occupation/median-earnings.html
[19] National Center for Education Statistics, Integrated Postsecondary Education Data, Summary Tables. Retrieved from: https://nces.ed.gov/ipeds/SummaryTables/. Data from 2021-22 are provisional.
[20] Section 3(12) of *Perkins V* defines a "CTE concentrator" at the secondary school level as "a student served by an eligible recipient who has completed at least 2 courses in a single career and technical education program or program of study."
[21] Section 3(48) of *Perkins V* defines the term "special populations" to mean "individuals with disabilities; individuals from economically disadvantaged families, including low-income youth and adults; individuals preparing for non-traditional fields; single parents, including single pregnant women; out-of-workforce individuals; English learners; homeless individuals described in section 725 of the *McKinney-Vento Homeless Assistance Act* (42 U.S.C. 11434a); youth who are in, or have aged out of, the foster care system; and youth with a parent who is a member of the armed forces (as such term is defined in section 101(a)(4) of title 10, United States Code) and is on active duty (as such term is defined in section 101(d)(1) of such title."
[22] U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Public Elementary/Secondary Education Survey", 2021-22 v.1a, 2022-23 v.1a.
[23] Zhavoronkova, M., Khattar, R. and Brady, M. (2022), *Occupational Segregation in America*, Center for American Progress. Retrieved from: https://www.americanprogress.org/article/occupational-segregation-in-america/
[24] Foster, T.B., Murray-Close, M. and Landivar, L.C. (2020), *An Evaluation of the Gender Wage Gap Using Linked Survey and Administrative Data* (CES 20-34), U.S. Department of Commerce, Bureau of the Census, Center for Economic Studies. Retrieved from: https://www2.census.gov/ces/wp/2020/CES-WP-20-34.pdf
[25] *Perkins V*, section 112(a)(2)(B).
[26] Arkansas Department of Education, Interview, May 10, 2023.
[27] Stanton, Jim, Goldsmith, Lynn et al. (2017), *State of the States Landscape Report: State-Level Policies Supporting Equitable K–12 Computer Science Education*, BNY Mellon. Retrieved from: https://www.edc.org/state-states-landscape-report-state-level-policies-supporting-equitable-k-12-computer-science
[28] Fowler, Brian and Vegas, Emiliana (2021), *How Arkansas implemented its computer science education program*, Brookings Institution. Retrieved from: https://www.brookings.edu/wp-content/uploads/2021/09/How-Arkansas-implemented-its-CS-education-program-FINAL.pdf
[29] Arkansas Computer Science and Cyber Security Task Force (2020), *Final Report*. Retrieved from: https://dese.ade.arkansas.gov/admin/Files/20210203093135_2020%20Computer%20Science%20and%20Cybersecurity%20Task%20Force%20Report%2020201001.pdf
[30] State of Arkansas, 94th General Assembly (2023), *Senate Bill 470*. Retrieved from: https://www.arkleg.state.ar.us/Home/FTPDocument?path=%2FBills%2F2023R%2FPublic%2FSB470.pdf
[31] Arkansas Department of Education (2022), *High School Computer Science and Computing Enrollment Report, School Year 2022-23*. Retrieved from: https://dese.ade.arkansas.gov/Offices/ar-comp-sci-initiative/computer-science-communications.

[32] Code.org, Computer Science Teachers Association, and Expanding Computing Education Pathways Alliance (2023), *2023 State of Computer Science Education: Understanding Our National Imperative*. Retrieved from https://advocacy.code.org/stateofcs.
[33] Women's Foundation of Arkansas (2015), "WFA Girls of Promise® Tech Summit at Governor's Mansion attended by 150 Arkansas girls from 40 schools" (press release), December 9, 2015. Retrieved from: https://womensfoundationarkansas.org/girls-of-promise-tech-summit-success/
[34] Women's Foundation of Arkansas (2023), *Coding Summits*. Retrieved from: https://womensfoundationarkansas.org/girls-of-promise/
[35] Arkansas Department of Education (2016), "Gov. Hutchinson, Arkansas Department of Education Announce Availability of 3 Documentaries that Highlight the Role of Women in Computer Programming" (press release), December 9, 2016. Retrieved from: https://dese.ade.arkansas.gov/Files/20210119012540_Press_Release_Computer_Science_Documentaries_Available.pdf
[36] Arkansas Computer Science and Cyber Security Task Force (2020), *Final Report*. The winning video is available at https://youtu.be/UzgJ7nebcvw.
[37] Arkansas Department of Education (2017), "Approximately 900 Public School Libraries to Receive Computer Coding Devices, Books" (press release), December 8, 2017. Retrieved from: https://dese.ade.arkansas.gov/Files/20210118172355_Press_Release_About_900_School_Libraries_to_Receive_Computer_Coding_Devices_Books_December_2017.pdf
[38] District of Columbia Public Schools, Interview, May 12, 2023.
[39] Kansas Department of Education (2020), *Individual Plan of Study Fact Sheet*. Retrieved from: https://www.ksde.org/Portals/0/CSAS/CSAS%20Home/Plan_Of_Study/IPS%20Fact%20Sheet%20July%202020.pdf?ver=2020-09-30-141131-187
[40] Kansas Department of Education (2021), *2019-2020 Annual Report: IPS Information*. Retrieved from: https://www.ksde.org/Portals/0/CSAS/CSAS%20Home/Plan_Of_Study/2019-2020%20IPS%20Annual%20Report.pdf?ver=2021-06-21-154323-873
[41] Kansas Hospital Association (2023), *Happy in Health Care*. Retrieved from: https://www.kha-net.org/
[42] KSDE, "Health Non-Traditional Concentration" (presentation and interview), May 18, 2023.
[43] Ibid.
[44] See the video on You Tube at https://www.youtube.com/watch?v=dfbt5OtFJZE and the poster at https://www.kansasregents.org/resources/PDF/2229-PosterNURSE.pdf
[45] Kansas Board of Regents (2023), *Kansas Promise Scholarship Act Information*. Retrieved from: https://www.kansasregents.org/students/student_financial_aid/promise-act-scholarship
[46] See, for example, Olsson, M. and Martiny, S.E. (2018), "Does Exposure to Counterstereotypical Role Models Influence Girls' and Women's Gender Stereotypes and Career Choices? A Review of Social Psychological Research," Frontiers in Psychology, volume 9. Retrieved from: https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2018.02264.
[47] KSDE, "Health Non-Traditional Concentration" (presentation and interview), May 18, 2023.
[48] Ibid.